UNDERSTANDING CONTINUOUS PROFESSIONAL DEVELOPMENT: AN HOLISTIC EXAMINATION OF ENGINEERING STUDENTS ENGAGEMENT WITH AND MOTIVATION TOWARDS CONTINUOUS PROFESSIONAL DEVELOPMENT

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Abstract

In an increasingly knowledge-based economy, there is a need to examine approaches to improving engagement with learning and developmental activities. This study carried out a holistic examination of engineering students' engagement with Continuous Professional Development (CPD) and motivation towards CPD. It established an understanding of the interaction (relationship and predictability) between Level of engagement with CPD (LECPD) and motivation towards CPD.

An explanatory sequential mixed-method approach was utilised in the study; 510 students were surveyed, and 20 academic and students interviewed across six universities in Southwest Nigeria and the North of England. In-depth analysis of data obtained yielded several findings, including the establishment of a tool that successfully measured LECPD.

The study found that engineering students attach varying importance to aspects of CPD. The study also found that there is a relationship between LECPD and Motivation towards CPD. It showed that some identified and emergent dimensions of motivation had a direct or inverse relationship with LECPD and that a large proportion of variance of LECPD can be explained by motivation towards engagement with CPD. The findings of the study also included the identification of predictors of LECPD among emergent and identified dimensions of CPD and showed that variables representative of the different dimensions of motivation are good predictors of LECPD, with a high level of accuracy. The findings also included successfully expatiating on engagement with CPD from an Interpretivist point of view.

The benefits and impacts of the study potentially cut across many sectors of society including industry, government and education research, policymakers, human resources and teachers. These areas can benefit from research that potentially enables a better understanding of student's engagement with CPD and Motivation towards engaging in CPD, an understanding that would lead to the development of strategies for improving student engagement with CPD.

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Declaration

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as References.

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Chapter one

1 Introduction

In an increasingly knowledge-based economy, there is a need to examine approaches to improving engagement with learning and developmental activities [1]. CPD a construct along the continuum of Lifelong Learning is one such approach [2, 3]. CPD is the deliberate development of professional competency (Knowledge and skill) within the context of a specific industry, towards the goal of improving productivity or innovation while still performing daily-based activities and work functions [4, 5, 6, 7, 2].

Motivation is a crucial construct in the consideration and evaluation of engagement with learning and developmental activity, including Continuous Professional Development (CPD) [8, 9]. Motivation is a multidimensional construct and can be evaluated from varying perspectives. In the context of CPD, the three relevant dimensions are the source, intensity and time [10, 2, 11, 12, 13].

> "Let us think of education as the means of developing our greatest abilities, because in each of us there is a private hope and dream which, fulfilled, can be translated into benefit for everyone and greater strength for our nation."
>
> John F. Kennedy as cited in [1]

This research is about how to get learners to learn efficiently and how to improve the process of learning and development, specifically the process of Continuous Professional Development. Simply said, this study looks at factors that motivate Engineering students to engage in CPD and how these factors can be evaluated and improved. The study examines the nature and relationship of learner's engagement with CPD and associated Motivation towards engaging with CPD. In so doing the study examines the nature of a learner's engagement with CPD, and examines the varying importance of aspects of CPD; establishes how to measure and track Level of engagement with CPD; examines associated Motivation toward engagement with CPD, identifying and determines relevant dimensions of Motivation, selects and establishes methods of measuring associated Motivation. Based on this, the study determines the relationship between Motivation towards CPD and Level of engagement with CPD; identifies the predictor of the Level of engagement with CPD among emergent and identified dimension of Motivation. In short, the study determines what learner's engagement with

CPD and associated Motivation towards engaging with CPD is and looks at ways motivating factors can be tracked and improved to positively affect a learner's continuous engagement with different forms of professional development and learning activity.

As CPD gains prominence, a Knowledge-based economy takes hold, and the world stands on the precipice of the fourth industrial revolution, it becomes more critical for individuals especially the young, to adapt to changing and insatiable needs [2, 3, 4, 5, 6, 7]. There is a need emerging to examine further or explore CPD, a concept understood as,

> "The means of constantly improving ones' knowledge and skills in a specific professional area" [2].

This need for re-examination of CPD is also supported by what Ray Bolam describes as the demand for a shift in CPD strategy from system-led to individual-led professional development [8].

Motivation is a crucial construct when considering engagement with learning and developmental activity, especially when examining approaches to increase Level of participation and intellectual dexterity of those involved with learning activity [9, 10, 11]. Based on this perceived importance of Motivation to learning and development, and the stated emerging prominence of CPD, this research aims to examine what motivates engagement with Continuous Professional Development. The research takes into cognisance the need for new and aspiring professionals to continually adapt to the changing needs which require varied knowledge qualifications and skills "by focusing pre-industry level individuals" [2]. The research focuses on individuals that succeed and individuals that fail at developing the skill of engaging with CPD before entering the industry, in this context, engineering Students.

The research seeks to answer the question; 'what motivates engineering students to engage in continuous professional development?'. It also seeks to explore the nature of the relationship between engineering students' (EES) Motivation towards engagement with CPD and Level of engagement with CPD (LECPD); and if engineering Students' Level of Motivation towards CPD can predict their engagement with CPD?

This focus gives rise to a number of questions such as: Why engineering students? Furthermore, how can professional development be considered in the context of students? The answer to the first question lies in the technology-focused nature of the fourth industrial revolution (also described as the new technology revolution) [4]. The justification of the stance adopted in this study that students

often referred as nonprofessional can engage in CPD is based on the existing trend in which universities encourage their students to engage in professional development, be it under a different name in some cases, further details are provided in Chapter 2 [12, 13, 14]. The rationale for the study is based on improving the quality of knowledge in the context of the relationship between technology and applied knowledge; on the other hand, the Motivation of the study is focused bridging industrial skill and knowledge gap.

1.1 Context and rationale

"The specific usefulness of a metaphor is what is most important to a scientist as the relationship between image (theory) and the fact is a complicated one" - Daniel Todes

[15]

It is suggested that the relationship between technology (in the context of industry) and applicable Knowledge (Relevant explicit or tacit knowledge that can be managed or used separately or in combination to address real problems and opportunities) could be likened to a relatively eternal dance. Dance towards the continually perceived advancement of humankind; evidenced by the increased investment of organisations in knowledge management through the utilisation of various knowledge management systems designed to capture and utilise both Tacit And Explicit knowledge [16, 17, 18].Tacit Knowledge is Knowledge that is unstructured and unregulated in the context of formalisation or codification. It is knowledge often based on individual experience and conceptualisation of understanding. Tacit knowledge is difficult to record, transfer or operationalise. Explicit knowledge, on the other hand, is codified, ordered, formalised and structured knowledge that is easily transferable, stored or articulated; It is the impersonal knowledge that is acquired through indirect experience [17, 19]. Irrespective of the nature of Knowledge Whether Tacit or explicit Knowledge the interaction between applicable knowledge and technology is key to activities of engineers.

The principal objective of engineers is to use technology and applicable knowledge to solve real-world problems. The relationship between technology and applicable knowledge may be likened to two dance partners whom to sustain their dance have to continually take turns in taking the lead at different points in time, by so doing, possibly driving each other forward to the eventual advancement

of humankind. It may be assumed that technology often requires the application of knowledge more than an in-depth understanding of the knowledge required (at least not to the level of pure knowledge seekers). Therefore, the existing technology is advance by utilisation of applicable knowledge (this does not mean that thoroughly understood knowledge cannot be used for invention) [18, 17].

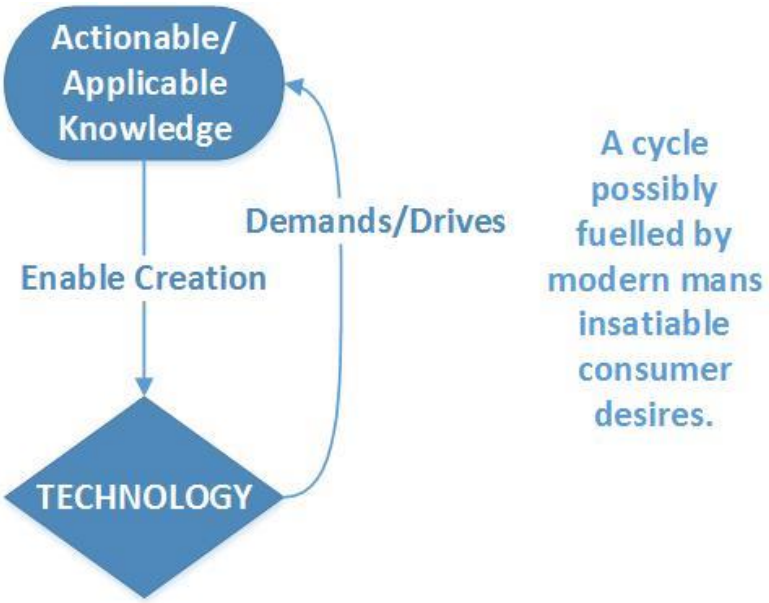


Figure 1 Compressed technology/knowledge cycle

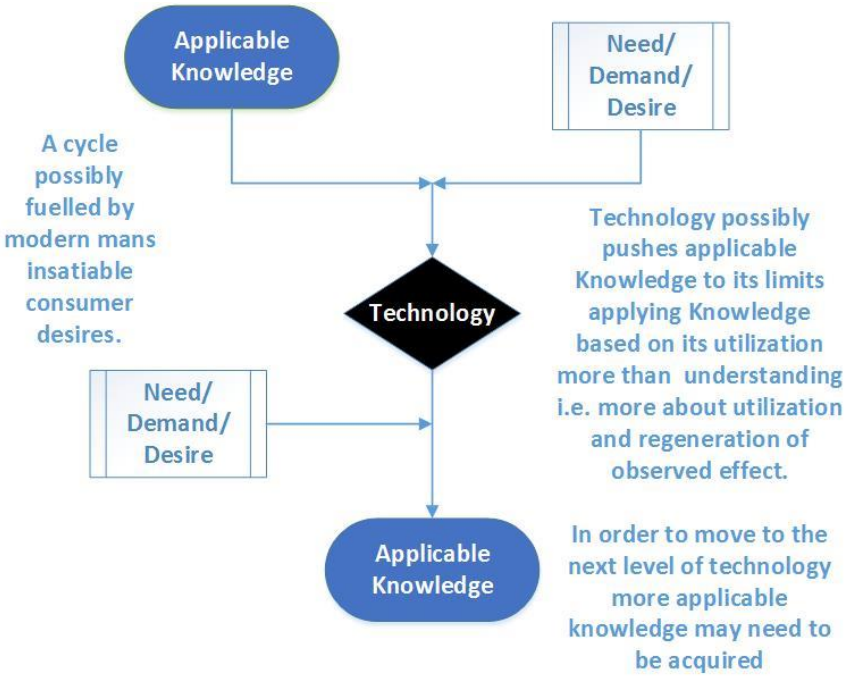


Figure 2 Technology/knowledge cycle

Technology reaches one step ahead of Knowledge (Applicable Knowledge), which creates a desire for more applicable knowledge due to ever-changing insatiable consumer needs/desires/demands [7]. This desire generates new technology as the technology industry supports the acquisition of knowledge by funding, curiosity, real-life tests and problems that need solutions. This constant jockeying between applicable knowledge and technology may need to be maintained to achieve sustainable technology development. Unfortunately, because technology has a primary driving force regarding profit, the drivers for knowledge is comparatively secondary [20]; as new knowledge results in new technology which results in profit (Ceteris paribus). *Figure 1* and *Figure 2* illustrate the link between technology and knowledge, as explained above. This constant jockeying results in need for engineers and those involved in technology development to consistently and continuously improve there knowledge and skills in line with the cycle of applicable knowledge and technology.

According to Davenport,

> *"Scholars and observers from disciplines as disparate as sociology, economics and management science agree that a transformation has occurred - Knowledge is at the centre*

stage. Knowledge is information combined with experience, context, interpretation, and reflection. It is a high-value form of information that is ready to apply to decision and action."

[18]

Knowledge acquisition, stalls when there is not adequate knowledge management or technology push (i.e. the application of already existing knowledge drives Acquisition of Knowledge). According to Davenport, technology infrastructure and information technology infrastructure are critical factors in Successful Knowledge Management Projects [18]. Knowledge immersed in organisation composes of system-led aspects such as "organisational culture, identity, routines, policies, systems and documents"; it also composes of individual-led aspects such as knowledge embedded in "individual employees". Knowledge management systems are designed to capture system-led Knowledge and individual-led Knowledge [21]. Continuous Professional Development is an approach to improve the quality of knowledge immersed in an organisation and can focus on system-led Knowledge or individual-led Knowledge; however, there is a shift towards individual-led professional development [22, 23, 24, 8]. This need for re-examination of CPD is also supported by what Ray Bolam describes as the demand for a shift in CPD strategy from system-led to individual-led professional development [8]

1.2 The Motivation of the study

The Motivation of this study is the establishment of further understanding of what motivates individuals in the context of university students to engage in Continuous Professional Development. The Motivation for this study is generated as a result of a desire to explore pathways to aid individual learners in bridging the gap between existing knowledge and the required knowledge and skills in a rapidly changing knowledge-based economy.

Kemp best underscores the importance of skills and knowledge in the modern era; according to Kemp,

"There is little doubt that the nations which will succeed in the 21st century will be 'knowledge societies' – societies rich in human capital, effective in their capacity to utilise and deploy their human resources productively and successful in the creation and commercialisation of new knowledge."

[6]

Skills and knowledge are essential in the modern world yet; there is a discrepancy between the skills required by industry and the skills taught and developed by the educational system [25]. The effect of this skill gap is exacerbated by industrial/market requirements for innovation and higher value-added; greater emphasis on creating and managing knowledge; the establishment of team-based manufacturing and processes that require a high level of skill and versatility [26, 18]. The increased competence (skill, and knowledge) requirement is occurring as organisations are experiencing increased budgetary constraints also significant is the reduction in the size of STEM-related labour force in the United Kingdom and much of the Conceptual West. The decline is due to the shift of the United Kingdom and other western-centric economies from manufacturing-based economies to services-based economies and a decrease in the overall number of individuals engaging in STEM subjects [27, 28].

To adequately bridge the skill and knowledge gap, students by the time they graduate and the entire labour force need to be equipped with the right set of skills and knowledge (practical and theoretical knowledge) to be applied in various domains of industry [29]. Sets of Skills and knowledge that enable students who often have the sound theoretical knowledge to act as intelligent problem solvers and 'hit the ground running' once they graduate and enter industry [25, 29]. Continuous Professional Development in the context of students serves as a tool to help students acquire the required industry related set of skills and knowledge to bridge the identified gap, while still developing the necessary foundation offered in formalised tertiary education settings.

Hence the principal Motivation for this study is to take a step forward in establishing mechanisms for enabling engagement with Continuous Professional Development and industry-specific skill and knowledge acquisition at an early stage (while students in University).

1.3 Statement of the problem

Continuous Professional Development is an approach to learning that views learning not as an event that occurs within a particular time frame but across the entire life of an individual and can be best described as meaning,

> *"The continuous development of the skills, knowledge and understanding that is essential for employability and fulfilment."*
>
> [30]

Continuous Professional Development is meant to complement institutional education in bridging the skill/knowledge gap and provide the labour market with much-needed skills and knowledge [31, 32].

In a rapidly developing world, Continuous Professional Development is an accepted method/means of bridging the skills gap by providing labour force/people with the knowledge and skills needed [33].

It may be suggested that Continuous Professional Development can be approached in two ways:

1. Universalistic approach: an approach where a single universal method (within the population of context) of lifelong learning is utilised. This approach is similar to what is described as a system-led approach by Ray Balom [8].
2. Particularistic approach: an approach where a set of varying methods are developed, and the method used by an individual would depend on the domain which the individual falls into based on a learning pattern test. This approach is similar to what is described as an Individual-led approach by Ray Balom [8].

It can also be suggested that Continuous Professional Development is not approached from a universalistic point of view but a particularistic point of view in line with Ray Balom's recommendation regarding a shift from a system-led approach to an individual-led approach [8]. In such a way that rather than approaching lifelong learning with a single method, a set of methods (which reflect varying individual learning, Motivation, and value proposition factors) is utilised for the application of lifelong learning. A determination of the particular method to be used out of the set of methods would depend on results of a test which would define the individuals learning, Motivation and value proposition factors.

As with any learning (skill and knowledge provision) approach, it is of importance to better understand the features and factors that influence the engagement of the target domain of the approach [34, 35, 36]. To effectively utilise lifelong learning, there is a need to have an understanding of the reasons why people engage or might engage in lifelong learning and by effect Continuous Professional Development. The level of adoption and engagement of individuals with lifelong learning can be evaluated and analysed from a number of perspectives.

There are questions as to whether or not there is an effective broad-based method of encouraging Continuous Professional Development or a better way of conducting lifelong learning. The possible solution would probably be based on establishing various categories of lifelong learners and learning platforms, determining the category of "lifelong learner" an individual falls into and determining the learning platform that best suits the individual in such a manner as to stimulate a constant desire to learn.

The problem statement for this study can be summarised as:

How can the factors that motivate engineering students to engage with Continuous Professional Development be identified and measured, so that the attributes often associated with those that are highly engaged with Continuous Professional Development can be explored?

1.4 Purpose & Aim

The study aims to carry out a holistic examination of engineering students' engagement with and Motivation towards Continuous Professional development, and in so doing, establish a holistic understanding of the interaction between them. This research aims to understand what factors motivate university students to engage with Continuous Professional Development. To identify individuals' critical attributes that enhance engagement with Continuous Professional Development to enable the selection or development of ideal approaches to motivate them to engage with Continuous Professional Development.

The scope of the study is the Motivation to engage with Continuous Professional Development in the context of university students, with a particular focus on engineering students. The concept of Continuous Professional Development will be evaluated from the perspective of developing the ability to engage with Continuous Professional Development as a skill. The scope of the study would encompass positivist inclined aspects that focus on the establishment of a measure of the Level of engagement with CPD, exploring the varying importance of aspects of CPD, exploring the relationship between Motivation towards CPD and Level of engagement with CPD and exploration and identification of predictor of the Level of engagement with CPD among dimensions of Motivation that emerge and are identified. The study's scope would encompass Interpretivist inclined aspects that shed light on the Level of engagement with CPD from an Interpretivist point of view, seeking to explore embedded norms related to CPD in the collective societal net of the academic community.

The research objectives are to shed light on the dynamics of learner's engagement with Continuous Professional Development and serve as a guideline for developing particularistic approaches to Continuous Professional Development. The research seeks to contribute to an existing conversation on the role of traditional pedagogic systems and lifelong learning in the modern world. In so doing, contributing to generating impetus for a shift in an existing perspective of Continuous Professional Development as a mainstay in an industrial context to engaging in Continuous Professional Development from an earlier point in life (definition of CPD and what constitutes CPD in the context of this research is expatiated upon in Chapter 2.0). It is hoped that the research results and findings would help improve understanding of the engagement of learners with learning activities and help

inform strategies to address skills and knowledge development needs, especially for those with performance challenges.

1.4.1 Overarching Objectives

The theoretical objectives of the research are:

- To produce a holistic literature review about Motivation to engage in Continuous Professional Development.
- To propose a multidimensional approach utilising different methods of measuring and tracking Level of Engagement with CPD and Motivation towards engagement with Continuous Professional Development
- To identify and establish the relationship between the varying identified and emergent dimensions of Motivation that influence engagement with Continuous Professional Development
- To develop a tool for predicting the tendency of a learner to engage with Continuous Professional Development.
- To develop tools to aid in changing a student's Level of Motivation to engage in Continuous Professional Development
- To identify the various forms and dimension of Motivation that are best suited for promoting engagement with varying types of Continuous Professional Development activity.
- Establish the relationship between achievement motivation, self-determined Motivation and time perspective all with the premises of engagement with Continuous Professional Development

Empirical objectives of the research are to:

- Study the key factors that influence the Continuous Professional Development climate of pedagogic institutions and organisations.
- Identify the influences of learner's dimensions of Motivation on learner's engagement with Continuous Professional Development
- To determine factors that motivates the development of Continuous Professional Development as a skill.
- Illustrate the key motivation profiles of learner engaged with Continuous Professional Development; Motivation profile being the outline of the student's multidimensional pattern of Motivation

Other objectives include:

- Utilising the concept of Continuous Professional Development to aid in bridging the existing skill & knowledge gap (the gap between University acquired competence and industry required skill)
- Develop approaches to aid the professional development of students
- Establishing factors that influence Continuous Professional Development
- To develop methodologies for determining and analysing the Motivation towards engagement with Continuous Professional Development.
- To develop a matrix for the evaluation of the Level of engagement with Continuous Professional Development.

1.4.2 Itemised Empirical Objectives

Detailed itemised empirical objective are as follows:

Measurement

1. Determine Level of engagement with CPD
    a. Determine if the Level of engagement with CPD can be measured.
    b. Establish a measure for Level of engagement with CPD.
    c. Determine the validity and reliability of measure for Level of engagement with CPD
2. Determine the level of Motivation to engage with CPD

    Determine the level of motivation in the specific context of CPD through the computation of variables representative of underlying interaction specific to the sample population.

    a. Identify existing instruments that can be used to measure the emergent and identified dimensions of Motivation towards engagement with CPD.
    b. Develop a commensurate way to aggregate the value of the level of Motivation towards engagement with CPD
3. Establish a way to compare the level of engagement with CPD to the extent of Motivation towards engagement with CPD

Importance of CPD

1. Determine Level of Importance (LP) students attach to varying aspects and items of CPD.

2. Determine if students attach different levels of importance to different aspects of professional development.
3. Determine if the Level of Importance (LP) attached to aspects of CPD vary across demographic features.

Relationship

1. Establish the nature of the relationship between LECPD and dimensions of Motivation towards engagement with CPD including associated subsets (Motivation Profile)
    a. Determine the extent (if at all) to which LECPD has a relationship with Motivation towards engagement with CPD
    b. Determine which elements and tier of dimensions of Motivation profile has the most pronounced relationship with LECPD

Overarching relationship

1. Determine the relationship between aspects of CPD and dimensions of Motivation towards CPD when effects occur simultaneously
2. Determine the tier of motivation variables that have a better relationship with Level of engagement with CPD when effect occur simultaneously

Predictors

1) To determine to what extent the Level of engagement with CPD and its respective aspects can be predicted from the motivation profile,
2) To develop a model for predicting the value of LECPD and its respective aspects using elements of the motivation profile.
3) To identify the most suitable model for predicting Level of engagement with CPD among the different tiers of motivation variables.
4) To specify which element of motivation profile that most facilitates or affects the LECPD and its respective aspects.

1.5 Research question

The research explores the interaction between students' Level of engagement with CPD and Motivation towards engagement with CPD.

The research primary research question is:

- *What motivates engineering students to engage with Continuous Professional* Development (CPD)?

Based on this, there are Secondary and tertiary questions

- What is the relationship between Engineering Students' (EES) motivation towards CPD and Level of engagement with CPD?
- To what extent can Engineering Students' Level of Motivation towards CPD predict their engagement with CPD?

The research questions are further refined to generate sub-questions in a number of categories as follows:

- Measurement
    - can the level of engagement with CPD be measured?
    - How can the level of engagement with CPD be measured?
    - How can the value of different subsets of dimensions of Motivation towards engagement with CPD be aggregate?
    - How can the level of engagement with CPD be compared to the associated Motivation towards engagement with CPD?
- Importance of CPD
    - What Level of Importance (LP) do students attach to varying aspects and items of CPD?
    - Do students attach different levels of importance to different aspects of professional development ranging across said groupings?
    - Does the Level of Importance (LP) attached to aspects of CPD vary across demographic features?

- Relationship
    - What is the nature of the relationship between LECPD and dimension of Motivation, including associated subsets?
    - To what extent, if at all does LECPD have a relationship with motivation profile?
    - Which element of motivation profile has the most Pronounced relationship with LECPD?
- Overarching relationship

- What is the relationship between aspects of CPD and dimensions of Motivation when effects occur simultaneously?
- What tier of motivation variables have a better relationship with Level of engagement with CPD

- Prediction
  - To what extent, if at all can LECPD and its several aspects be predicted from motivation profile?
  - What is the model for predicting the value of LECPD and its respective aspects using elements of individuals' motivation profile?
  - What is the most suitable model for predicting Level of engagement with CPD among the different tiers of motivation variables?

1.6 Thesis outline

The thesis is divided into 13 chapters; the first four chapters are theoretical; chapters five presents the Conceptual framework bringing together the findings of the theoretical chapters and serving as a bridge between the theoretical sections and the empirical sections. Chapter Six to twelve are empirical and analytical chapters; with Chapter Six laying out the research and analysis method while Chapters 7 to 12 present analysis and discussion. Chapter 13 contains the conclusion of the study.

The first section offers a brief introduction to the purpose and direction of the research. The following section (Chapter 2) examines the definition of CPD, evaluating the varying definition of CPD, and presenting the most appropriate definition in the context of the research. This section focusing on CPD also lays out the proposed methods/instruments for measuring LECPD. The following section examines pedagogic theories of interests to this study; this includes Vygotsky's theory of Zone of Proximal Development which is used in an uncharacteristically mechanical manner to illustrate and lend credence to constructs and arguments espoused.

The fourth section lays out the motivation theories of interest, exploring and examining Achievement motivation, Self-determined Motivation and Time Perspective, and how they interact individually and collectively with the Level of engagement with CPD. Furthermore, it lays out the foundation of the argument for the influence or effect of Motivation on LECPD. The fifth section brings together the findings of the literature review in order to create a cohesive argument to support the postulations made in the study. Chapter 5 expands on the propounded relations between varying dimensions of

Motivation and CPD with the aid of constructs such as the ZPD and recall. Chapter 5 establishes a conceptual framework that guides the empirical and analytical evaluation of the research going forward.

The sixth section in furtherance of the preceding chapter presents the detailed research question and hypothesis developed from the finding of the literature review and the arguments espoused. The research question is 'What motivates Engineering students to engage in CPD?' as aforementioned. The research question comprises of two sub-questions namely: 'What is the relationship between Engineering Students' (EES) motivation towards CPD and Level of engagement with CPD?' and 'To what extent can Engineering Students' Level of Motivation towards CPD predict their engagement with CPD?' The hypothesis based on the research question is reflective of consideration of variation in LECPD, motivation profile and influences of motivation profile on LECPD. The pragmatic worldview applied towards the research and research methods for testing the hypothesis and answering the research question is laid out in this chapter. The proposed research method is a comparative case study design based on explanatory sequential mixed-method approach.

Chapter 7 establishes understanding of students' engagement and the level of importance (LP) that students attach to the varying aspect of CPD across subject areas, skill areas and activities types. This chapter argues that students attach varying levels of importance to different aspects of professional development ranging across said areas. Firstly, the Concept of CPD and the items of professional development considered in the study are introduced. Then, the chapter elucidates on the relevance and preponderance of understanding student's perception of the LP of certain aspects of CPD. After describing the data collection and analysis process, light is shed on patterns of note in the data, especially those that strongly align with or stand in contrast to expectations. Lastly, a description is given of plausible further applications of the results of this study, particularly regarding CPD related research.

Chapter 8 establishes the measure for Level of engagement with CPD; this is one of the key research aims of the study and is paramount to further analysis required in the study. Establishing the said measure also helped in answering the research question in relations to the measurability of level of engagement with CPD. This chapter presents the approach taken in developing the measure including creating the required questionnaire, establishing the validity & reliability, exploring the interaction of items and components of CPD, computation of variables representative of the value of engagement with CPD for respective subscales (Values of Components LECPD)and the full scale (LECPD Value).

Chapter 9 presents the approach and results of the computation of variables representative of different dimensions and components of Motivation towards engagement with CPD. To enable in-depth evaluation of the relationship between the level of engagement with CPD and motivation towards engagement with CPD and by effect attempt to answer key research questions and hypothesis, variables representative of different dimensions and components of the Motivation towards engagement with CPD are computed. The process of computing the variables representative of the value of the said components and dimensions also allows for exploration and understanding the interaction between varying dimensions of motivation in the context of CPD. The variables are computed using the result of factor analysis which not only sheds light on how the variables can be computed but also the underlying trend of interaction within the dimensions of motivation. A non-refined method using weighted sums of factor loadings above a cut-off point is used in computing the variables from the result of factor analysis [37]. Variables are computed for the Achievement motivation, Self-determined motivation and Time perspective (Future Time Perspective, Zimbardo Time Perspective and Multidimensional future Time Perspective) dimensions of motivation. Pearson correlation is used to establish the nature of the relationship between the said dimensions of motivation and CPD. In so doing engaging with one of the critical objectives of this research which is to: determine the level of motivation in the specific context of CPD through the computation of variables representative of underlying interaction specific to the sample population.

In Chapter 10, an in-depth evaluation of the relationship between the level of engagement with CPD and motivation to engage with CPD is carried out. By effect, answering key research questions and hypothesis regarding the relationship between, variables representative of different dimensions and components of motivation and LECPD. These evaluations allow for exploration and understanding of the interaction between varying dimensions of motivation in the context of CPD. Pearson correlation and Canonical Correlation are used to establish the nature of the relationship between the said dimensions of motivation and CPD. In so doing, engaging with some of the key objectives of this research which are: 1) establishing the nature of the relationship between LECPD and dimensions of motivation, including associated subsets. 2) Get greater insight into the overall interaction of the aspects of CPD and the dimension of motivation. Chapter 10 tests the related hypothesis using Pearson correlations and Canonical correlation. The hypothesis that state that: 1) There is a relationship between LECPD and different dimensions of motivation and respective associated emergent subsets of said dimensions of motivation. 2) There is a relationship between the given

variable set for the level of engagement with Aspects of CPD and the other Variables set of dimensions of motivation towards engagement with CPD.

In the analysis of student motivation and engagement with Continuous professional development, it is important to explore which dimensions of motivation have a crucial impact on the level of engagement with CPD and its respective aspects. To this effect, there is a need not only to investigate which dimensions and variables of motivation towards engagement with CPD have a relationship or correlate with LECPD as was done in chapter 10 but also to carry out further multivariate analysis to examine which dimensions and variables of motivation effectively predict the level of engagement with CPD and its respective aspects. Said Multivariate analysis in the form of multiple regression was carried out making use of variables for LECPD established in chapter 8 and variables of motivation established in chapter 9. Regression was used to explore the effect of a set of independent variables (Predictor) on a dependent variable (criterion). In this case, the Independent Predictor variables being the dimensions of motivation and associated subsets, and the Criterion variable being the individual variables of LECPD and its aspects respectively

Chapter 11 take us through how the predictors of Level engagement with CPD denoted by the aforementioned variables representative of LECPD and its respective aspects were identified among the aforementioned variables representative of the different dimension of motivations. In so doing achieving some of the primary objectives of this study which are 1) to determine to what extent, if at all LECPD and its respective aspects can be predicted from motivation profile, 2) To develop a model for predicting the value of LECPD and its respective aspects using elements of individual's motivation profile, 3) To identify the most suitable model for predicting Level of engagement with CPD among the different tiers of motivation variables 4) To specify which element of motivation profile that most facilitates or affects the LECPD and its respective aspects. Chapter Eleven Shows how the hypotheses regarding the predictability of LECPD have tested; the different hypotheses and how they are tested are stated in their respective sections in the chapter. In all Chapter 11, not only shows that motivation and its many dimensions can be effective predictors of engagement with CPD and its respective aspects but also establish the intricate network of levels of motivation variables that come together to propel individuals to engage with said developmental activity.

Chapter 12 intends to shed light on the Level of engagement with CPD from an Interpretivist point of view. In so doing presenting a different outlook on what motivates students to engage with CPD. In exploring the nature of Engineering Students' (EES) motivation towards CPD and Level of engagement with CPD, there is a need to not solely rely only on a positivist approach but also to incorporate an

interpretive approach to shed some light on results gleaned in proceeding chapters. To that effect, Chapter Twelve serves to expatiate on engagement with CPD from an interpretivist point of view. Chapter Twelve presents the result of an in-depth exploration of Level of engagement with CPD through the lens of academic and students, enabling understanding of the constructed meaning associated with CPD. The chapter presents explicit knowledge of the full picture of embedded norms related to CPD in the collective societal net of the academic community.

Chapter 13, which is the Conclusion, reflects on arguments made and propositions put forward. The conclusion reflects on the findings of the Literature review chapters (2 to 5) that establish the theoretical basis for the research. The conclusion goes further to reflect on the findings of the positivist inclined chapters (7 to 11) that establish the varying importance of CPD; the measure of the Level of engagement with CPD, establish and aggregae the level of Motivation towards engagement with CPD; the relationship between motivation towards CPD and Level of engagement with CPD; and identified the predictor of the Level of engagement with CPD among emergent and identified dimensions of motivation. The conclusion also reflects on the findings of interpretivist inclined chapter twelve, which presented explicit knowledge of the full picture of embedded norms related to CPD in the collective societal net of the academic community. The conclusion also reflects on the benefits and impacts of the study. Benefits and impact that potentially cut across many sectors of society: from industry to Government and education research, policymakers, Human Resources, teachers. In all the Conclusion reflects on arguments made, propositions put forward and their potential impact and benefits.

1.7 Contribution to Knowledge

The contribution to knowledge revolves around the establishment of a holistic understanding of factors that motivate students to engage with Continuous Professional Development, employing a multidimensional approach. This potentially leading to the identification or development of a domain of Motivation based on the intensity, source and time dimensions of Motivation which can be utilised for predicting, tracking and changing learner type and form of Motivation towards CPD and level of engagement with CPD. I.e. The creation of a tool to aid in transforming the nature of the student's Motivation through internalisation or creating the necessary conditions for a student to be best positioned to succeed in Continuous Professional Development.

The significant contribution to the body of already existing knowledge is the creation of indexes for the effective and practical evaluation of Level of engagement with CPD and Motivation towards engagement with CPD. An index developed to measure the level of engagement with CPD was created by evaluating different identified markers of engagement with CPD across identified aspects of CPD

(as done in Chapter 8). An index was developed to measure motivation towards the level of engagement with CPD based on the resultant Motivation of the identified and emergent dimensions of Motivation. These indexes allow for effective measurement of Level of engagement with CPD and Motivation in the context of Continuous Professional Development, and support migration of Motivation through internalisation to a form of Motivation more conducive to the desired form of Continuous Professional Development activity.

In addition to this, the investigation of student motivation in the context of Continuous Professional Development enables an understanding of factors that affect Motivation to engage with Continuous Professional Development. The investigation is different from previous explorations of Continuous Professional Development, which are usually in the context of subjects currently involved in a profession in the industry as opposed, to the subjects of this study which are learners in tertiary academic institutions [38, 8].

The uniqueness of the research is further strengthened by the fact that Continuous Professional Development is considered more from the perspective of Continuous Professional Development as a skill rather than on the content of knowledge of the Continuous Professional Development activity; with the research focus on the development of the skill of engaging in Continuous Professional Development.

The theoretical contribution to the body of knowledge includes establishing a new student-centric outlook of Continuous professional development from the perspective of students engaged in tertiary education; the establishment and utilisation of a mechanistic approach to Vygotsky's zone of proximal development; and establishing a conceptual framework for a holistic examination of engineering students engagement with and Motivation towards Continuous Professional development, and establishing a holistic understanding of the interaction between them. The empirical contribution includes establishing the varying importance of CPD; establishing the measure of the Level of engagement with CPD; establishing and aggregating the level of Motivation towards engagement with CPD; the relationship between motivation towards CPD and Level of engagement with CPD; identifying the predictor of the Level of engagement with CPD among emergent and the identified dimensions of motivation; and developing models for predicting the level of engagement with CPD. The empirical contribution also includes establishing knowledge of embedded norms related to CPD in the collective societal net of the academic community.

In all the study not only contributes to the body of knowledge but also has real-world benefits and impact. Benefits and impact that potentially cut across many sectors of society: from industry to Government and education research, policymakers, Human Resources, teachers. These areas can benefit from research that potentially enables a better understanding of students motivation to engage in Continuous Professional Development; understanding that allows the development of strategies for improving student engagement with Continuous Professional Development.

1.8 Assumptions, Guiding Principles, Constraints and Limitation

Some assumptions were made in the process of carrying out this research. The entire of the research process and report was influenced by the author's bias and guiding principle

1.8.1 Guiding principles and bias

The outlook of this research is guided by a number of guiding Principles and bias

- Metaphors: A metaphor aids in the expansion of thought revolving around particular concepts. The notion of the importance of metaphor is supported by authors such as Ivan Pavlov and Bernard Weiner [39, 15]
- Relatedness of all things: Everything is equal to anything given the right equation or function linking them. The authors underlining philosophy of thought revolves around this concept, which implies that an underlying connection exists between all things, ideas or constructs physical or metaphysical, the pattern of the connection need only be identified or recognised
- No student left behind: The principle of developing systems that encourage and enhances development for all. A notion that every human has peculiarities and individual differences nevertheless they are equal in ability to develop given the right circumstance and mediation especially in the context of learning and development
- Industrial capitalism: development should be based on tangible results and not an extensive system of manipulation.

1.8.2 Assumptions

- An underlying assumption made was that all learners are entities with a Sense of Own Agency, as such has an ability or, at least, the perception of an ability to influence and make things happen in their immediate environment. [40]
- Learners in the context of this research are mostly referring to university students, particularly those studying engineering-related degrees, although the term holds a more generic meaning on some occasions.

1.8.3 Constraints and Limitations

There are constraints and limitations to the research. Motivation and Continuous Professional Development's multifaceted and subjective nature poses some restrictions, especially the over-determined nature of Motivation and human behaviour. In conjunction with constraints revolving around the use of positivist methods in evaluating learning and behavioural constructs.

The study is subject to several limitations commonly associated with the nature of self-reported questionnaires. In terms of quantitative data, the data collected in Nigeria was more robust than the data collected in the UK; as such, creating some limitation, this imbalance was not present in the qualitative data collected. The study of Motivation and Continuous Professional development's complex and multidimensional nature resulted in a relatively large survey tool that had its limiting influence on the study.

The study is relatively large because of the nature of the evaluated constructs; as such, not all collected data was utilised or plausible line of inquiries pursued due to space constraint. That said, the study is relatively comprehensive, although lines of enquiries not pursued serve as a reasonable basis for further studies, some of which are recommended above.

Chapter Two

2 Continuous Professional Development (CPD)

2.1 Definition of Continuous Professional Development (CPD)

Continuous professional development does not have a universally agreed definition and is often referred to by a variety of terms such as continuing education, life-long learning and professional skills development [41]. Nevertheless, there is agreement about the fact that CPD revolves around maintaining & developing competency (skill and knowledge) and is associated with Life Long Learning (LLL) [41, 38, 42, 43]. Ryan describes CPD as laying on the continuum of LLL while NHS Scotland describes CPD as activities or processes aimed at embedding the skill of lifelong learning [42, 38].

Due to the professed association between LLL and CPD, there is a need to state the definition of LLL. The Scottish Executive's Lifelong Learning Strategy (2003) defines Lifelong Learning as encompassing:

> *"The whole range of learning: formal and informal learning, workplace learning, and the skills, knowledge, attitudes and behaviours that people acquire in day-to-day experiences."*
>
> [1]

While the European commission describes lifelong learning as,

> *"Embracing all learning activity undertaken throughout life, with the aim of improving knowledge, skills/competences and/or qualifications for personal, social and/or professional reasons."*
>
> [44]

There are varying definitions of CPD, the nature of the definition is often affected by the background and outlook of the author towards professional development [45, 31, 46, 32, 47, 48, 49]. The nature of the definition can be, as:

- A process: CPD is considered as a procession of time bound activities a member of a particular organization or professional needs to advance in their career, provided that the number of hours and series of activities are carried out, the subject is considered to effectively engage with CPD.
- Knowledge or Skill Content: CPD is considered in terms of the knowledge or skill content, which an individual or a member of an organization or profession gains in a particular period

of time without regards to the series of activities or particular activities or duration of activities the professional has engaged with. Therefore, so long as the knowledge content is tested and found to be increased within the context of the profession, the individual is found or said to have engaged in CPD. This is a somewhat an unpopular approach due to the expense of testing the knowledge content or skill.

- An Activity: CPD is a check list of activities professionals go through in order to advance their careers and is quite a limited outlook. As long as a professional can check the series of activities, he is considered to have engaged in CPD.
- A skill: In this context, the person is considered to be engaged in CPD when he is skilled or reflects skill in the act of self-learning & development. An example is, in the process of a professional career either along a pre-established plan or due to on field challenges, the individual develops a skill of engaging in activities that are aimed at increasing knowledge and skills threshold.

  [45, 31, 46, 32, 47, 48, 49].

Below are some examples of the varying definitions of CPD

- Flemming describes CPD as,

  "The development of professional theoretical skills in addition to practical work functions i.e. a combination of continuing engineering education along with productive engineering". [47]

- Allen describes,

  "CPD is the process of tracking and documenting skills, knowledge and experience that is gained both formally and informally as one works, beyond any initial training. It's a record of what you experience, learn and subsequently apply. CPD is a process and skill of recording and reflecting on learning and development".

  [48]

- The British CPD is the process,

  "Through which professionals maintain and develop their knowledge and skills throughout their career to ensure that they retain their capacity to practice safely, effectively and legally within their evolving scope of practice".

  [45]

- The CPD Certification Service describes CPD as,

"The term used to describe the learning activities professionals engage in to develop and enhance their abilities. It enables learning to become conscious and proactive, rather than passive and reactive".

[49]

- The Professional Associations Research Network describes CPD as,

  "A means through which professionals maintain improve and broaden their knowledge and skills and develop the personal qualities required in their professional lives".

  [46]

- Engineering council describes CPD as,

  "The systematic acquisition of knowledge and skills, and the development of personal qualities, to maintain and enhance professional competence".

  [32]

- NHS Education for Scotland describes, Continued Professional Development (CPD) as,

  "The collective name for a range of activities through which you prove your fitness to practise". [42]

- Continuing Professional Development (CPD) is,

  "The term for a framework of learning and development activities which is seen as contributing to an individual's continued effectiveness as a professional"

  [43]

In most definitions of CPD, some key terms stand out. They include; knowledge, skills, continuous improvement, development, competency, industry, deliberate. Based on this, CPD may be defined, as the deliberate development of professional competency (knowledge and skill) or engagement with activities promoting professional competency within the context of a specific industry towards the goal of improving productivity or innovation while still performing daily-based activities and work functions.

2.2 CPD in the Context of students

In the context of this research, CPD is explored as a student centric construct. CPD is seen as the deliberate professional development activities engineering students engage in outside the remit of their main degree activity. It is also perceived as development of industry focused competency (Knowledge and skills) by engineering students, apart from competency development as a result of degree related activities.

In the normative sense, CPD is thought of in terms of those who engaged in industry or engaged in a profession [46, 31]. In order to rationalize how CPD applies to students, it is important to consider how CPD which is often thought of as for professionals is applied for those who are not yet engaged in a profession.

Considering Students as engaged in CPD can be justified by either considering their regular day to day degree related activities as a kind of profession or pointing out that CPD in the context of students is not such a strange idea as students are in some form already engaging with Professional development although under different names. The relevance of this is brought to the fore by taking into cognisance the fact that students across varying institutions are encouraged to take part in different forms of professional development activities apart from their day to day degree related activities in the form of what is termed professional or personal development planning. This is reflected in the policy statements of many Universities [50, 51, 52, 53, 12, 13, 14]. The University of York for example states:

> *"The University of York policy on personal development planning (PDP), as endorsed by Senate in July 2004, states that the undergraduate experience should play a critical part in students' personal and professional development. The policy and accompanying framework are underpinned by the belief that planning and reflection should form an integral part of the student-supervisor relationship."* [50]

Focusing on engineering students (EES), my research aims to investigate CPD from a different approach to that of CPD as a main stay of industry [31, 32]. The research primarily focuses on the notion of CPD as a skill (although it does in some instance examine CPD as and activity) and seeks to understand how to encourage engineering students to start engaging in CPD before they enter industry (graduate). In the context of the research, an individual is said to have developed CPD as a skill when the learner develops a mind-set and ability to engage in non-degree related activities that improve their professional competency or potential. While still engaged in basic day to day activities which will in this case be University prescribed, degree related learning and development activities.

For example, EES' maybe said to be engaged in CPD, if they learn how to use a particular software on discovering that the job or professional role they desire requires the use of the software that is not part of the university curriculum or used while engaged with degree related activity (apart from day to day activities). By engaging in this activity, the EES is gradually developing a habit or skill of engaging with CPD. A skill of engaging in development processes towards achieving certain industry or professional goals. A skill and orientation that may serve the individual down the line when they are

engaged in industry; and thereby resulting in benefits for the individual, organisation, industry and society at large.

2.3 Measurement of engagement with Continuous Professional Development (CPD)

The techniques and methods for evaluation and measurement of the Level of Engagement with Continuous Professional Development (LECPD) utilised by companies, organizations and professional bodies are often inadequate, with some organizations not carrying out any form of measurement or evaluation [54, 31].

International Federation of Accountants (IFA) states,

> *"Measurement is not well understood and the extent to which it takes place is relatively unknown. Many professional bodies have not even thought of output measurement"* [31]

This is also reflected in the limited literature available on the measurement of LECPD. The approaches towards the measurement of LECPD in majority of organisations can be divided into planning, action, results, reflection. The effectiveness of the CPD approaches of many organizations is damped by the ineffectiveness of the measurement strategy of the organisation. This is because the measurement procedures or instruments are oftentimes an activity list or record of activities which fail to take into cognisance the other factors that determine utility of the CPD activity [31, 54].

CPD can be evaluated using an input, output or a combination of both. The evaluation of CPD is often found lacking as most methods of evaluation focus on purpose and importance but not the output of the CPD. For instance, over 32% of professional bodies in Australia, Canada, UK and Ireland do not have a formal CPD evaluation/measurement method. This rises to as high as 33% and 45% in the Engineering and Education related sectors respectively. The evaluation of CPD by 34% of professional bodies focuses only on inputs and 14% focus only on output, thereby leaving only 21% of professional bodies with a formal CPD approach that is holistic, focused on both output and input. This falls to as low as 13% and 17% in the engineering and education sector respectively. This shows a deficiency in the measurement of engagement with CPD. Although the IFA seems to attempt to present a step forward in the evaluation, it falls short in this regard [31].

The Medical Profession is at the forefront of CPD measurement and engagement due to high stakeholder's demand for display of professional competence. 75% of Medical Professional organisations have a formal method of evaluation with 28% of this being a holistic combined

approach. This is higher than the average 68% and 21% of all organizations across UK, Ireland, Canada and Australia [31, 55, 56].

The analysis of CPD can be achieved using a four-phase CPD cycle comprising of component for evaluation of planning, action, results and reflection. The result component is divided into an effect, behaviour and knowledge component [31]. The subject's LECPD is analogous to what IFAC terms "Professional Development Value (PDV)". A model for 'CPD measurement' was developed by the International Federation of Accountants which takes into cognisance a range of factors that determine the 'professional development value' [31].

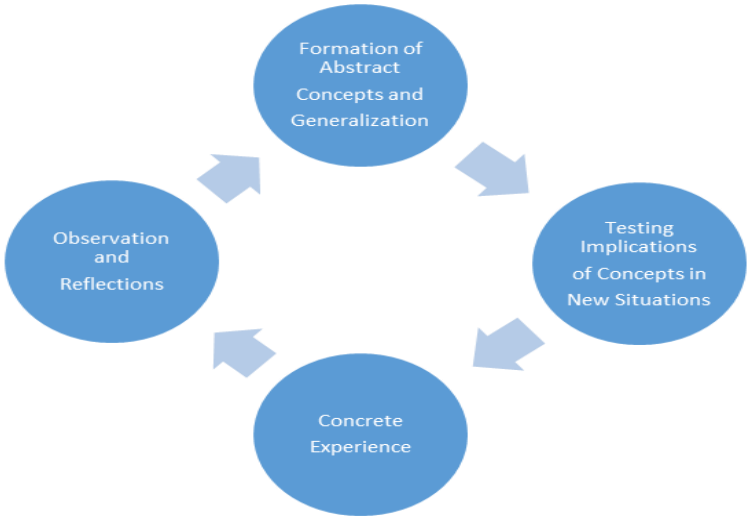


Figure 3 Kolb cycle of experiential learning

Adapted from [57]

The design of the model was influenced by Kolb's cycle of experiential learning (as illustrated in Figure 3) in which planning is analogous to formation of abstract concepts and generalization, action analogous to testing implication of concept in new situation, learning outcomes analogous to concrete experience and reflection analogous to observation and reflection (Kolb & Kolb, 2005). The design is also in line with Dennison and

Kirk's model of learning process [58].

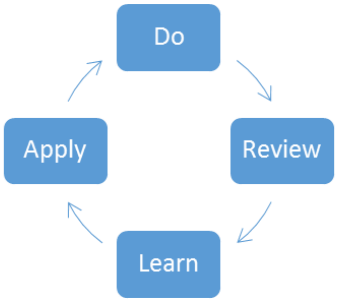


Figure 4 Dennison and kirk's model of learning process

Adapted from [58]

The CPD cycle as illustrated in Figure 5 comprises of four components in line with the Kolb 's cycle of experiential learning. The components are Planning, Action, Results and Reflection, with the Result component comprising of three sub-components [31, 54]. The three sub-components are Practice/Organizational Effects, Behaviour and Knowledge. These sub-components are reflective of the variation of results and result assessment approach depending on the particular nature and objective of CPD activity [31]. The International Federation of Accountants' revised model of CPD is illustrated in Figure 6.

The measurement approach involves a sequential evaluation of the various phases of the CPD cycle. A singular value for engagement with CPD termed professional development value (PDV) is arrived at. [31].

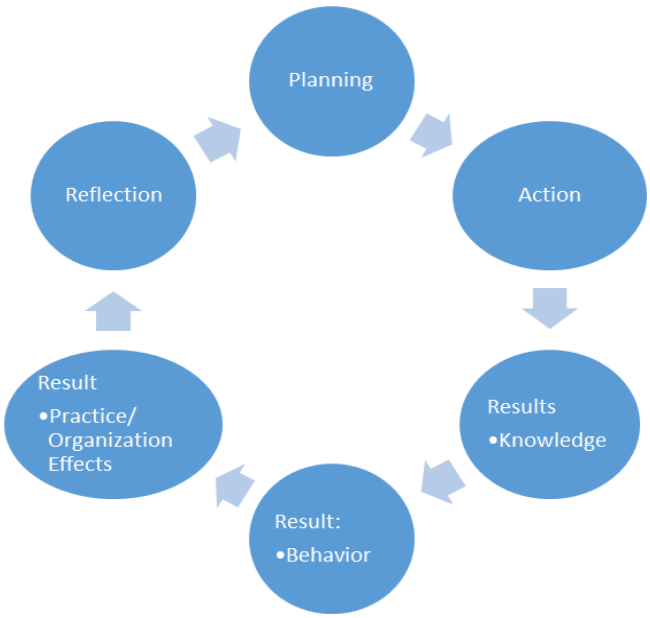


Figure 5 CPD Cycle

Adapted from [54, 31, 57]

Level of engagement in CPD as symbolized by the Professional Development Value (PDV) would be calculated using the revised model in Figure 6. The value of each component of the model is determined in order to deduce the Professional Development Value.

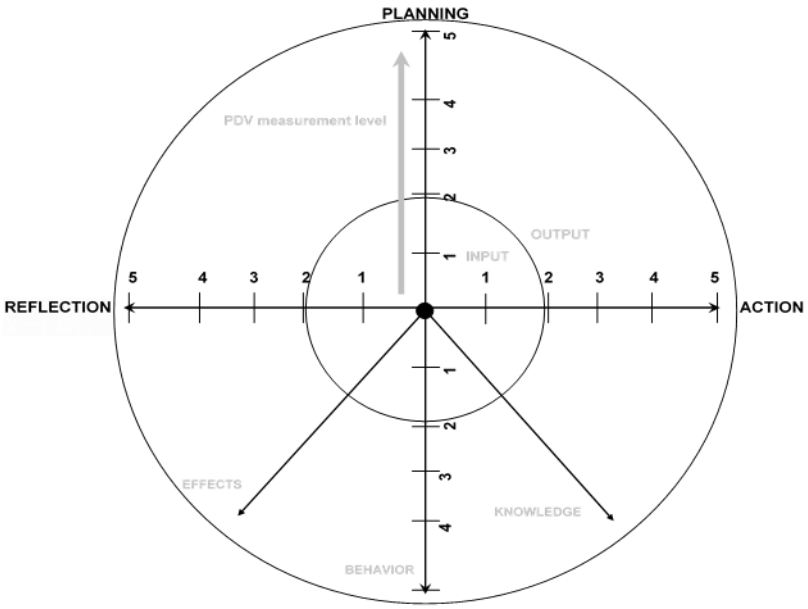


Figure 6 Revised Model of CPD measurement

[31]

Further details about the operationalisation of the measurement of professional development are provided in Chapter 8

Chapter Three

3 Pedagogy and learning theories

The nature of CPD as a form of learning process makes it essential to explore some pedagogic theories in the process of investigating the learner's engagement with CPD. The pedagogy and learning theories to be explored and utilized include Vygotsky's Zone of Proximal Development (ZPD), Behaviourism and Activity Theory.

3.1 Vygotsky's Zone of Proximal Development

Vygotsky is an important name in many fields of study, especially that of human learning [40, 59, 60]. Nevertheless, there is often misinterpretation and confusion in regards to using of Vygotsky's theories resulting from a lack of clear understanding and appreciation of the philosophical basis of his work [60]. Vygotsky's philosophy of learning is one that revolves around the social nature of learning. Vygotsky viewed learning as a social cultural and environmental construct or process with human consciousness and language, internalisation, vocalisation and sub-vocalization playing a key role [40, 60].Vygotsky viewed learning as a product of society, and individuals perceived intelligence as not standing apart from social, cultural and environmental factors & conditions [59, 60, 40]

Vygotsky referred to himself as a Marxist and a historical materialist as espoused by Karl Marx [61, 62]. According to Davydov,

> *"Vygotsky was happy to call himself a Marxist. The historical-materialist approach ensured the success of his scientific investigations; this was the philosophy that armed him, gave him the basis for integrating the sciences."* [62]

There is a consensus that Vygotsky is a social constructivist based on his theories of social learning and the attribution of the origin of constructivism to him. Although there are those critical voices that say Vygotsky's philosophical outlook is not social enough [63, 60]

Some key conceptualization of Vygotsky's outlook is that:

a) The process of development and learning cannot be separated from the influence of the society / socio-cultural group.
b) The exact nature and outlook of society and the value of social-cultural and environmental influence is a product of collective subjectivity. According to Liu & Mattew,

"collective subjectivity is a notion that external social world is shaped historically by collective participation and collaboration".

c) The collective being, the socio-cultural group or entity is always greater than the sum of its part.

[63, 40, 60, 59]

A consequence of Vygotsky's philosophical outlook towards learning (as a product of social culture interaction) is that Vygotsky conceptualisation such as the Zone of Proximal Development is hardly operationalised, especially in a mechanistic sense. Nevertheless, to utilise Vygotsky's construct of ZPD as a tool for mediating understanding in the context of this research, an uncharacteristically mechanistic interpretation will be utilised and for the purpose of this thesis, would the termed "a mechanistic approach to understanding and operationalising Vygostky's Zone of Proximal Development (ZPD). This approach is not for lack of understanding of the implication of Vygotsky's philosophical position but for pragmatic and practical purposes of applicability [64, 59].

3.1.1 Zone of proximal development (ZPD)

This is a concept developed by Vygotsky and may be viewed as a concept based on the notion that there is a region or domain of optimal development where a learner achieves optimised learning due to balance between new (required) and existing knowledge, skills, cognitive ability & competency. [59, 65]. Zone of Proximal Development (ZPD) can be defined as:

"the distance between the actual developmental level as determined by independent problem solving and level of potential development as determined through problem solving under adult guidance or in collaborations with more capable peers"

[59].

The ZPD may be viewed as a domain that promotes learners' ability, motivational and possibility to learn. In this optimal learning region, there may be an optimal balance of level of challenge, which is adequate to maintain interest and growth without overwhelming the learner. This is a zone of undeveloped but developing conceptualizations and processes. As illustrated in Figure 7, this optimal level is depicted as being just beyond the student's area of comfort; an area between the can and can't zone. It may be said that Vygotsky believed that the role of educators and official pedagogic

agencies was to aid learners in getting to and remaining in this ZPD through variation of level of challenge as learners develop [66, 59, 65].

According to Vygotsky,

> *"The ZPD characterizes the difference between what the child is capable of himself and what he can become capable of with the help of a teacher".*

[65]

The notion assumes that learners may achieve effective learning within the ZPD through the process of pedagogic agency, assisted problem solving and learning activities [67, 65].

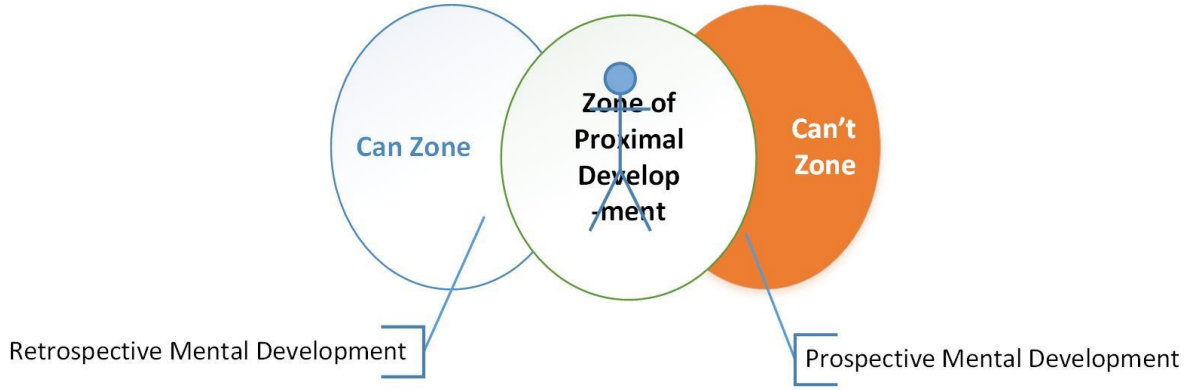


Figure 7 ZPD Model

Adapted from [68] [69] [59]

CPD is a learning approach that seeks to place students in the proximal development zone and develop a skill and mental disposition where the students continually seek to be in this zone and look for continuous further development. This is based on the assumption that the student's development is constantly in the forward direction and that events/activities and competencies in the ZPD eventually migrate to the students 'can zone'. The students 'can't zone' then activates and becomes the new ZPD activities.

3.1.2 Holistic Continuous Professional Development (CPD) Engagement and performance Level measurement based in the context of Zone of Proximal Development

According to Moll (1990) Vygotsky's concept ZPD, can be broadly described as a systematic and regimented approach of aiding and directing a learner's development within specific contexts and

development levels. [67]. The ZPD is an embryonic zone where skills, knowledge and competencies can be further developed.

Based on this, it may be suggested that an individual's Level of engagement with CPD can be measured by doing an initial test of the developmental level of the individual, determining what the size of the immediate domain of proximal development of the individual is, and comparing that with how much of that potential development of the individual has engaged in or how far within the proximal development domain the individual has advanced. This is illustrated in Figure 8.

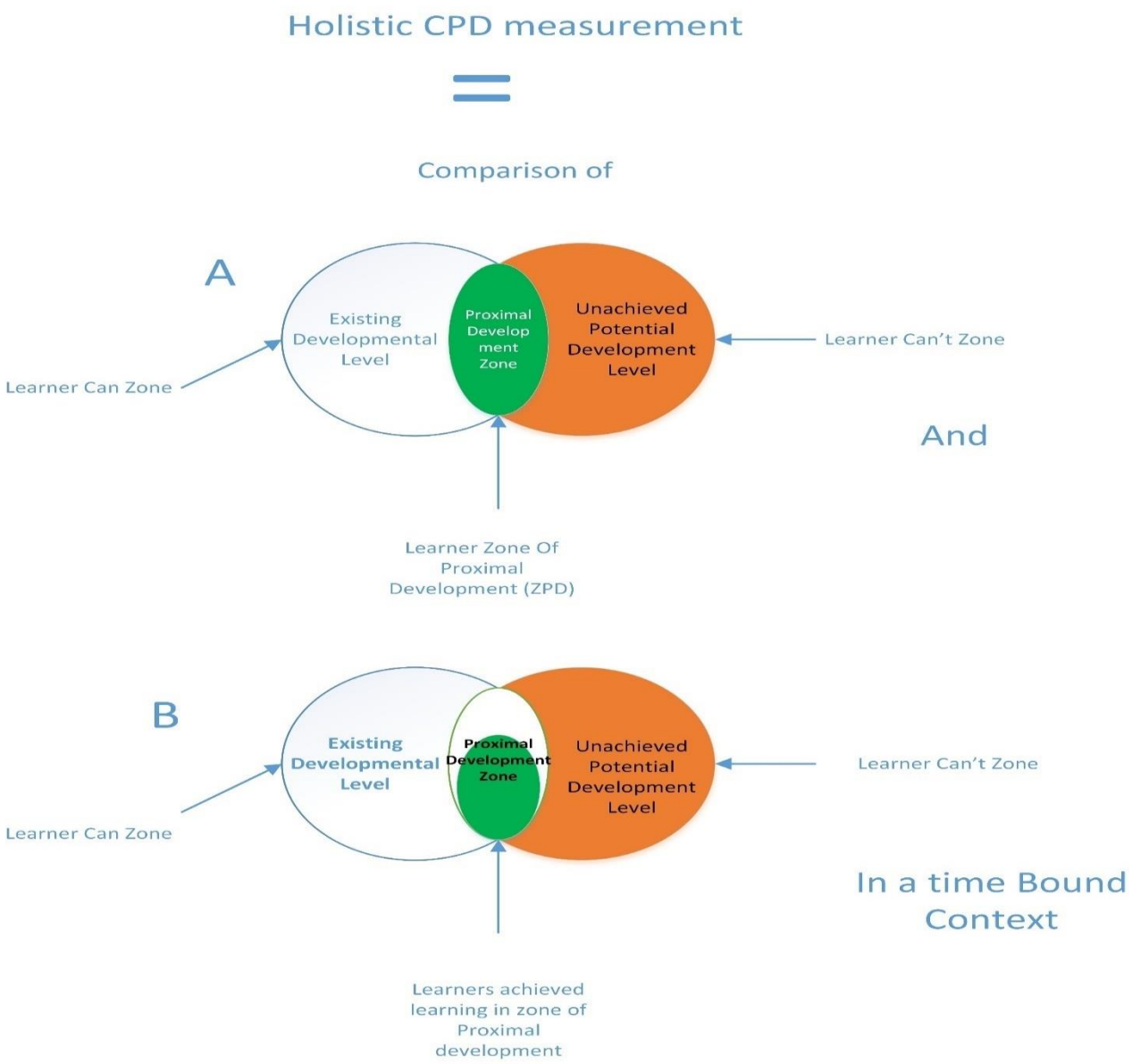


Figure 8 Model for Holistic CPD Engagement and performance Level measurement based in the context of ZPD Model

Adapted from [68, 67, 65, 59]

3.2 Behaviourism:

Behaviourists attribute behaviour to the external stimulus, taking the point of view that behaviour is a reaction or response to stimuli. The origin of behaviour theory can be traced back as far as Ivan Sechenov and Ivan Pavlov. Nevertheless, the popularity of behaviourism is associated with John Watson who some arguably refer to as the founder of behaviourism. There is an extensive application of behavioural theory in education, although there are theorists that question the premise of behavioural theory [70].

Behaviourism revolves around the notion of behaviour as central to learning [70]. This notion can be considered as based on the logic that behaviour is a combination of codes and context of a society as reflected in the action, attitude, preconception and thought patterns of individual members of the society. On the other hand, learning is the process of creation, transfer and change of the codes and context of a society as perceived by an individual member of the society. As such, learning is the process of change and modelling behaviour i.e. learning is reliant on the central concept of behaviour [71].

Behaviourism focuses on observable behaviour and factors that result in behaviour i.e. situations that elicit behaviour. Behaviourism seeks to approach the concept of learning from the context of Behaviour, defining learning as a change in behaviour as a result of external stimulus and learning motivation generated or prompted by external stimulus. According to Ivan Pavlov, external stimulus in the form of negative and positive stimulus (i.e. Incentives and Punishment) aid in modelling behaviour and, by virtue, the rate and nature of learning [72, 73].

When considered from the point of view of behaviourism and Pavlov/skinner interpretation of learning behaviour, it may be stipulated that the role of CPD and the process of improving CPD skill of an individual may be termed as a process of moving individuals from a behaviourism nature where the learner is a passive recipient to being an incentive-driven learner. The former gains knowledge and skills as a result of response to an external stimulus or as a result of a push, while the latter is an active pursuer of knowledge and skill as a result of beholding the future incentive of learning [74, 15].

3.3 Activity Theory

Another theory that is of interest when considering engagement with learning and development such as CPD is activity theory. The effect of group interaction on engagement with CPD may be evaluated through the lens of activity theory.

Activity theory has implications for investigating the effect of group interaction on engagement with CPD. For an event to be considered as a group activity the collection of individuals that comprise the group must have a shared goal [40, 75].

Activity theory known as the Cultural-historical theory is a theory that evolved to bridge the perceived gap between psychoanalytic and behaviourism approach to psychology. Vygotsky viewed all actions, especially actions or reactions to stimuli as a result of mediation by clues. Activity theory revolves around Vygotsky's concept of mediation [76, 40] with stimulus being analogous to relationships between humans, objects and events in the environment.

According to Smidt

> *"For Vygotsky, a human individual never reacts directly to the environment, rather a relationship between a human being and objects or events"*
>
> [40]

Activity theory has gone through various iterations and the notable ones are:

1. The original guided by the concepts of artefact-mediated and object-oriented.
   Artefact-mediated means occurrences that utilise cultural tools. Object-oriented means occurrences in the form of first-hand exploration or concrete experience. The figure below reflects the first iteration of activity. This theory is based on the relationship between cultural artefacts and behaviour in the context of interaction between Individuals and Society as propounded by Vygotsky [40, 76].

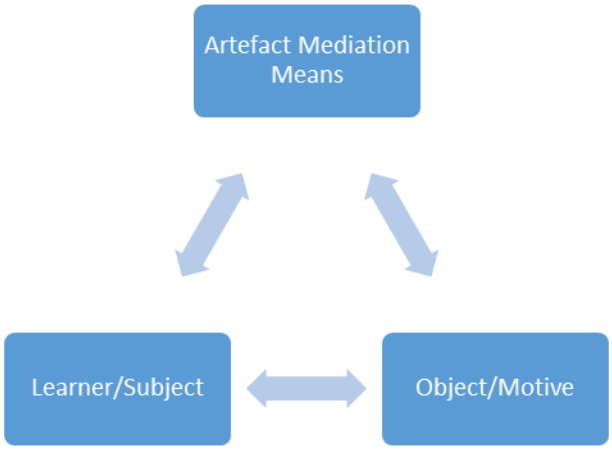


Figure 9 First Generation activity theory

Adapted from [40, 75, 77, 76]

2. The second iteration is the Leontie iteration. It includes the concept of joint collective action-mediated and a discreetly oval shaped representation of objects to indicate the subject and changeability of object-oriented action. [77]
3. The third iteration of activity theory being that of Micheal Cole who inserted an element for cultural diversity and inclusion of "tools to understand dialogue, multiple perspectives a network of interacting activity systems" [40].
4. The fourth iteration of activity theory was evolved by Engestron, who took into cognisance imports of the dynamics between goals and perspective of goals. Engestron added elements that signify dynamics between goals and perspective of goals to activity theory. Engestron believed that the dynamics of interaction between varied goals and viewpoints of individuals constantly and continuously involved the nature of the activity and common goal in a context where activity is a group of events having a common goal [76, 40, 78]. This iteration gave rise to joint collective mediation which means that occurrence takes place through interaction with others [40]. The dynamics of goal and perspective iteration involve constant negotiation, orchestration and struggle all coming together to achieve activity. [76]
5. The fifth iteration of activity theory is designed to create what is termed an 'institutional version of the ZPD by building on or utilising theories of cultural historical activity to create and promote a collaborative learning within a system of shared rules i.e. a new ZPD is a zone of joint mediated activity.

   The fifth dimension is applicable to development activity. It improves learner's participation, especially through the development of inter-thinking as defined by Smidt. According to Smidt,

"inter-thinking is how learners think and become able to appropriate collective thinking. The thinking of others in their culture"

[40, 75]

This applicability especially in the context of CPD can be achieved through:

1. The utilization of question-and-answer sessions to evaluate knowledge and aid in developing understanding [79];
2. The utilization of a focus on subject context cues and suggestion reflective of approaches to development and solutions to inform learners development [80];
3. Treating Learning as a social and communication process [40].

Activity theory and Internalization

A connection between internalization, activity theory and motivation can be drawn when considering mediating internalization through activity in order to achieve a change in one's nature of motivation towards CPD and learning from CPD activity.

Internalization through mediation can be utilized as a means of improving engagement with learning activities such as CPD and also changing form of motivation.

Internalization can be achieved through mediation of third parties such as tutors and managers who share similar background, occupation or culture; this is referred to as relatedness; through those having a shared conceptualization of operation/interaction parameter between them within a setting. [40, 81, 77].

Activity Theory and Threshold concept.

Paiget viewed human development as a chronological and sequential age based order, while Vygotsky viewed the chronology of development as an ecological based order. This reflects meaningful transition in subject's life, therefore, implying connections between the relationship of groups in society and environment connections [40, 82, 83].

Chapter Four

4 Motivation theory

The concept of motivation is a wide and multifaceted concept that cuts across various schools of thought and bodies of knowledge.

> *The range of literature on motivation is vast and, depending on whether one's professional discipline is, for example, Psychology, Bioscience, Education or Business,– it will represent motivation in quite different ways.*
>
> [10]

The share volume of articles with the word 'motivation' in their title is a testament to the importance and versatility of the concept of motivation. With over 51,000 articles on google scholar from 1990 to 2014 having the word 'motivation' in their title, and about 4,520 articles using the term 'motivation' in the abstract in the past year.

There are various definitions of the concept called motivation. The definitions vary depending on the context, form of motivation and school of thought being considered, with definitions sometimes appearing to contradict.

> "*There can be contradictory views of what the inherent nature of motivation is,"*
>
> [69]

The author has made various attempts to come up with a comprehensive definition of motivation.

> *"Motivation concerns the conditions responsible for variations in the intensity, quality, and direction of ongoing behaviour."* [70]

> *"In summary then, it seems that the use of motivational concepts can be justified in order to predict something about: (1) the activity level of the organism, (2) the direction of such activity, and, finally, (3) the organism's persistence in attempting to reach a proper goal."*
>
> [71]

"All motivated acts consist of three common phases, which we shall refer to as (1) arousal, or activation, (2) engagement of specific mechanisms and activities, and (3) sustained and various modes of pursuance of certain ends or goals."

[72]

"Motivation refers to processes or conditions which may be physiological or psychological, innate or acquired, internal or external to the organism which decide or describe how, or in respect of what, behaviour is initiated, maintained, guided, selected, or terminated. It also refers to end states which such behaviour frequently achieves or is designed to achieve whether they are conditions of the organism or environment; it also refers to the behaviour engaged in, or aspects of that behaviour, in respect of its, organisation, occurrence, continuation, reorganization, or termination with regard to past or present or future organic or environmental conditions; further, it refers to the fact that an individual will learn or remember or forget certain material, as well as the rate or manner in which these processes occur and the ease or difficulty with which they are altered, as well as to some processes or conditions which are responsible for this behaviour; similarly, it determines"

[73]

From the various definitions of motivation, it can be put foward that motivation is a concept, construct or term that attempts to describe the process and complexities that surround the various phases of organismic action. Motivation is a concept that attempts to find underlining mental factors involving the process of deciding to act, the process of action, and possibly the result of action.

4.1 Theories of Human Behaviour

Maximising the potential of human resources has become an increasingly complex task as technology and society develop. [74]

The study of human behaviour and its determinate (especially motivation as a concept) has come to the forefront in consideration of human potential development, engagement and behaviour analysis. Human behaviour is broadly examined through two fundamental paradigms, internal and external. Internal theories have been the dominant torch bearer of motivation and comprises of theories from the likes of Freud, Maslow and others [75, 74, 76, 77]

Internal theories approach motivation from the point of view of inert capabilities developed from biological nature (essence). These theories focus on factors, dynamics and nature that can alter or

affect said capabilities. Internal theories range from mechanistic theories to cognitive theories [75]. The theories have sort to investigate the links between nature of behaviour internal capabilities such as motivation, behaviour nature and exhibition of behaviour such as performance, resistance, persistence, task engagement. Internal constructs of behaviour such as motivation have been a critical focus of research into human capacity development, especially as a result of the plausible link between constructs such as motivation and behaviour.

4.1.1 External Theories of Behaviour

External theories with works of authors like Locke, Thorndike, Watson, Skinner are not as established or noted as internal theories. External theories approach motivation from the point of view of external induced capacity development.

These theories focus on the varying effect of external stimulus on behaviour and via the external determinate of behaviour as the principal source or precursor of human behaviour [74, 75]. This is supported by a worldview that behaviour is reinforced or impeded by positive or negative consequences i.e. all behaviour as a form of the effect of or reaction to external stimulus [26, 74]. Internal

There is a renewed focus on determinate of behaviour such as motivation whose dynamics can result in an alteration of learning patterns predictably hence, developing a means of controlling and altering human behaviour. Behavioural theories, both internal and external analysis behaviour through a primary categorisation of plausible results of behaviour exhibition, using the identified categorisation as theories much like external theories seek to investigate factors that affect behaviour and the dynamics between the source of behaviour and behaviour exhibited.

The position of the external paradigm is next illustrated by the turn of the century Thorndike Law of Effect which states that,

> *"Behaviour with rewarding consequences tends to be repeated, and behaviours with punishing effects tend to disappear."*
>
> [78]

Anchor to hold firm and allow working back.

These categorisations of result are as follows:

- Positive reinforcement

- Punishment
- Negative reinforcement
- Persistence
- Extinction [77, 74]

4.1.2 Need theories

Many theories examine the factors that result in behaviour or that decides the behaviour to be exhibited (as illustrated in Figure 10). Theories such as:

1. Maslow's need theories can be best elaborated by the following one-line self-description of his work.

   "In addition to what the psychologist of the time had to say about human nature man also had a higher nature and that this was instinctoid, i.e., the path of his essence."

   [77]

Figure 10 Maslow's Hierarchy of needs

[76]

This quote credited to Maslow to a large extent exemplifies Maslow's work and his passion

"to understand human behaviour through systematic categorisation of the need that precipitate behaviour and an analysis of said categorisation and dynamics that come to play." [77]

Maslow's theory of needs revolves around categorisation of needs and the hierarchy of said categorised needs. Maslow examined the dynamics of such needs with respect to the various forms of plausible consequences. However, Maslow's theory focuses more on extinction i.e. satisfaction of need and the effect that it has on other needs on the hierarchy of needs.

Maslow's theory conceived that needs lower in the hierarchal structure were more pertinent than those higher, with higher ordered needs either being masked, dominated or practically nonexistence when the lower orders are unsatisfied.

Maslow's theory asserted that it should approach lower needs from an external paradigm while higher needs approached from an internal point of view. Maslow also asserted that it exhibits higher ordered needs only after satisfaction of lower pre-potent needs.

The validity of Maslow's hierarchy has been called into question by many. Raaij and Wondwossen state that

"Maslow's need hierarchy is by no means definitive and is rather out of focus".

[79]

Regardless of status of empirical Validity of Maslow's hierarchy of needs, its functionality is undisputed [79].

2. Alderfer's ERG Theory is further expanded on by Maslow's theory by distilling Maslow's conception of need into three core needs
    a. Growth
    b. Existence
    c. Relatedness [80]

The categories are existence, relatedness and growth. Figure 11 below illustrates this categorisation.

Maslow's Needs	ERG Need
Physiological	Existence
Safety-material	
Safety-interpersonal	Relatedness
Belongingness	
Esteem-interpersonal	
Esteem-self confirmed	Growth
Self-actualization	

Figure 11 Categorisation of Alderfer's Theory

[80]

3. McGregor's Theory "X" and Theory "Y" developed models that attempt to interpret behaviour from negative theory "X" and positive theory "Y" point of view. McGregor's model is a conflict model that attempts to interpret behaviour by positive or negative theory "X" and a positive theory "Y" [81].
4. Herzberg's Two Factor Theory examines motivation based on the effects of factors of motivation dividing or classifying the factors into hygiene or extrinsic factors and motivators [82].
5. McClelland's Achievement Need Theories. This theory revolved around the needs for achievement, power, and affiliation. Defining the needs as Nach, Npower and Naff. This lead to more advanced theories such as Atkinson's AM theory [75] [74]

4.1.3 Process Theory

Process theories seek to understand the processes involved in behaviour or determination to engage in certain exhibitions of behaviour. The process theories include Vroom Expectancy Theory, Kelley's Attribution Theory, Locke's Goal Setting Theory, and Adam's Social Exchange Equity Theory.

1. Vroom's Expectancy theory attempts to draw a direct link between behaviour and consequences through an examination of the subjective value of or interpretation of nature of consequences termed expectancy. They have shown recent interest in the Vroom's theory. Vroom's Expectancy theory revolves around the key concepts of valence, expectancy and instrumentality. This concept where considered in the context of a number of outcomes. [83, 84]

Vroom identified the variables of behaviour as attractiveness, performance-reward and effort in more accurate terms performance-reward linkage and effort-performance Linkage as illustrated in Figure 12

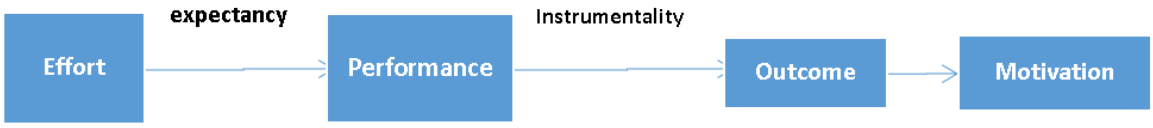


Figure 12 Expectancy and Instrumentality

[84, 74, 83]

2. Expectancy theory conceptualises the effect of expected outcome and value of the outcome on motivation to exhibit certain behaviour [79].

   Expectancy is the perceived probability that effort will lead to outstanding performance. Instrumentality is the perceived probability that outstanding performance will lead to desired outcomes. Valence is the value of expected outcomes to the individual. [74]

3. Kelley's Attribution theory seeks to examine the effects of failure or success on behaviour by analysing and classifying explanations for failure. The categorisation in which the explanation for failure falls is then employed in predicting motivation to engage in future activities or the effects of the success or failure (effect of success links it to Atkinson's theory of motivation). The categories include ability, effort, task difficulty and luck.
4. Adam's social exchange or equity theory attempts to relate subjective evaluation of results obtained in a similar action by other organisms to that of this organism.
   It based the key evaluation on the subjective reaction of the organism to perceived level of equality or inequality of rewards i.e. relative to the rewards of other entities. This comparison can be made relative to other individuals, systems or self.
5. Locke's Goal-setting theory attempts to link behaviour with nature of goal.

4.2 Academic Motivation

In the context of learning and development, there are various definitions and forms of motivation, but it may be safe to assume that it is universally agreed that motivation plays an important role in the learning process especially in the context of official pedagogic agencies.

> *Educators agree that a major variable affecting classroom performance is motivation. Motivational variables are important in understanding, predicting, and controlling classroom behavior.* [8]

Motivation is a major factor that affects the interaction and performance, of a learner in the context of learning. The term academic motivation was coined as a construct to describe the concept of motivation in the context of learning in the framework of official pedagogic agencies. Academic motivation is a key factor that affects academic performance

> *" Academic Motivation is so essential to academic achievement that motivation has taken a place along with cognition as one of the most followed lines of inquiry in educational psychology."* [22]

The concept of academic motivation or motivation in the framework of academics was relatively undefined, even though the importance of motivation in this context was well established. The first iteration of a theory of academic motivation may have been in 1957 by Atkinson in the form of Atkinson theory of AM. [8].

There are various definitions of academic motivation, much as with the construct of motivation itself. Nukpe (2012) describes Academic motivation as:

> *"Academic motivation is about goals, energy, drive and direction and having a reason to do what they do and do it to the best of their ability"* [10]

Based on the various definitions of Academic motivation, it may be suggested that Academic motivation is the motivation of a learner to partake in what is termed as academic learning in the context of an official pedagogic agency.

There are wide arrays of academic motivation theories which can serve as windows through which a learner's motivation can be viewed. The theories of relevance to CPD motivation and engagement research are selected based on three dimensions; source of motivation, the time duration of motivation and level of motivation. The theories are as follows.

4.3 Achievement Motivation

According to Weiner (1972), Achievement motivation (AM) is:

> *"The positive or negative anticipatory goal reactions aroused in situations that involve competition with a standard of excellence, where performance may be evaluated as a success or failure."* [59]

AM is motivation in the context of achievement of a set goal. According to Kaplan (2009)

> *"AM denotes processes leading to behaviour that aims to achieve a certain criterion or standard."* [85].

AM may be influenced by personality characteristics, context and situation. According to [86]

> *"AM refers to motivation in situations in which individuals' competence is at issue."* [86]

AM tends to reflex an approach to motivation from the perspective of the intensity of motivation or, at least, intensity of participation in an activity as a result of Motivation. According to Revelle and Micheals (1976):

> *"The classic theory of AM is found to be a special case of a more general theory relating task difficulty and number of trials to performance."* [87]

This fact may somewhat indicate that although motivation does not guarantee success, it improves the probability of success by influencing both the intensity of effort, frequency of effort, concentration, etc. as such motivation can be approximated by the number of trials to perform. AM may either be achievement-oriented or failure avoidance-oriented (Failure Threatened)
[86] [85] [8]

4.3.1 Background of Achievement Motivation (AM)

The background of AM revolves around exploration of human behaviour by the likes of Hull, Lewin and McClelland. In exploring the background of AM, it took a look at the role of the key conceptualisation of behaviour in the context of nature versus nurture, environmental situation versus individual nature, and similarities in behaviour versus difference. Also included is an evaluation of the influence of the likes of Hull, Lewin and Atkinson in shaping the discuss of AM. In addition to this, it carried an exploration of the critical construct of achievement need which is central to AM including the role of the Thematic Appreciation test in evaluation in achievement need and development of initial theory of AM. The examination of the background of AM theory was concluded with a consideration of the importance and applicability of AM theory.

Environment versus individual nature: Similarities versus Differences

In the process of understanding behaviour or attempting to understand behavioural similarities and differences, the behaviour of organisms need needs to be explored so as to (delete the word so as to) determine decide underling factors.

The similarity of behaviour is often observed through the lens of environmental determinates of behaviour while differences are often explore through the paradigm of individual nature (personality structure) [75].

Berlyne points out the conundrum this poses:

> *"It is perfectly obvious that human beings are Different from one another in some respects but alike in other respects. The question is whether we should first look for statements that apply to all of them or whether we should first try to describe and explain their differences."*
>
> [88]

Behavioural theorists such as Watson and Hull discarded examination of behaviour based on individual difference in favour of an environment based approach. This bias was as a result of inherited schools of thought, personal philosophy of science, a preoccupation with learning and learned behaviour as the gateway for understanding higher mammal's behaviour [88].

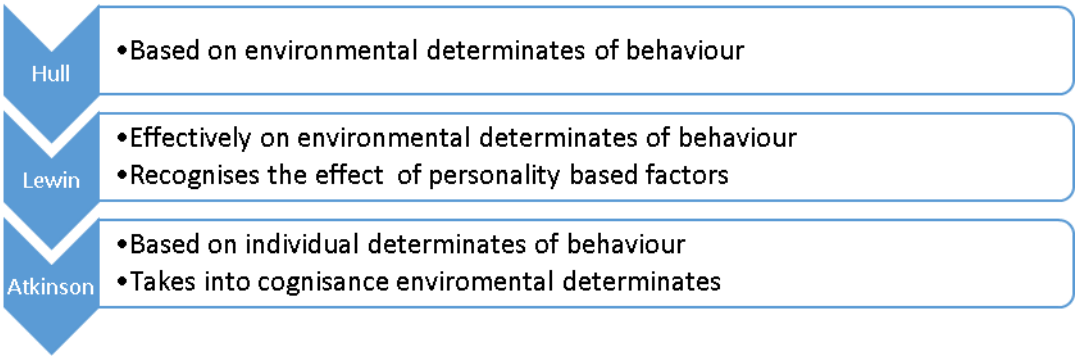


Figure 13 Approaches to examination of behaviour

[89, 90, 91]

On the other hand, those like Lewin and Atkinson took a more balanced approach taking into cognisance both individual nature and the environment. This is illustrated by Atkinson's Equation for Hope of success, which is in line with the Lewinian scheme. Figure 1 displays the approaches to examination of behaviour adopted by Hull, Lewin and Atkinson.

Lewin posits that:

"General Laws and individual differences are merely two parts of one problem; they are mutually dependent on each other and the study of one cannot proceed without the study of others" [91]

Lewin's work focused more on (is either momentary or temporary) personality factors, while Atkinson's focused more on permanent personality factors. The key difference between Atkinson and Lewin is that Lewin approached the concept of individual differences as certain value of variables within the behaviour equation, while Atkinson approached individual differences in terms of personality factor as a determinate of behaviour [91, 11].

Lewin approached personality factor or individual differences as a certain value of the general law equation i.e each set of values of the general law is a spectrum of personality with varying values representing individual spectrums. Viewing the value of general law equation as being equivalent to behaviour and variance of this value is equivalent or reflective of individual differences (almost like view individual differences as categories of behaviour). Atkinson approached the personality factor or individual differences as an integral part of the equation of behaviour, viewing individual differences as separate factors which in combination with general laws decide behaviour. i.e viewing personality factor as one of the factors whose resultant determines behaviour.

Atkinson's approach to motivation is informed by: Drive *Habit theory; Hullian & Lewinian conceptualisation of behaviour and miller's conflict model. Atkinson approached individual differences in the context of Drive * habit theory then inserted this into Hullian and Lewinian behaviour functions. Atkinson's approach involved a modification of Hullian and Lewinian conceptualisation of behaviour by taking into cognisance individual differences in the context of Drive *habit theory and the peculiarity of AM situation in the context of miller's conflict model [11, 90, 92].

Atkinson's conceptualisation of behaviour or the function of behaviour includes an equation with variables representing personality factors, environment factors and experiential variables. Atkinson's conceptualisation further includes two polar components of this equation whose resultant reflect the overall tendency to engage with achievement-related tasks [11, 90, 92].

Tendency to locomote = Hope of success (+VE) + The Fear of failure (-VE). *(1)*

= Approach Tendency towards goal (+VE) + avoidance Tendency (-VE). (2)

=Achievement oriented motivation(+VE) +Failure avoidance oriented motivation(-VE). (3)

Atkinson's equation of determinants of approach behaviour

4.3.1.2 Hull, Lewin and Atkinson

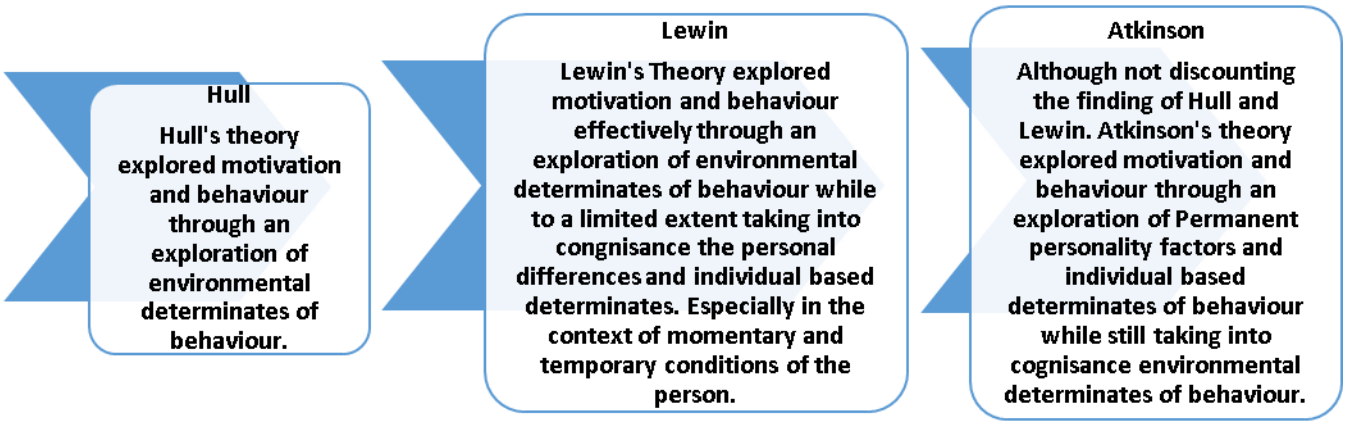


Figure 14 Differences of approaches to examination of behaviour and motivation

[90, 91, 75, 11]

Atkinson's theory of motivation may be said to be within the same nomological network as the works of many motivational theorists such as Hull, Lewin, Tolaman. The major way in which Atkinson's theory stands out and achieves construct validity is based on the fact that Atkinson's theory examines motivation from the point of view of the permanent or inert motivational disposition of the individual this differs from the theories of Hull and Lewin. Hull, in the tradition of empiricist and associationists, explores motivation and behaviour theory from the point of view of environmental effects on motivation. Hull's orientation was found to be as a result of his political and philosophical views [90, 91, 11, 75]. According to Weiner,

> *" Hull's relative neglect of individual differences was a conscious by-product of his philosophy of science"*

[75]

On the other hand, Lewin explored motivation from both the point of view of environmental influence and individual differences although Lewin's focus in terms of individual differences was on momentary

and temporary individual differences. This distinction effectively made Lewin's exploration of motivation and behaviour similar to Hull's as Lewin's approach appropriated an equivalent value of momentary and temporary condition to subjects in the same baseline experimental conditions. According to Lewin,

> " *The basic contention was that behaviour is a function of both the person and the environment*"
>
> [91]

Atkinson's theory was a concerted attempt at a mathematical representation of factors that influence behaviour [8, 75]. According to Weiner (1972)

> " *Atkinson attempted to isolate the determinants of behaviour and specify the mathematical relationship between the components of the theory".*
>
> [75]

This Mathematical outlook on motivation was not limited to Atkinson, as Hull and Lewin also conceived analysis or evaluation of motivation in mathematical terms as a result of his preconceived strict qualitative natural science approach to behaviour theory; as general laws are expressed in an equation which relates variables [91, 88]. According to Berlyne, hull offered the hypothesis that;

> *"assuming that the forms of the equations representing the behavioural laws of both individuals and species are identical and that the differences between individuals and species will be found in the empirical constants which are essential components of such equations*".
>
> [88]

Similar constructs or at least a semblance of similar constructs exist with Atkinson and Lewin motivation theory in the context of constructs existing within Lewin's theory that can reflect permanent or inert motivational disposition of the individual.

The interconnection between Hull, Lewin and Atkinson's theory seems to form a natural progression. Hull explored motivation from the context of environmental determinates of behaviour. Lewin hints at individual differences but effectively explores motivation from the context of environment, although examining temporary or momentary individual differences. Atkinson explores motivation in the context of individual differences in the form of permanent individual differences while still taking into account environmental determinates. Atkinson utilized similar behavioural determinant variables to Hull and Lewin but incorporated individual differences by including a variable for personality structures among behavioural determinants [11, 75, 88].

Hull - Environment; Lewin - Environment (effectively) and The person (with a notion of the person); Atkinson - Person (effectively) and Environment (with a notion of environment in a very Limited context).

It can be suggested that Lewin seems torn between his philosophical consideration and his observation of individual differences. As such he balanced it by attempting to link individual difference to environmental determinates through the construct of temporary and momentary condition of person [91, 90, 89].

The achievement theory of motivation is based on the key premise of task stimulus and response. The Theory revolves around the relationship between perception of task stimulus and achievement related response. According to Weiner, AM theory assumes that,

> *"One's beliefs about the likelihood of attaining a goal (success at an achievement task) mediate between the perception of the task stimulus and the final achievement-related response."* [75]

Atkinson, Hull, and Lewin approached motivation and behaviour as a function of nature or property of the person, nature or properties of the goal object especially in the context of incentive or valence and experience in the form of an experiential or learning variable represented as either probability of success/habit strength or psychological distance.

Atkinson viewed property of a person as a stable personality attribute and a permanent content of the person, while Hullian and Lewinian interpretation of a temporary construct which is reflective of a temporary state of drive or tension [90, 91, 11].

Learning or associative variable is the experiential component. Hullian viewed this as a mechanical strengthening of S-R bond while Lewin and Atkinson viewed this as a cognitive process that involved anticipation and prediction regarding to the goal of the activity and the consequences that follow from engaging in the said activity.

The change in subjective probability of success(P_s) on engagement with achievement-related tasks indicates the presence of a learning process as the subject changes, expectations of reward based on historic data. The changes in behaviour or motivation are induced by experiential components which signify learning.

Hull's interpretation of this process was as the strengthening of a stimulus-response (S-R) bond as a result of experience or repetition of event. While Lewin and Atkinson view the process as the intervention or inclusion of a bond changing mental event due to experience in the stimulus response

relationship. i.e. S-E-R symbolising metal event due to experience changing the S-R cognitive relationship [11, 75, 90, 93].

Weiner described Atkinson's and Lewin's position as a perceived conceptualisation of man as "rational" and able to use mental faculties to aid in reaching goals. They view man as an intelligent and rational being capable of utilizing intelligence of rationality to reach a conclusion i.e. they were rationalists. Atkinson viewed incentive value of success and failures as dependent on the probability of success (P_s) or failure(P_{AF}) i.e. value of I_s or I_{AF} is determined by value of P_S or P_{AF}. Hull and Lewin viewed the incentive value of success and failure as having an independent operational existence with the value of I_{AF} or I_s being independent [75, 11, 90, 91].

Hull and Lewin adopt a Freudian approach on the interpretation of stimulus, seeing organism as seeking to achieve homeostasis. The Freudian approach to stimulus is a basic approach that assumes that an organism is constantly seeking for a situation of stimulus bond or equilibrium in which no stimulation occurs i.e. a Nirvana state. Atkinson, on the other hand, is not a homeostatic theorist and does not include Nirvana or Homeostatic constructs and conception in his theory although Weiner modification changes that [11, 90, 91, 75].

Lewian and Hullian were general behavioural theorist while Atkinson's theory was considered to be a general theorist of action as illustrated in *Figure 15*

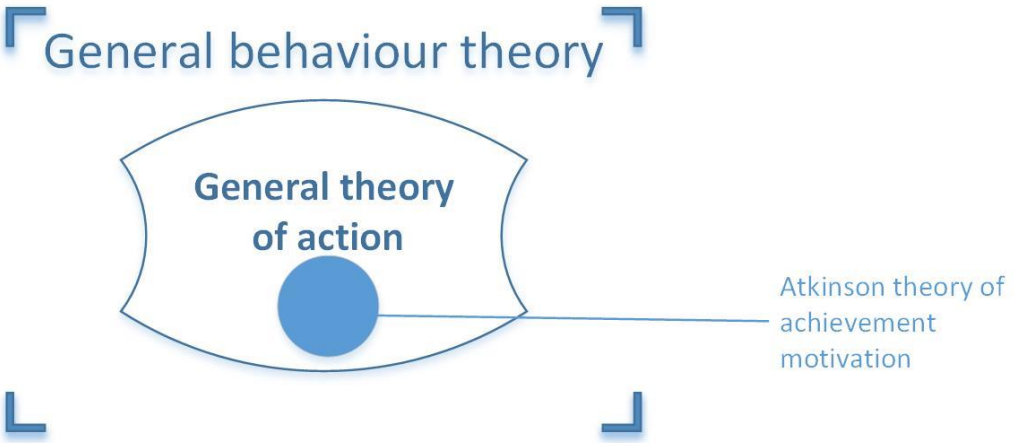


Figure 15 General Behaviour theory`

4.3.1.3 Achievement Need

AM theory is indicative of the strong link between motivation and belief about/subjective perception of the probability of success(P_s). AM revolves around the achievement need. The need to achieve is a potent force that cannot be ruled out in consideration of organismic action [11]. Murray described the need for achievement as:

"The desire or tendency to do things rapidly and /or as well as possible (it also includes the desire) to accomplish something difficult. To master manipulate and organize physical objects, human beings or ideas. To do things as rapidly or independently as possible. To overcome obstacles and attain a high standard. To excel one's self. To rival and surpass others. To increase self-regard by the successful exercise of talent."

[94]

This need for achievement forms the basis of AM. The study of AM has evolved through different stages. The most notable of these being: 1) The development and use of the Thematic Appreciation test (a fantasy measure) to evaluate the strength of achievement and what was termed 'individual Difference' in this strength also described as Personology. 2) The effort towards establishing antecedents and correlates of AM. In tandem with a push to establish validity through a comparison of empirical data and behavioural indices. 3) The formation of a theory of AM theory. 4) Evaluation and examination of the wider application of AM theory and establishment of variants of the theory [94, 75, 95].

4.3.1.3.1 Thematic Appreciation Test

The Thematic Appreciation Test played a critical role in the evaluation and development of initial theories of AM. The procedure of the thematic appreciation involved showing a picture to the subject and giving a sheet of paper to the subjects with question written on it. The process was then repeated a number of times every 4 minutes, depending on the nature of the picture. The following sets of question where asked: 1) What is happening? Who are the persons? 2) What has led up to this situation; that is, what has happened in the past? 3). What is being thought? What is wanted; by whom? 4) What will happen? What will be done? [75, 95, 11].

Early measures of AM such as the Thematic Appreciation test involved the identification of indicator of achievement imaginary in statements made or written by subjects. The indicators of achievement imaginary are Competitive Activity, Use of adjectives of degree (good, better, best), Unique accomplishment, A long-term Achievement Goal and Indication of strong affect and/or instrumental action; Positive affect [96].

The evaluation of AM as a construct was along a number of subcategories. They included: Need (they want to do a good job); Instrumental activity (years of hard work); Positive affect (they feel elated); Positive goal anticipation (they are thinking that they will succeed); Blocks or impediments in the world (tools are not available); Thema (a point given when only AM is represented in the story); negative

affect (they feel unhappy); negative goal anticipation (they are thinking they will fail); blocks in the person (they cannot concentrate on their work); nurturing press (someone aids the characters to reach their goal; as, for example, a friend encourages them to continue) [95].

In terms of validity of the Thematic Appreciation Test, the criterion validity as defined by McClelland is strong. This is because the achievement need which is a focal point of TAT as a measure is found to be related to a diverse range of criteria, although the content validity of TAT as a measure is found to be lacking [95, 97, 96].

4.3.1.4 Importance and applicability of Achievement Motivation (AM) theory

The construct of AM is applicable across many fields including education and has been used as a basis for the evaluation of human behaviour in the context of varying achievement related scenarios and tasks [8, 75, 98, 99].

Many of the evaluations of AM have been in education, although there has been a wide spread utilization in evaluating behaviour in the context of Work, Sports and Military service, with over 245,000 articles that link AM and sports on google scholar (Bal et al. 2010; [100, 8, 98]. Figure 16 below contains details of the number of articles that are found on google scholar with the word "AM" and "a key term". This shows the importance of the various examinations of AM. This evaluation indicates the level of consideration of AM in relation to key terms, what has been done and where the gaps are in terms of evaluation of a key term.

	Non-exact terms (no terms in quotation marks	Exact first term (only first term in Double quotation marks)	All Key terms (all terms in Double quotation mark)
AM and CPD(CPD)	463,000	17,900	147
AM (AM) and Sports	181,000	17,000	11,500
AM and education	1,830,000	105,000	95,100
AM and Military	247000	7,870	7,870
AM and entrepreneurs.	176,000	8,260	5,120

AM and Intrapreneurs	6,400	588	150
Intrinsic motivation and CPD	135,000	36,200	777
Extrinsic Motivation and CPD	47,000	17,000	239

Figure 16 Considerations of AM

The importance of AM in the process of a learner's development is best illustrated by the words of Weiner, Meahr and Sjogren. With Weiner stating that,

> *"Perhaps the greatest general import of the study is the ease with which the theory of AM can be brought to bear upon educational Practice"*
>
> [75]

Meahr and Sjogren go further to describe Atkinson theory of AM theory as the first step in creating an education theory of motivation [8].

It must however be noted that there are those that disagree with the premise of a theory of AM as a whole [101]. DeCharms states;

> *"What I am suggesting is that we apply scientific thinking to our own subject matter-namely, persons in action- and stop trying to apply an inadequate physicalist analogy to human action"*
>
> [101]

Richard deCharms expresses contention to the continued study of AM. He questions what they termed the 'reductionist nature' of psychological investigation in the context of AM, that leads to an ineffective investigation of the parts without looking at the sum of the parts which is the human being [101].

When considering behaviour in the context of AM, consideration is given to the situational determinates, inertial sources of motivation, other or external sources of motivation and environmental sources of motivation [11, 75, 102].

AM theory gives rise to interesting implications when considered in the context of CPD. The AM theory presents a simplification of the tendency to engage with CPD, thereby offering a tool for effective

prediction of engagement with CPD; although this might be an oversimplification given the overdetermined nature of the concept of behaviour [75, 76, 93, 11].

Before going further, it must be stated that behaviour in itself is an overdetermined concept. As such no singular theory or determinate can effectively be used to predict or navigate behaviour [76]; notwithstanding, Atkinson's theory of AM offers useful insights.

4.3.2 Atkinson's theory of Achievement Motivation(AM)

In the context of AM, a person is viewed as,

"*An entity with a particular conjunction of distinguishable properties, based on an ongoing order of differentiated activity"*

[103]

The person is characterized by what is described as an extensive taxonomy of needs and this is reflected in the approach of AM theory. This view of the person results in the establishment of AM as constituting avoidance and approach type motivations. This is based on the effects of the extensive taxonomy of needs on the person [104, 75, 94].

The study of AM is adherent to the Lewinian programmatic statement which is based on the notion that the properties of a person(PP) and the characteristic of the environment (CE) are key determinates of behaviour(B) [91]. The Lewinian Programmatic Statement is that:

> "Behaviour is a function of the properties of the person and the characteristics of the environment."

$$B = f(PP, CE)\ (4)$$

Where

B= Behaviour.

PP = Properties of the person.

CE = Characteristic of the environment.

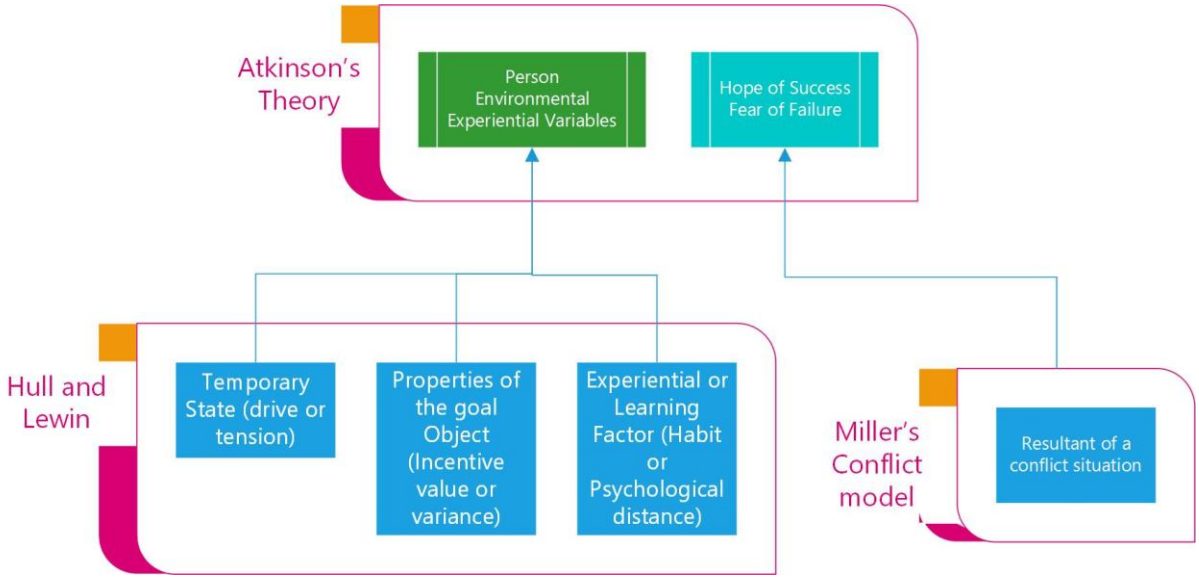


Figure 17 Illustration of concepts that inform Atkinson Theory of AM

[11, 90, 91, 92, 75]

Atkinson's theory of AM can be termed or viewed as a risk preference based on categorisation or analysis of motivation. The subject of AM was extensively studied by McClelland, Atkinson and Weiner among many. Arguably one of the most influential of AM theories was Atkinson's theory which was a conflict model based theory that took elements from Hullian and Lewinian interpretation of motivation and paradigm of research (as illustrated in Figure 17) [75, 91, 90, 93]. AMs outlook of Atkinson was a cognitive examination or interpretation of motivation, although there is still a presence of strong influences of mechanistic and physicalist concepts with an evidence of Aristotelian epistemology [75, 11].

Atkinson's theory of AM was intended to solve the problem of inadequate measures for individual differences in strength of motivation [105]. Atkinson's theory of motivation and the many theories of goal-oriented motivation that come after it utilise the Miller's Conflict model approach. This approach interprets behaviour from the point of view of a system in conflict due to principal forces soliciting exhibitions of behaviour in opposite planned direction; with the overall stronger tendency winning out [92, 11]. Atkinson's theory of AM stated that,

> *"The strength of the approach tendency towards the goal (the hope of success) relative to the strength of the avoidance tendency (the fear of failure) determines whether the individual will locomote towards or away from achievement- related motivation".*
>
> [11]

Atkinson's theory of AM is based on his exploration of motivation in the context of individual differences and permanent personality factors [75, 11]. Atkinson's theory which borrows concepts from the Miller's conflict model posits that:

- in the context of a game like scenario or competition against a standard of excellence, the construct of 'hope of success' and 'fear of failure' come into play. This is also known as goal approach tendency and goal avoidance tendency respectively [8, 89].
- The resultant of the interaction between 'hope of success' and 'fear of failure', also known as Resultant AM affects the tendency of an individual to engage in or disengage from the achievement related tasks [8, 89].

4.3.2.1 Mathematical Representation of Atkinson's Achievement Motivation(AM)'s tendency of approach or avoidance

The learned knowledge and experience of past failures and success elicit varied anticipatory reactions to achievement related task, a reaction whose exact nature is influenced by the nature of the individual. The affective anticipation can either be positive or negative.

4.3.2.1.1 Hope of success.

Hope of success is the positive affective anticipation aroused during a learner's engagement with achievement related tasks.

$$T_s = M_s \times P_s \times I_s \qquad (5)$$

[89]

Where $T_s = Hope\ of\ Success\ or\ Tendecy\ to\ approach\ an\ achievement\ related\ goal$

$$M_s = Need\ for\ achievement\ or\ motive\ for\ success$$

$$P_s = Probability\ that\ one\ will\ be\ successful\ at\ task$$

$$I_s = Incentive\ value\ of\ success$$

Need for achievement (M_s) or Achievement motive as an affective disposition which, represents a persistent tendency or predisposition to pursue success, Atkinson defined it as, " *the capacity to experience pride in accomplishment*" [11]

Probability of success (Ps): this variable represents the perceived probability of success in a goal oriented action and its anticipatory effect. Weiner describes this as a variable that is,

> *"A cognitive goal expectancy or an anticipation that an instrumental action will lead to the goal"* [75]

This concept is influenced by Atkinson's interpretation of Tolman's Latent learning concept.

Tolman's Latent Learning is a concept based on the ability for organism to latently learn when exposed to a non-incentivized task and display such learned information by demonstrating a higher performance at the task when an incentive is inserted [75]. According to Weiner,

> *"The Hullian scheme learning is represented as the strengthening of a mechanistic bond between an antece dent stimulus and a subsequent response"*
>
> [75]

The probability of success in this context is a representation of the subjective expectancy of attaining a goal. This expectancy is often underpinned by an expected reward (R) for attaining the said goal. The goal expectancy is generated as a result of the dynamics of the relationship between stimulus and reward so long as the said stimulus is a goal related stimulus(S) and the expected goal reward is attainment related. As the cycle of S-R-S repeat, an incremental goal expectance is created, with the increment in expectancy being proportional to the number of S-R trials [11, 75].

The dynamics of the relationship between stimulus and reward in the form of S-R-S forms the bases for expectancy.

P_s in actual sense is the subjective expectancy of success. According to Weiner,

> *"The Probability of success (P_s) in Atkinson's equation of the determinants of approach behaviour represents a subjective probability of success, or a personal belief about the chances of goal attainment."* [75]

The magnitude of Probability of Success (P_S) can be altered by the inclusion of stimulus that affects the subjective expectation of success in goal attainment i.e. the belief about winning or performing. This could be supply of normative information, difficulty ranking of task, age based performance expectation index, insertion of competition for goal attainment, monetization of goal reward, varying activity difficult, altering reinforcement history [106, 75, 107, 108].

The Incentive Value of Success: this term which Atkinson describes as "pride in accomplishment" is inversely proportional to the probability of success (P_s) i.e

$$I_s = 1 - P_s \qquad (6)$$

[89]

The incentive value of success, a concept influenced by Escalona and Festinger resultant valence theory, reduces as probability of success increases and vice versa. [107]. This is based on the fact that the satisfaction received for success is often higher for more difficult tasks. As such ceteris paribus the incentive for success is higher; while the probability of success is often lower for more difficult tasks,

hence an inverse relationship [11]. Empirical evidence or support for this relationship was established in findings of [107].

4.3.2.1.2 Fear of failure.

The learned knowledge and experience of past failures and success elicit varied anticipatory reactions to achievement related tasks. The exact nature of this reaction is influenced by the nature of the individual.

According to Mahone Fear- of-failure is a,

"Motivational disposition to be anxiously concerned about avoiding failure"

[109]

A measure of the negative affective anticipation to an achievement related task is a concept called the fear of failure. The fear of failure is the tendency to avoid achievement related tasks. The fear of failure is analogous to the hope of success and they form two interlinked concepts learned based on past experience [89, 11].

$$T_{AF} = M_{AF} \times P_f \times (-I_f) \qquad (7)$$

Where

$T_{AF=}$ Tendency to avoid failure.

M_{AF} = Motive to avoid failure.

I_f = Incentive value of failure.

P_f = Probability of failure.

Atkinson defined Motive to avoid failure as,

"The capacity to experience shame given nonattainment of goal (failure)"

[11].

Motive to avoid failure (M_{AF}) or Avoidance motive is an affective disposition which represents a persistent tendency or predisposition to avoid failure.

[75, 11, 89, 109, 110]

Probability of Failure (Pf): this variable represents the perceived probability of failure in a goal oriented action and its anticipatory effect. This is a variable that refers to a cognitive failure expectancy or an anticipation that an instrumental action will lead to the failure. P_f in actual sense is the subjective expectancy of failure. According to Atkinson

$$P_s + P_f = 1 \qquad (8)$$

$$P_f = 1 - P_s \qquad (9)$$

$$P_f = I_s \qquad (10)$$

[89, 11]

Incentive Value of failure (If) a term also described as "shame" is inversely proportional to the probability of success (P_f).

$$I_f = -(1 - P_f) \qquad (11)$$

[89]

The incentive value of failure reduces as probability of failure of increases and vice versa.

4.3.2.1.3 Resultant motivation

The construct of a resultant motivation is key to the interpretation of AM offered by Atkinson's theory. Atkinson's conflict behaviour interpretation of AM is indicative of a stable equilibrium avoidance-approach type conflict situation in which tendency to approach or avoid a goal are produced [11, 92]. According to Atkinson, Resultant motivation (T_A) is the combined effect of the positive approach motivation and negative avoidance oriented motivation the two opposing orientations coming together to determine the direction of exhibited behaviour [89, 11]. It should be noted that although there is agreement on the general conceptualization of opposing behavioural tendencies there is great debate on the nature of the relationship between them [75, 11, 92]

Resultant motivation is:

$$T_A = T_s + (-T_{AF}) \qquad (12)$$

$$T_A = M_s \times P_s \times I_s + M_{AF} \times P_f \times (-I_f) \qquad (13)$$

This can be resolved to give

$$T_A = M_s \times P_s \times (1 - P_s) + M_{AF} \times (1 - P_s) \times P_f \qquad (14)$$

$$T_A = (M_s - M_{AF})(P_s \times (1 - P_s)) \qquad (15)$$

Where

$T_A = Resultant\ motivation$

$T_s = Hope\ of\ Success\ or\ Tendecy\ to\ approach\ an\ achievement\ related\ goal$

$M_s = Need\ for\ achievement\ or\ motive\ for\ success$

$P_s = \ Probability\ that\ one\ will\ be\ successful\ at\ task$

$I_s = Incentive\ value\ of\ success$

$T_{AF} = Tendecy\ to\ avoid\ failure$

$M_{AF} = Motive\ to\ avoid\ failure$

$P_f = Probability\ of\ failure$

$I_f = Incentive\ value\ of\ failure$

[89, 11, 75, 8]

The equation above effectively displays the many factors of motivation previously introduced. The probability of success (Ps) is considered to be the core variable and the key determinate of behaviour. This assumption forms the basis of various contentions with Atkinson's theory of AM. Although the assumption makes it more practical to investigate and carry out experimentation by varying the subjective value of probability of success, the contentions create and highlight a need for better understanding of the relationship between I_s, P_s, $-I_f$, P_f. [75, 111].

There are effectively four degrees of freedom and two personal determinates of behaviour in Atkinsons theory of AM. M_s and M_{AF} are described as the personal determinates of behaviour. The four degrees of freedom, I_s, P_s, I_f, P_f, are described as the environmental determinants of behaviour.

P_s is described as the main environmental determinates and a practical condensation of four degrees of freedom, as I_s, I_f, P_f are operationally defined in terms of P_s.

That is:

$I_s = (1 - P_s)$ *(16)*

$P_f = (1 - P_s)$ *(17)*

$I_f = P_s$ *(18)*

[89, 8]

The implication of the relationship of the degrees of freedom and personal determinates form the basis of many interpretations of behaviour based on Atkinson's theory of motivation.

4.3.2.2 *Exploring Atkinson's theory of Achievement Motivation (AM)*

AM theory postulates that:

1. Irrespective of the nature of resultant AM, optimal performance at task is achieved for tasks with intermediate difficulty. These are tasks which have an intermediate subjective probability of success (P_s= 0.5) [89, 75, 8].

   The validity of this is supported by Vygotsky's construct of ZPD which seeks to constantly keep subjects in the optimal zone of development or learning. A zone is characterized by an intermediate level of difficult or subjective probability of success as it is located between the can zone with high probability of success and the can't zone with low probability of success as illustrated in Figure 18 [43].

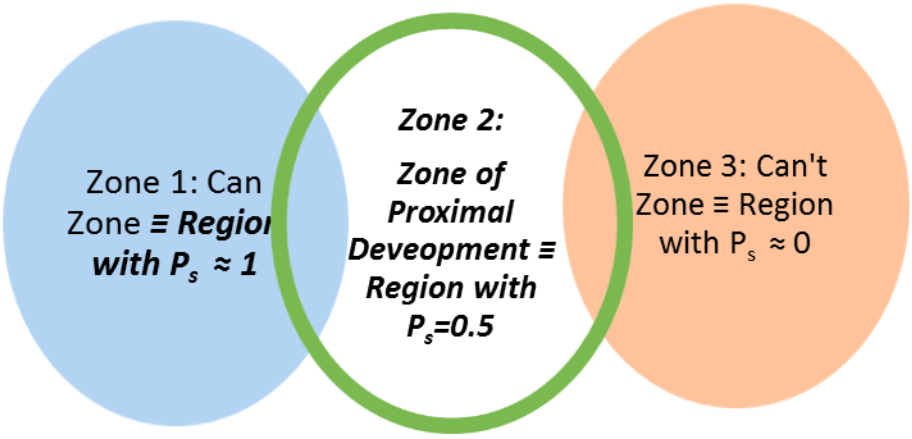


Figure 18 Evaluation of condition for optimal performance of task through the lens of the ZPD

2. If the probability of success is constant, subjects high in resultant AM characterized by a need for achievement that is greater than motive to avoid failure ($M_s > M_{AF} \Rightarrow +T_A$), would approach goal related tasks. Conversely, subjects low in AM characterized by a motive to avoid failure greater than a need for achievement ($M_s < M_{Af} \Rightarrow -T_A$), avoid goal related tasks. Where negative is an indication of what subject would possible do, subjects high in resultant AM are termed as approached oriented and those subjects low in resultant AM are termed as avoidance oriented.

Achievement need is a key factor when considering AM. Nevertheless, satisfaction of achievement need is not the sole reason for engaging in achievement related activities (Goal oriented task) [11].

According to Weiner,

"*Achievement related activities are not necessarily initiated to satisfy achievement need*" [75]

Behaviour and action is often not due to a singular determinate or motive. Even though AM is intended to conceptualise engagement with achievement related tasks, not all engagements with achievement related tasks can be directly attributed to satisfaction of achievement need [75, 76, 89]. Avoiding punishment needs, gaining power needs and affiliative needs are some of the other needs that can come into effect in engagement with AM [11]. Weiner further stated that,

"Behaviour as a concept is over determined and many sources of motivation may cause action" [75]

This statement is supported by Maslow's interpretation of motivation and human need via the hierarchy of needs. Maslow points out that multiple needs exist at the same time and there is no situation where only one need existed but only a situation where a particular need or sets of needs are more prominent. On partial satisfaction of the proponents need, the next most pressing need becomes the prominent need [76].

Atkinson points out that his initial theory of AM did not take full cognizance of the source of motivation. Atkinson further builds on this theory by making key assumptions that the achievement oriented tendencies he postulated was person centric (intrinsic) and that the determination of achievement behaviour requires consideration of extrinsic factors i.e. $Achievement\ related\ behaviour = T_A + extrinsic\ motivation.$ [75, 106, 11]

This extrinsic addition possibly depends on the strength of other motives, goal expectancies and incentives. These formed the basis for the decision to further explore the source dimension of motivation (the notion of extrinsic and intrinsic motivation) through the lens of self-determined theories of motivation [112, 66, 75, 11, 110].

Metaphorically, this fact 'sets the stage' for the multidimensional approach to the exploration of motivation adopted in this study. The 'stage is set' by the fact that apart from the inbuilt consideration for environmental factors in the context of individual differences (which is a pivotal component of Atkinson's theory), the evaluation of the resultant value of achievement behaviour needs to be considered in context of extrinsic factors (motivation). Extrinsic factors which are a function of other motives, goal expectancies and incentives set the stage for the multidimensional approach to exploring motivation, adopted in this research. This reinforces the need for further exploration of the influences of the intrinsic-extrinsic balance (through the lens of Self-determination(SM) theory) and

effect of extrinsic factors on individual goal expectance, especially the effect of time on the individual's perception of goal and incentive value [112, 12, 75, 11].

A consequence of the evaluation of motive based on Atkinson's theory was the prominence of individual's motive balance between motive for success (need for achievement, M_S) and motive to avoid failure (need to avoid failure, M_{AF}) in the interpretation of behaviour. A number of predispositions are hypothesized to be indicated or influenced by the relationship between motives for success (need for achievement, M_s) versus motive to avoid failure (need to avoid failure, M_{AF}). Such predispositions include persistence of behaviour in progress (in terms of 'temporal persistence' and 'resistance to extinction'), performance, task choice, level of aspiration, free-choice behaviour, forced-choice behaviour, effects of success and failure, influence of instruction, and in the context of this research, the potential to engage with CPD [106, 110, 108, 113, 11, 89]. The nomological network of AM comprises of seven components which are; initial task choice, persistence, performance, valence of success, valence of failure, task difficulty estimates, task difficulty preferences [114].

4.3.2.3 Implications of Atkinson's Theory of Achievement Motivation (AM)

Evaluation of engagement with CPD can be viewed as a form of evaluation of vocational behaviour and learner's behaviour. Learner's behaviour in terms of learning activity involved in each unit of CPD activity and vocational behaviour in the sense that it is an examination of engagement with development activities geared towards work.

Tseng and Carter define Vocational Behaviour as,

> *"Any interaction between the individual and his environment which is related to work"*
>
> [115]

Atkinson's theory of AM, with the aid of its many modifications and improvements, can help provide insights into the plausible behaviour of students engaged in CPD. Atkinson's theory can be comparatively utilised to shed insights into:

- The influence of success and failure on a student's behaviour, especially in the context of the extent to which a student would continue to act after success or failure. This can be done through the iteration of Atkinson's theory, which is focused on the persistence of behaviour and its prediction [106, 113].
- The kind of CPD activity the student would engage in, in terms of the level of difficulty and the area of specialization. This can be done using approaches in line with approaches for investigation of the level of aspiration, and area of concentration based on Atkinson's theory [109, 116, 108, 117] .

- In relative terms, how motivated and how well the subject would do in certain forms of CPD activity (CPD) through the lens of iteration of Atkinson's theory geared towards intelligence, motivation, ability group and structure and performance [75, 118, 119, 120, 107]

These insights enable one to paint a holistic picture of the plausible achievement oriented (Intensity axis of motivation) pattern of behaviour of the students, in the context of CPD.

The level of AM as theorized by Atkinson is equal to the resultant AM generated from the combination of approach and avoidance-oriented AM. This was described by Wiener as affective and emotion anticipation vying against one another [89, 11, 75]. This then leads to the deduction that if the subjective probability of success (P_s) was constant, the relationship ratio of need for achievement (M_s) and motive to avoid failure (M_{AF}) reflects the level of AM.

Resulting Level of resultant motivation	High Low
Need for Achievement	High Low
Motive to avoid failure	Low High

Figure 19 Resultant of interaction between Need for achievement and Motive to avoid failure

Adapted from [89, 75]

As illustrated in Figure 19, if the Need for achievement is greater than the Motive to avoid failure ($M_s > M_{AF}$), the resultant motivation is high and the subject is termed as high in resultant motivation or low in anxiety. Conversely, if the Need for success is lesser than the Motive to avoid failure ($M_s < M_{AF}$), the resultant motivation is low and the subject is termed as low in resultant motivation or high in anxiety. If the value of both Need for achievement and Motive to avoid failure are considered high or low at the same instance, the resultant motivation is intermediate; with the intermediate of High-High greater than that of a Low-Low combination [89].

4.3.2.3.1 Free choice behaviour

Free-choice activities in this regard means that the determination to engage in the activities (what activity and when) is autonomous (left to subject) [121, 122]. Although it is noted that the concept of free-choice is a relative concept and is mentioned only in comparative terms as there are disputes on

whether any rational thought based action is truly free since to rationalize implies to apply constraints based on perceived reality [123, 124].

Based on the interpretations of Atkinson's theory in the context of free-choice behaviour, it can be argued that individuals with high resultant AM ($M_s > M_{AF}$) are more likely to engage in achievement-related tasks than individuals with low Resultant AM ($M_s < M_{AF}$) [125, 105]. This is due to a higher need for achievement. In free choice situations, it is observed that individuals who are high in resultant AM ($M_s > M_{AF}$) where were more engaged in achievement-related tasks than those low in Resultant AM ($M_s < M_{AF}$). This was observed in the form of a greater zeignarik effect.

> The zeignarik effect developed as an examination of the relationship between task accomplishment, human behaviour and state of tension within a system in the context of the status of memory. zeignarik effect revolves around the continuation or persistence of task related mental processes, in situations where tasks were interrupted, discontinued or completed. The zeignarik effect was the observed effect that for tasks of equal priority, it is easier to recall interrupted tasks, than completed tasks. Conversely, the reverse zeignarikeffect revolves around the notion of easier recall of completed tasks than uncompleted tasks [126, 127, 128, 129].

The plausible implications of this observation on free-choice are illustrated in the prediction of a framework for higher excitement (High resultant AM) or high inhibition (Low resultant AM) individuals. The direct implication is that it can be interpreted that an individual's high resultant in AM ($M_s > M_{AF}$) could possibly achieve more engagement in a situation where when they volunteered to take part in the action or arrived at the conclusion to take part in the action of their own volition and free will. Subjects high in resultant AM ($M_s > M_{AF}$) engage better in a free-choice context under failure condition. The figure below illustrates the implication of AM theory in the context of free-choice and forced-choice [89, 75].

	high in resultant AM ($M_s > M_{AF}$)	low in Resultant AM (Ms<MAF)
Nature of task	Achievement related tasks	Non achievement related tasks
Preferred Context	Free-choice (Volunteer)	Forced Choice (non-Volunteer)
Presiding condition for optimal outcome	Failure condition	Success condition

Figure 20 Level of Resultant AM and recommend conditions

[125, 105]

The failure condition in the context of Vygotsky's ZPD can be interpreted as the subject being placed in a region of the ZPD that is closer to the can't zone. Conversely, the success condition can be

interpreted as the subject being placed in a region of the ZPD that is closer to the can zone as illustrated in Figure 21

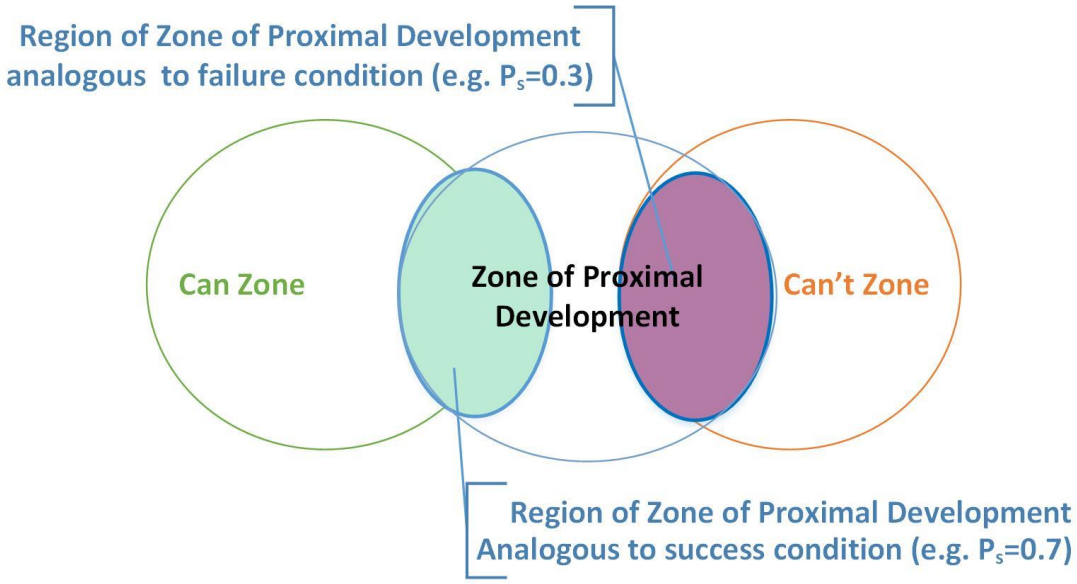


Figure 21 Position in ZPD reflective of relative success or failure conditions

Adapted from [59, 11, 49]

In the context of CPD, the deduction from Atkinson's theory of AM regarding free-choice behaviour is relevant. The relevancy of the effects of the nature of AM on free-choice behaviour to research in CPD cannot be overstated. This is because as a key feature or sizable component of Continuous Professional Activity are relatively free-choice activities. CPD activities in the context of this study are considered as primarily free-choice activities due to the fact that CPD by nature requires participants to make decisions to engage with particular development activities with greater degree of autonomy and freedom than standard institutional learning. This can also be interpreted to indicate the nature of CPD activities subjects should participate in, with those high in AM (Ms>MAF) encouraged to take part in achievement related tasks in the form of CPD activities with clearly defined achievement goals.

4.3.2.3.2 Forced Choice Behaviour.

Atkinson theorised that subject's high resultant in AM ($M_s > M_{AF}$) selected tasks of intermediate difficulties more readily than subjects low in Resultant AM ($M_s < M_{AF}$) (as illustrated in the Figure 22)

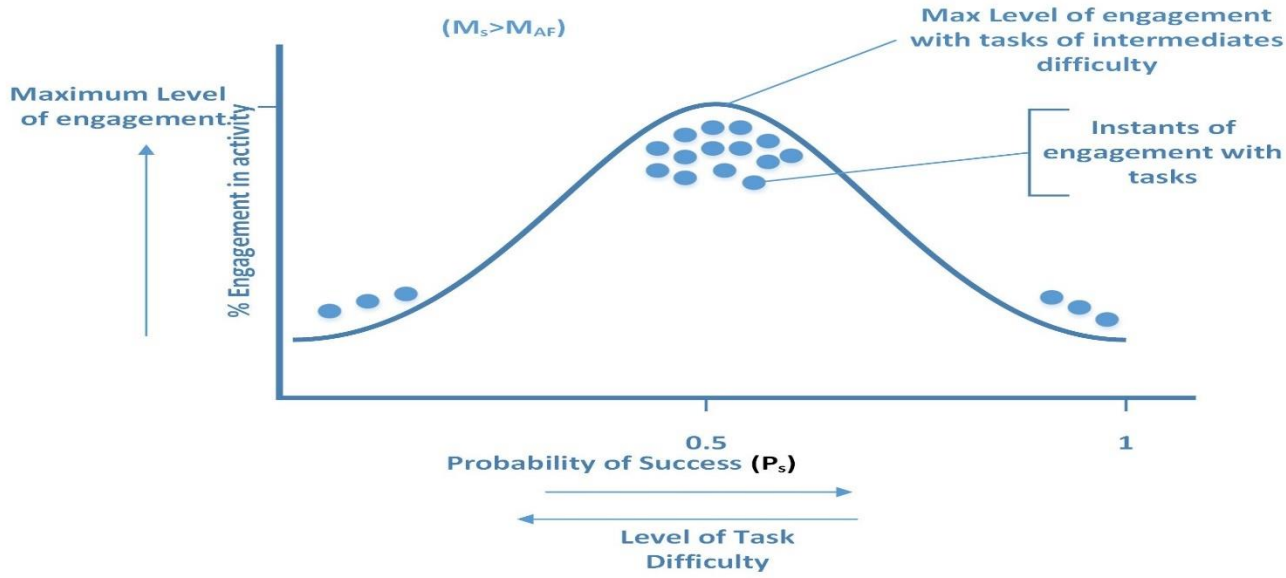


Figure 22 Illustration of task selection preference for those high in resultant AM

Conversely for individual low in resultant AM are more likely to select that of high or low difficult (as illustrated in the Figure 23). This tendency results from the change in value of the subjective Probability of Success (P_s) as the level of difficult changes (as illustrated in Figure 24).

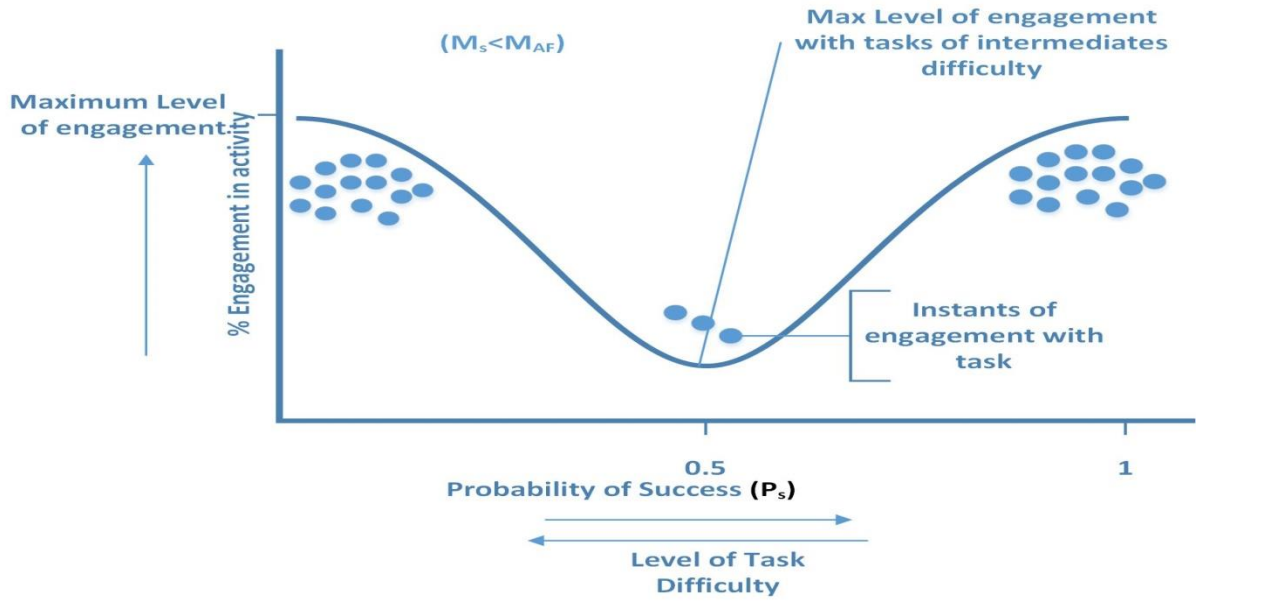


Figure 23 Illustration of task selection preference for those Low in resultant AM

Level of Difficulty of Task	High ⟷ Low
Subjective Probability of Success	Low ⟷ High

Figure 24 Relationship Between Level of difficult of a task and Subjective Probability of Success

[89]

The level of motivation is highest at intermediate level of difficult when P_s=0.5 for subjects high in resultant AM (M_s>M_{AF}). This is not directly due to the fact that the Subjective Probability of Success (P_s) is equivalent to 0.5, but is due to the combined effect of Incentive of Success(I_s) and Probability of Success(P_s) [75, 11]. Weiner explains as follows:

> *"Further, the strength of motivation decreases symmetrically, as P_s increases or decreases from the level of intermediate difficulty. Neither the incentive value of success nor the expectancy of success are greatest at tasks of intermediate difficulty. But the postulation that $I_s = (1 - P_s)$ and the specification that I_S and P_S, relate multiplicatively, result in greatest motivation when P_S, and therefore I_S, are equal to 0.50."*

[75]

In order to derive the most from the use of Atkinson's theory of motivation, it must be considered that Atkinson's theory is about risk preference and the interplay of risk preference on human behaviour and motivation [89].

4.3.2.3.3 Level of aspiration.

Level of aspiration as investigated by Festeinger, who compared knowledge of group standards and level of aspiration, was defined in terms of the relationship between subject performance and his estimation of future performance [130].

> Level of aspiration is a construct that is defined as a function of the positive valence of success and negative valence of failure in the context of the potency of success and failure. Level of aspiration is a function of the desirability of success and disagreeability of failure at a certain level of performance. It is akin to the level of consequence of failure a subject is willing to risk in order to achieve the benefit of a certain level of success [130, 129].

Examining Atkinson's work through the lens of level of aspiration further sheds light on the interplay of AM and behaviour especially in the context of engagement with CPD. It examines the dynamics that develops given encounters with success or failure.

Level of aspiration describes the setting of performance goal. The selection of aspiration level at an achievement related activity by an individual is a combination of consideration of the probability of success and the task value of the success. This consideration is guided by the conceptualization that simpler tasks are easier to succeed at but the value of success for a simple task is lesser. On the other hand, difficult tasks are harder to succeed at but the value of success for a difficult task is greater. The selection of aspiration level is different from level of persistence or performance, and observation may seem contradictory.

On encountering failure, those with high resultant AM ($M_s > M_{AF}$) respond by selecting an easier task after failure, while those with low resultant achievement motivation ($M_s < M_{AF}$) respond by selecting more difficult tasks after failure. This reaction is labelled as Ttypical. The opposite occurs when those high resultant AM ($M_s > M_{AF}$) or low resultant AM ($M_s < M_{AF}$) encounter success [113, 11]. Figure 25 and Figure 26 illustrates aspiration of subjects after failure and success with level of probability of success (P_s) changing before and after success.

Subjects low in Resultant AM ($M_s < M_{AF}$) often lower their aspiration level following goal attainment while they increase aspiration on failure. This is often due to the fact that they are failure averse and as such aspire towards the direction that guarantees avoidance of failure by selecting easier tasks after success and selecting more difficult tasks after failure [113].

Subjects high in resultant AM ($M_s > M_{AF}$) often increase aspiration after success while they lower aspiration level after failure. This is achieved by selecting a more difficult task after success and a less difficult task after failure. This is due to the fact that they are success oriented hence adopt positions that best guarantee success. Subjects high in resultant AM ($M_s > M_{AF}$) tend to approach success. As such, they tend to aspire for more difficult tasks in order to achieve a higher level of success and receive a commensurate level of satisfaction from succeeding at more difficult tasks (as illustrated in Figure 25) [113, 108].

Conversely, subjects low in Resultant AM ($M_s < M_{AF}$) tend to avoid failure. As such they tend to aspire for less difficult tasks when they succeed in order to guarantee future success and avoidance of failure.

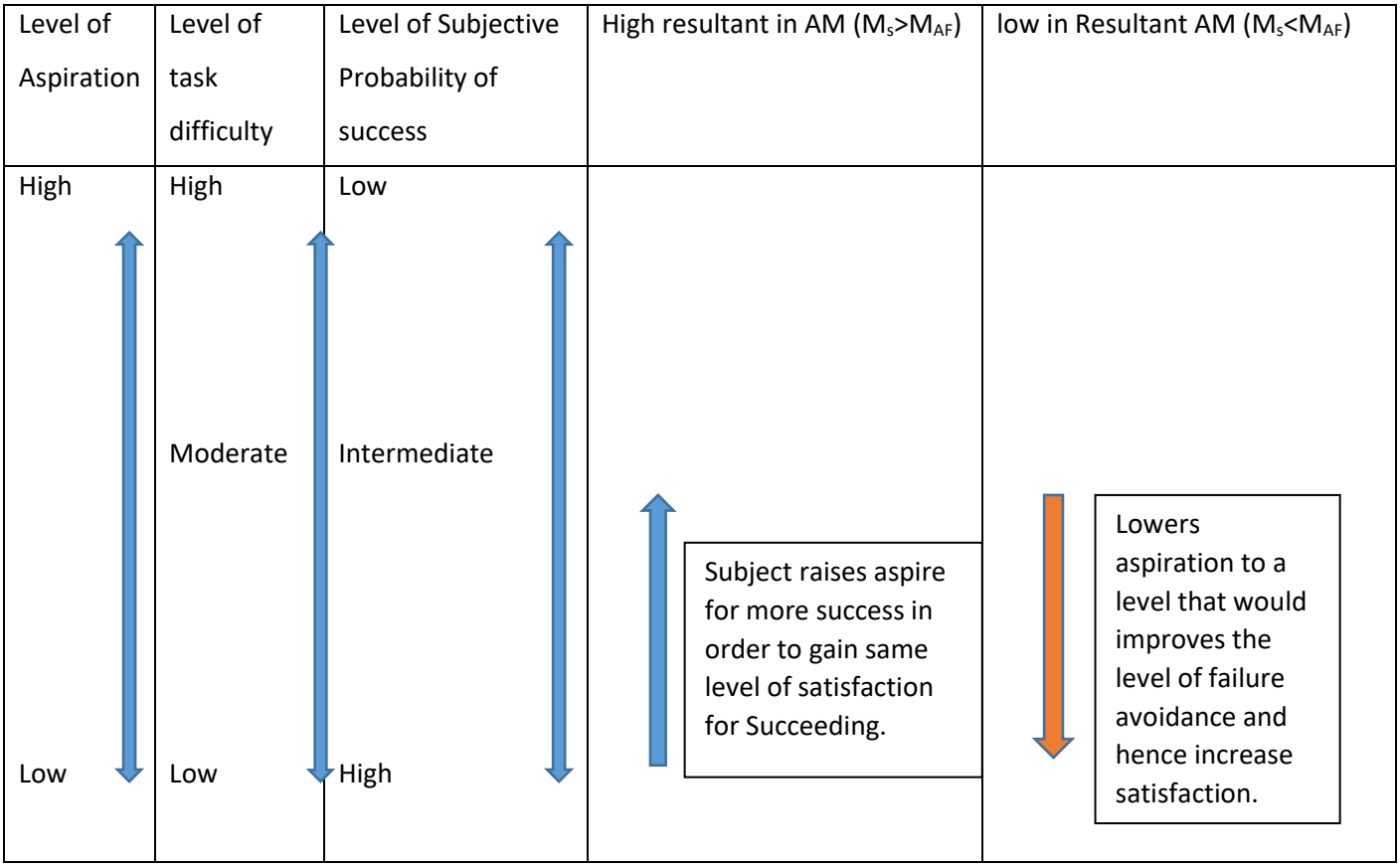


Figure 25 Relationship between level of aspiration and Subjective Probability of Success, in the context of success.

Adapted from [113]

Subjects low in AM tends to benchmark the level of aspiration that guaranteed that they avoided failure. Therefore, they aim for a lower level of aspiration than the benchmarked level of aspiration at which they achieved success and avoided failure in order to gain a level of satisfaction commensurate with the initial avoidance of failure (as illustrated in Figure 26). Basically, a subject avoiding failure would get the highest level of avoidance of failure, at the level of aspiration where the subject avoided failure, or at an easier level of aspiration with a higher guarantee of avoiding failure [11, 75].

Level of Aspiration	Level of task difficulty	Level of Subjective Probability of success	High resultant in AM ($M_s > M_{AF}$)	low in Resultant AM ($M_s < M_{AF}$)
High  Low	Hiigh  Moderate Low	Low  Intermediate High	 Lowers aspiration to gain success that upsets previous failure	 Subject raises aspiration to offsets precious lack of avoidance of failure

Figure 26 Relationship between level of aspiration and Subjective Probability of Success, in the context of failure.

Adapted from [113]

Subjects High in resultant AM ($M_s > M_{AF}$) on failure, tend to aim for easier tasks so as to achieve success. This is because of the need for success. Subjects Low in Resultant AM ($M_s < M_{AF}$) on the other hand, tend to aspire for more difficult tasks after failure in order to achieve a higher level of satisfaction from avoiding failure at a more difficult task. This offsets the initial failure at the less difficult task.

The level of aspiration also affects the choice of task preference, with subjects having intermediate resultant AM (roughly equivalent Need for achievement and Motive to avoid failure, $M_{AF}=M_S$) having difficulty in choosing task preference than those low or high in resultant AM [75, 130, 113].

4.3.2.3.4 Persistence of Behaviour

Persistence of a subject in an achievement-related task can be predicted using Atkinson's theory of AM [106, 75, 11]. This is supported by experiments carried out by Feather and Moulton [106, 113].

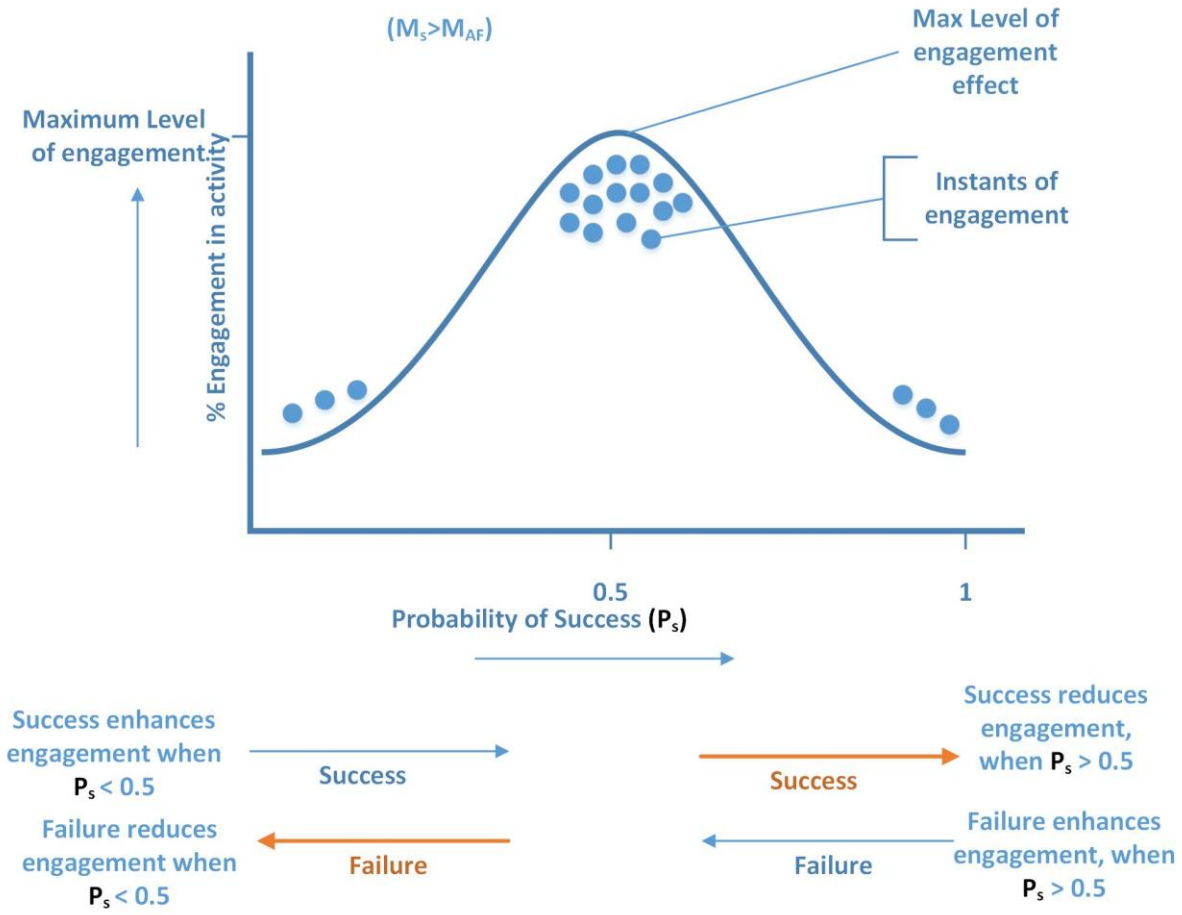


Figure 27 Effect of success and failure on task engagement for Subjects high in AM (M_s>M_{AF})

Adapted from [106, 11]

For individuals high in resultant AM (M_s>$M_{AF,}$), when the probability of success (P_s) is greater than the intermediate level (P_s >intermediate level), the level of achievement motive increases after failure as probability of success (P_s) approaches intermediate level (P_S→ Intermediate Level). On the contrary, when intermediate level is greater than the probability of success (P_s) (P_s < intermediate level), the AM decreases following initial failure as probability of success(P_s) recedes from intermediate level (as illustrated in Figure 27).

Motivation is highest for subjects high in resultant AM (M_s>M_{AF}) when probability of success is intermediate ((P_s) =0.5). Persistence in failure is greater when probability of success (P_s) is high than when probability of success (P_s) is low.

This finding is based on Atkinson's theory and is supported by Feather's experiment, which illustrate that when probability of success is high (in this case P_s= 0.7), motivation continues to increase as failure occurs and probability of success (P_s) reduces. It also supports the fact that the motivation

continues to reduce as Probability of success (P_s) reduces, illustrating that persistence at an easier tasks lasts longer on failure than a more difficult task for subject's high in resultant AM.

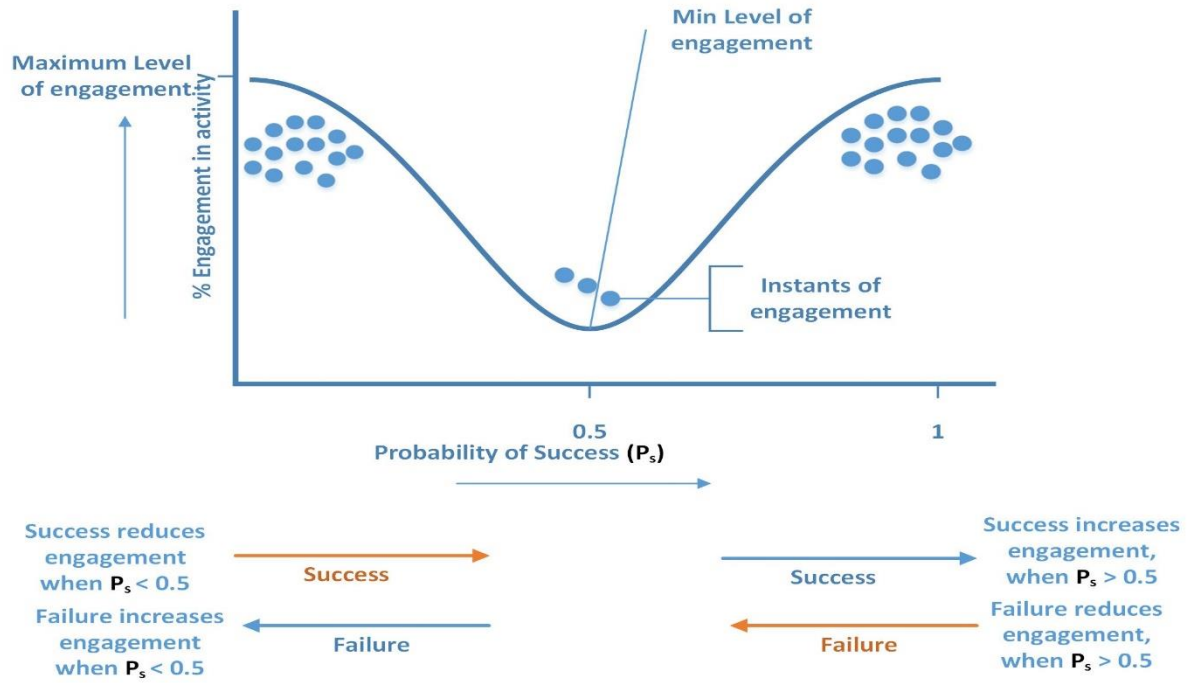


Figure 28 Effect of success and failure on task engagement for Subjects Low in Resultant AM ($M_S<M_{AF}$)

Adapted from [106, 11]

The reverse is the case for subjects' low in resultant motivation ($M_S<M_{AF}$); when probability of success (P_s) is greater than intermediate level (P_s>intermediate), persistence decreases following initial failure. The lowest level of persistence for subjects' low in resultant motivation ($M_S<M_{AF}$) is experienced when probability of success is at intermediate level (P_s=0.5). As failure occurs when subjective probability of success (P_s) is high, the value of probability of success (P_s) continuously approaches the intermediate level at which motivation is least for subject's low in resultant motivation ($M_S<M_{AF}$). Conversely, when the probability of success is at an intermediate level (P_s=0.5), the value of Probability of Success recedes from the intermediate level at which persistence is least for subjects' low in resultant motivation ($M_S<M_{AF}$) as illustrated in Figure 28.

Persistence in failure is greater when Probability of success is low (P_s=0.05) than when probability of success is high (P_s=0.07). When probability of success is low (Ps= 0.05), persistence continues to increase as failure occurs and probability of success (P_s) reduces [75, 106, 113, 89].

4.3.2.3.5 Vocational Aspiration s

Individuals with low resultant AM($M_s<M_{AF}$) i.e. individuals in which inhibition is higher than excitement, either over or under aspire while individuals with high resultant AM ($M_s>M_{AF}$) i.e. individuals in which excitement tendency outweighs inhibitor tendency, are congruent in the choice of achievement related activities to engage in [109, 75].

> Applications based on this can be rightfully developed with a more structured approach towards CPD for students' low in resultant AM ($M_s<M_{AF}$), and less structured approach for students' high in resultant AM ($M_s>M_{AF}$) [109, 75].

This difference is as a result of a difference in risk preference behaviour of both groups, with students high in resultant AM ($M_s>M_{AF}$) preferring tasks with intermediate difficulty and students low in resultant AM ($M_s<M_{AF}$) least preferring tasks with intermediate difficulty.

The intermediate difficulty is congruent with choice. Congruent choice is the choice of intermediate difficulty, as choosing a task equal to one's ability offers the most intermediate probability of success. An external factor is the factor that students low in resultant AM ($M_s<M_{AF}$) are less likely to engage in activities as they may not have the ability to correctly gauge their ability hence over or underestimate ability. This notion is confirmed by an experimentation carried out by Mahone to determine the level of realistic estimation of one's ability versus the resultant AM [109].

Mahone's experiment compared objective simplicity or difficulty of a task against a subjective measure of probability of success at a task. This in turn yields the result that the subjects low in resultant AM exhibited unrealistic choices in the context of engaging with achievement related tasks by choosing to engage in overly difficult or overly easy tasks rather than intermediate level tasks [75, 109, 115].

4.3.2.3.6 Programmed Instruction

Programmed instruction is defined by Richey et al. as,

> *"A type of individual instruction in which the content has been divided into small hierarchically sequenced units and learners are required to correctly respond to each unit at their own pace before progressing through the material. "*
>
> [131]

Programmed instruction is a form of constructivist approach to learning or learner development in which learning activities are broken-down into small units to enable a serial assimilation of intended knowledge. It is best suited for serialists. It is an approach that seeks to reinforce learning by placing

a learner well within the ZPD. The approach involves small units that the learner can correctly answer and build on [43, 131, 132, 133].

When engaged in education or learning and development activity that is in the form of programmed instruction, (in this context a unit of professional development activity with a programmed instruction structure) motivation is maximized for students' low in resultant AM ($M_s<M_{AF}$) as the probability of success(P_s) approaches unity ($P_s\rightarrow1$) when engaged in programmed instruction. This is due to the fact that AM is highest for students' low in resultant AM ($M_s<M_{AF}$) as Probability of success(P_s) approaches zero or unity ($P_s\rightarrow0$ or 1) as illustrated in Figure 29.

The probability of success when engaged in programmed instruction is high ($P_s\rightarrow1$), due to the nature of the programmed instruction. Programmed instruction is designed in a way that guarantees small incremental progress by breaking the learning process into small elements (with high probability of success) that learners can easily succeed at.

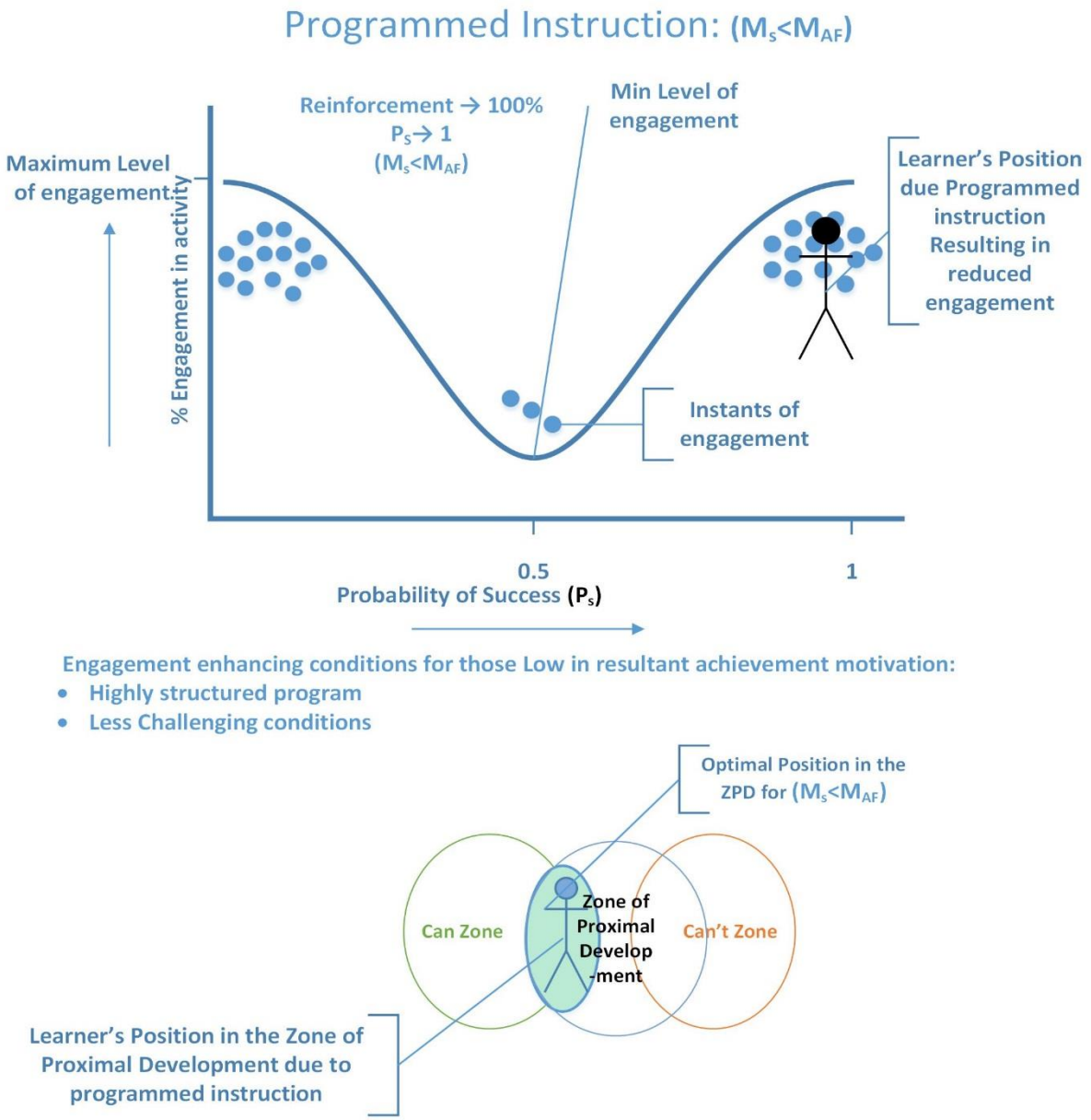


Figure 29 AM (M_s<M_{AF}) in the context of Programmed Instruction

Adapted from [43, 11, 59]

AM is minimized for subjects high in resultant AM (M_s>M_{AF}), as the AM is minimum as probability of success approaches 1 or 0 and moves away from the maxi-point (P_s=0.5) as illustrated in Figure 30.

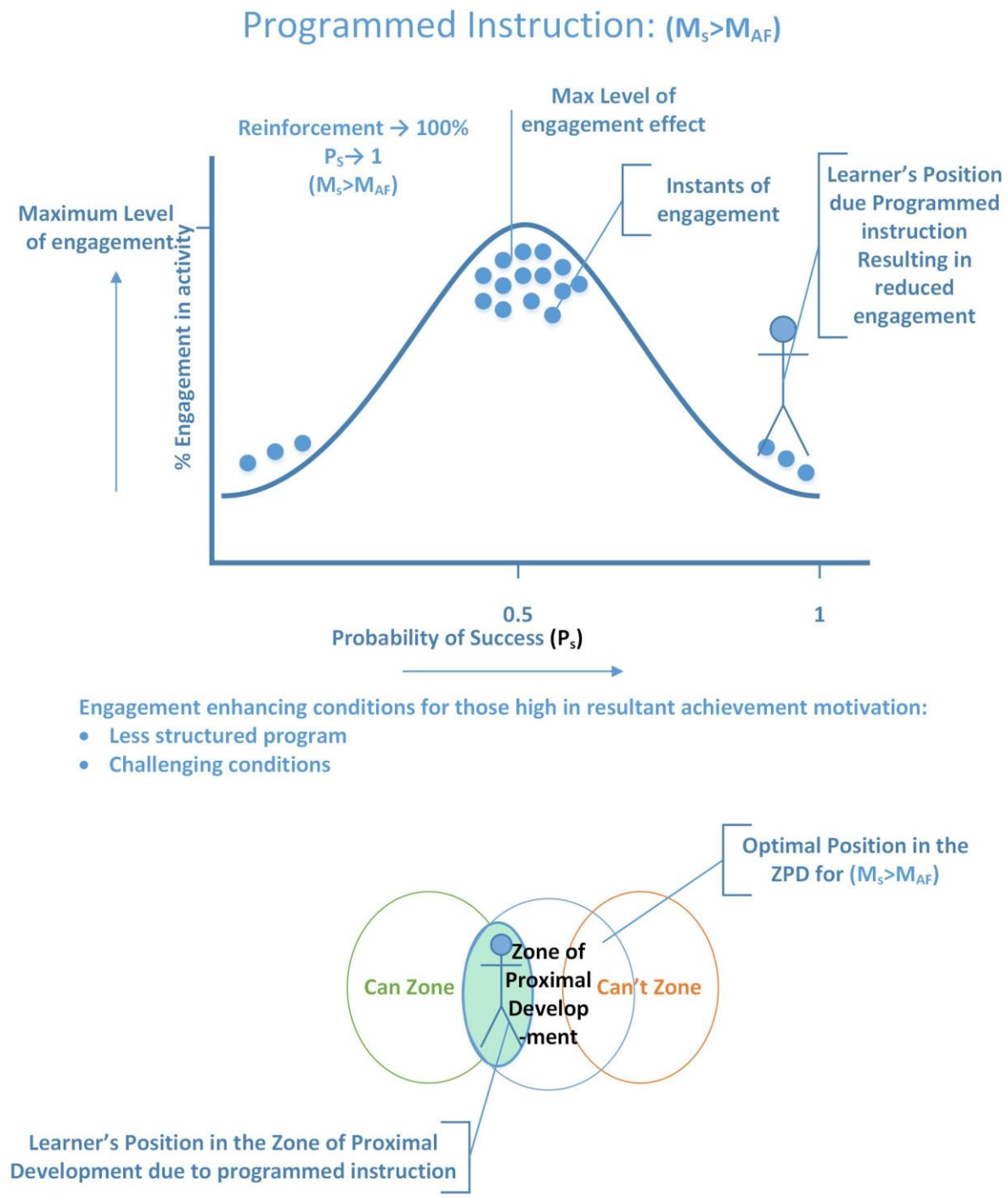


Figure 30 AM (Ms>M_{AF}) in the context of Programmed Instruction

Adapted from [43, 11, 59]

This has implications that can be expanded on if considered in the context of ZPD. The implication of the above illustrates that those high in resultant AM (M_s>M_{AF}) require a level of failure or benefit from a level of failure when probability of success is initially high(P_s>0.5) as such should be closer to the

can't region of the ZPD (as illustrated Figure 31) and while those low in resultant AM (M_s<M_{AF}) should be closer to the can region of the ZPD, so as to ensure enhance motivation [50, 11, 75].

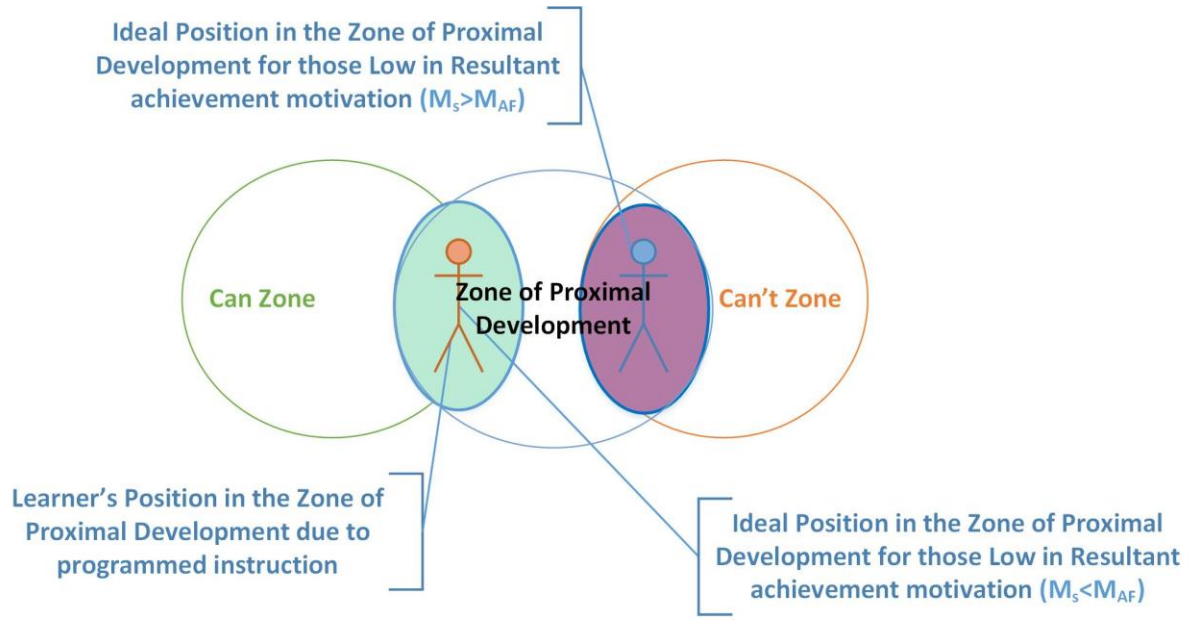


Figure 31 Illustration of programmed instruction in the context of ZPD

Adapted from [11, 43, 75]

4.3.2.3.7 Intelligence and motivation

Intelligence and academic grades are not directly linked to achievement need. Nevertheless, a relationship can be established between performance at IQ tests or examinations and the nature of achievement orientation of a subject, when considered in the context of anxiety of failure[119].

Anxiety of failure and intelligence are related. There is no direct correlation between achievement need, motivation and intelligence especially in the form of IQ test. A link does exist between performance at IQ test or examination and anxiety; by virtue, indirect link exists between performance IQ test or examination and level of resultant AM (AM orientation) as a result of effects of failure or success on anxiety [11, 75].

A tenuous indirect link can be drawn between AM and IQ test, if an assumption is made that intelligence has a direct impact on rate and experience of success and failure. As experience of success and failure illicit fear of failure (Avoidance oriented AM) and or Hope of success (approach oriented AM) that can influence desire to engage with achievement -related activities and by virtue achievement-motivation. All in the context of the impact anxiety has on the performance at IQ tests and examinations [75, 108, 11, 110, 119].

In the context of engagement with CPD, the implication of the above interaction, is that those low in AM (avoidance approach oriented, $M_s<M_{AF}$) may be less motivated to engage in CPD activity that involve IQ test or examination. In terms of performance they may be better at engaging with CPD activity (without examination) that least generates anxiety and by virtue inhibitive tendencies.

4.3.2.3.8 Ability grouping

Grouping learners based on homogenous ability grouping results in increased motivation for those high in resultant AM ($M_s>M_{AF}$) than those low in resultant AM ($M_s<M_{AF}$). Although grouping of learners according to ability does result in increased performance [11].

This is as a result of the fact that when a group is placed together the average ability have the most intermediate probability of success (P_s) by virtue they are strongly motivated to succeed. As the worst and best performing have a low value of subjective probability of success(P_s) or a high value of subjective probability of success (P_s) respectively [75]. As such motivation to succeed is higher in the average group. Increasing the size of the average group can increase the performance of the whole group; Increasing the size of the average group can be achieved by grouping according to ability.

Those high in resultant AM ($M_s>M_{AF}$) experience substantial increment in performance and AM when grouped according to ability. The converse is the case for those low in resultant AM ($M_s<M_{AF}$) due to the implication of probability of success. Those low in resultant AM($M_s<M_{AF}$) are most motivated when they fall in the higher or lower category of group as the probability of success is either high or low (away from the minimum point for $M_s<M_{AF}$ $P_s= 0.5$). Grouping according to ability expands the average subgroup reducing the zone that is best for those low in resultant AM. Hence, those low in resultant AM do not experience substantial increment in performance and AM when grouped according to ability [120, 75, 11, 107].

It must be noted though, that there are other factors at play that augment the performance and motivation of those low in resultant AM ($M_s<M_{AF}$). Further to these, it should be stated that it has been proven that the effect of ability group is limited in a context where the individual need of the subjects is not taken into consideration. Substantial improvement in motivation as a result of ability group is mainly achieved in context where individuals' differences are taken into consideration in structuring the activities of the group [134]

In the context of CPD, this can have implication for structuring and grouping activities and the utilisation of such structure to create conditions that promote motivation to engage.

4.3.2.3.9 Area of Specialization

In selection of areas of concentrated studies; it is shown that those high in Resultant AM ($M_S>M_{AF}$) are more likely to select major fields of studies with intermediate difficult based on the fact they are more

likely to engage in activities of intermediate Subjective Probability of Success (P_S=0.5). While those low in resultant AM (M_S<M_{AF}) tend to select those major fields of specialization which are either perceived or judged to be too easy or too difficult due to natural aversion from areas of intermediate difficulty with an intermediate subjective probability of success (P_s=0.5) [11, 89, 116, 115, 117].

The implication of this for engagement in CPD, is that those high in resultant AM (M_s>M_{AF}) are more likely to engage in CPD activities or field of interest that they view as being of intermediate difficult with Subjective probability of success (P_S=0.5). A program designed for those with these orientation needs to be designed in such a way as to evoke an intermediate perceived probability of success [135]

4.3.2.3.10 Achievement Motivation (AM) in success and failure

Atkinsons theory of motivation assumes that the key Variable factor is the subjective probability of success (P_s), further assuming that the effects of failure and success are brought to bear in future by changes in the subjective value of probability of success(P_S) i.e. success increases the subjective Probability of success while failure reduces subjective probability of success (P_s). Although, it should be noted that in some situations success also results in satisfaction of achievement need (need for success) hence, reducing motivation as a whole [11].

4.3.2.3.10.1 Motivational effect of failure performance

Performance of a subject reduces as a function of the degree of prior failure for subjects high in anxiety i.e. Low in resultant AM (M_s<M_{AF}); while performance improves in the case of Low anxiety subjects (High Resultant motivation M_s>M_{AF}) [110]. Those low in anxiety are motivated by failure, while individuals high in anxiety are inhibited by failure at an achievement-related goal. Retention or speed of learning is also adversely affected by failure among subjects high in anxiety [125, 105, 136]

4.3.2.3.10.2 Motivational Effect of Success

The effect of success on individuals low and high in AM is the converse of the effects of failure [107]. Reduction in the pursuit of engagement with tasks, occurs when subjects low in anxiety (high in Resultant AM, M_s>M_{AF}) succeed at an achievement-related task i.e. individuals low in anxiety relax when they succeed at achievement-related task. The opposite is the case for subjects high in anxiety (Low in resultant AM, M_s<M_{AF}) as they exhibit increased pursuit of engagement with achievement-related tasks i.e. individuals high in anxiety increase striving after succeeding in achievement-related tasks [11, 107, 75, 113].

4.3.2.3.10.3 Implication of effects of success and failure

This has implications for learners low and high in anxiety and in direct correlation with the observations made in section about programmed instruction. Those low in anxiety (high in Resultant

AM, $M_s > M_{AF}$) should be constantly placed close to the can't zone of the ZPD as illustrated in Figure 32 [75, 11, 49].

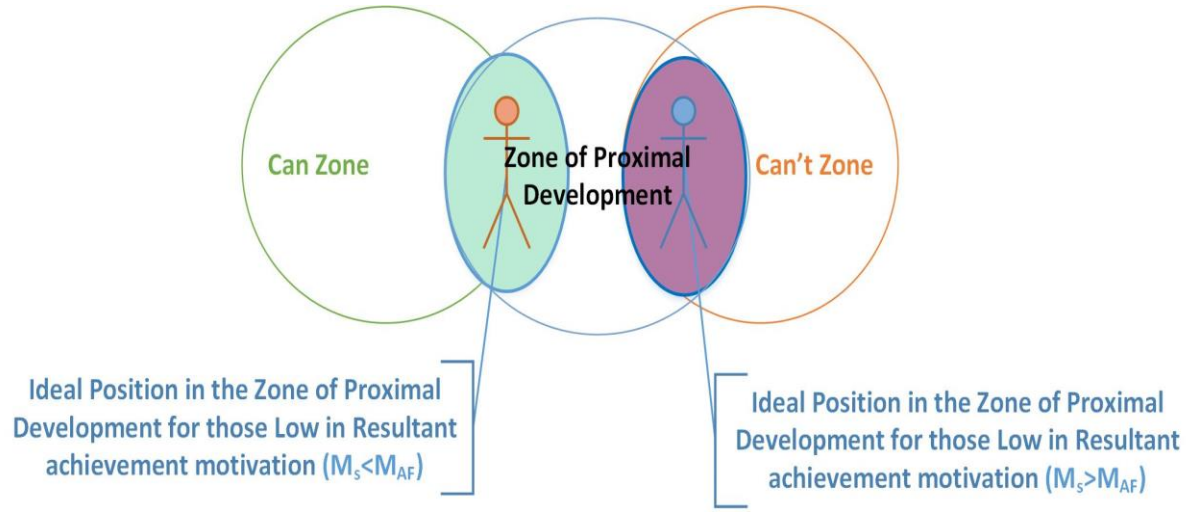


Figure 32 Position in ZPD based on AM orientation

Adapted from [11, 43]

4.3.2.4 Weiner's Modification

The applicability of Atkinson's theory of AM is well established, nevertheless there are a number of recognised conceptual problems with Atkinson's theory of AM. There is a problem with the dependence on probability of success (P_s), the lack of account for the effect of unsatisfied motivation, the assumption that there is zero pre-existing motivation and the reliance on stimulus, which does not take into consideration the absolute value of incentive of success [137, 11, 75].

Weiner's iteration of Atkinson's theory of AM addresses this problem. A key element that improves the applicability of Atkinson's theory of AM especially in the context of the intended research on CPD is the inclusion of a concept called the inertia motivation. This concept enables the explanation of observation based on Atkinson's theory to be more accurate and enhanced [75, 108, 137, 102]. The theoretical basis for inertia motivation is similar to Maslow's concept of pre-potent needs which points to the presence of certain pre-existing latent needs and the constant existence of a relationship between every drive, need, and the state of satisfaction or the pre-potent drives or need [76, 75, 77]. The introduction of this concept was due to a paradigm shift by Atkinson in his approach to the exploration of AM [137]. This shift also addresses shortfalls in explaining certain observations such as the motivation effects of success and failure in the context of AM [102]. The third iteration of Atkinson's theory containing a revised inertia motivation concept was developed by Weiner. The concept of inertia motivation was developed by Atkinson and Cartwright as part of the second iteration of the theory due to observation and recommendation that his theory of AM was reflective

of stimulus-bond organism which Atkinson was philosophically against [75, 108]. According to Atkinson and Cartwright;

"It is proposed that activity already in progress (initial activity) and the persistent effect of previously aroused but unsatisfied behavioural tendencies (inertial tendencies) be included in a formal conception of the contemporaneous determinants of decision and performance."

[102]

Upon extensive review, Atkinson observed that his initial theory of motivation was based on the notion of an organism bound by stimulus. Atkinson advocated a change to one based on the notion of an active organism. Weiner's iteration of Atkinson's theory builds on Atkinson's attempts to make his theory more holistic i.e. organism not bound by external stimulus, behaviour [102, 75].

Taking into account the work of the likes of Freud and Lewin, who take the position that behaviour persists even in the absence of stimulus, Atkinson arrived at the conclusion that motivation does not originate from a zero point [108, 102]. Hence, Atkinson suggests that future investigations should focus on change of attitude and motivation. According to Atkinson,

> *"There are no behavioural vacuums in the life of an individual; behavioural life is a continuous stream characterized by changing from one activity to another; the focus of interest must now change to the juncture or joint between two episodes that constitutes the cessation of one and initiation of another"*

[137]

The goal-directed behaviour or motivation to partake in a goal-directed endeavour does not always persist till the goal is achieved. Often times, the process of engagement is truncated due to various plausible factors, leaving the subject with unsatisfied goal-oriented motivation [102, 75].

In reality, when an individual's motivation to engage in an achievement-oriented activity is initiated, the individual does not start from a zero level of motivation; the individual has a pre-existing unsatisfied tendency to achieve success (motivation). This is in line with Maslow's conceptualisation of pre-potent needs [102, 75, 11, 77].

The Construct of General inertia tendency(T_{G_i}) was developed by Atkinson and Cartwright as a representation of the persisting unsatisfied tendency from a truncated action.

Atkinson and Cartwright describe inertia tendency as follows,

> *"The persistent unsatisfied motivation, or what might be called, the inertial tendency* (T_{G_i}) . *In using the capital 'G' as subscript, we mean to imply this: when a person, has had motivation to achieve aroused in the performance of a particular task and then is interrupted before he has successfully completed the task, what persists is his general tendency to achieve. We mean*

to imply that this persistent tendency will be added to any subsequently aroused tendency to perform any response which is expected to have, as a consequence, success."

[137]

A revised notion of total AM was also developed in the form of what was described as an overall tendency to perform response for a class of goals(T_{RG_i}) . The original resultant motivation was clarified as the resultant motivation of the current task (for a singular goal only) symbolized by T_A or (T_{R_i}) . The equations for this are displayed in Figure 33 [137, 11, 102] .

In the context of Atkinson and Cartwright's iteration, the inertia tendency (T_{G_i}) is the general tendency to achieve success that persists after the non-attainment of goals in an activity that aroused an initial tendency to achieve. Here lies the distinction between Atkinson & Cartwright's iteration and Weiner's iteration, as the value of inertia tendency (T_{G_i}) is considered to be equal to the general tendency to achieve success ($T_{G_i\,S}$). As such it consists of only the positive approach component in Atkinson and Cartwright's Iteration. Weiner's iteration on the other hand considers the value of the inertia tendency to be a resultant of both the general tendency to achieve success $\left(T_{G_i\,S}\right)$, which is the positive approach component, and the negative approach component which is the general tendency to avoid failure($T_{G_i\,AF}$). As illustrated in Figure 33, the key difference between Weiner's iteration and the addition based on Atkinson and Cartwright's introduction of inertial tendency is that Weiner expanded the construct of inertial tendency to include both persistence of fear or threat of failure and tendency towards goal while Atkinson and Cartwright only included the persistence of tendency towards goal [75, 102, 108].

Version	Author of iteration	Illustration of Iteration
1st iteration	Atkinson's theory	Atkinsons first Iteration $T_A = (M_s - M_{AF})(P_s \times (1 - P_s))$
2nd Iteration	Atkinson and Cartwright addition	Atkinsons First iteration + inertial tendency in form of persistent approach tendency

		$T_{RG_i} = (T_A + T_{G_i})$ For second iteration $T_{G_i} = T_{G_i\,s}$ $T_{RG_i} = (T_A + T_{G_i\,s})$
3rd Iteration	Weiner's Modification	Atkinsons First iteration + Modified inertial tendency $T_{RG_i} = (T_A + T_{G_i})$ For Third Iteration $T_{G_i} = T_{G_i\,s} + T_{G_i\,AF}$ $T_{RG_i} = T_A + (T_{G_i\,s} + T_{G_i\,AF})$

Figure 33 Iterations of Atkinson's theory of AM

Where T_{RG_i} = Overall Tendency to perform response for a class of goal objects

T_{G_i} = *General* Inertia tendency = Resultant inertia *tendency*

$T_{G_i\,S}$ = *Inertial tendency's approach component* = *Persistent tendency towards goal*

$T_{G_i\,AF}$ = *Inertial tendency's avoidance component* = *Persistent fear of failure*

T_A = *Resultant motivation of current task only* = *motivation aroused by particular task*

Adapted from [75, 102, 11, 89, 137, 108]

Atkinson's theory of motivation is tailored after a conflict model and strongly informed by Lewin and Miller's approach-avoidance conflict analysis [92]. The approach and avoidance conflict and the preceding value of it informs the level of AM and is applicable with the environmental, situation or inertial components of AM [89]. AM = environmental/situational component + inertial tendency = (avoidance environmental/situational component+ approach environmental) + (approach inertial +avoidance inertial) [75, 108]. This is supported by concepts such as vacuum behaviour.

Confirmation of Weiner's modification is lent credence by interpretation of concepts such as frustration. Amsel's views frustration as

> *"a conceptualization of a hypothetical, implicit reaction elicited by no reward after a number of prior rewards. Frustration is simply a motivational condition contributing to drive and providing directive cues".* [138]

Frustration is a form of deprivation of achievement of a nature that positively influences the general level of drive and response strength [138].

The inertial tendency would add to the AM strength of subsequently aroused AM. AM aroused in an activity after the preceding activity without goal attainment resulted in the persisting inertial tendency. The AM of the said activity would be strengthened by the addition of the inertia tendency (T_{G_i}).

This effect exists for activities that intend to lead to the result of success at an achievement-related task and no other kind of consequence e.g. eating, sexual activity, and affiliation. This only occurs when failure occurs in previous activities as motivation is satisfied by success and becomes zero. According to Weiner,

> *"Failure is the antecedent condition that results in the continuation of previously aroused motivation"*
>
> [75]

The inertial tendency that persists as a result of failure at an achievement-oriented task is a combination of the residual or persistent previous aroused but unsatisfied approach and avoidance motivation [75].

The iteration of Atkinson's AM theory does not change the validity of the observations of behaviour exhibited by subjects with different AM orientations. It influences explanations and predictions of the motivation and behaviour tendencies.

Weiner's inertia model is confirmed by its ability to mutually explain observations of Atkinson's theory of motivation and other theories such as Amstel's concept at the same time. Hence, Weiner's inertia models the ability to provide an underlying explanation encompassing the likes of Atkinson's theory of motivation and Amsel's concept while simultaneously explaining observation such as changes in expected motivational response after success or failure which said theories could not adequately explain [138, 102, 75].

However, some dispute the need for variations of Atkinson's theory of AM especially in the context of risk preference, activity choice and engagement. According to Schneider,

> *"After summarizing the results of a series of studies on choice behaviour in achievement-related situations, the conclusion is drawn that such a revision is unnecessary. Choice behaviour is in agreement with the prediction of the original model when expectancies are assessed in the proper way."*

[139]

It is argued that the first iteration provides adequate information, with subsequent iteration providing little or no practical difference in terms of additional knowledge or information in the context of prediction of patterns of behaviour. Nevertheless, Weiner's modification offers an alternative paradigm or outlook for examining AM, hence serving as a way of triangulating explanations provided by the first iteration [139].

Weiner's modification effectively explains the already explained and some of the unexplained. As in both concepts of achievement models, not achieving intended goal affects the approach/avoidance balance in favour of avoidance, while contributing to the overall value of following aroused motivation. This is in line with wiener's inertial concepts; additional credence is also lent by repeatability of results [75, 108].

The implication of this on the analysis of the effect of failure on AM is as follow:

- For those high in resultant AM ($M_S > M_{AF}$), failure results in the creation of an inertial tendency which has a higher approach component than avoidance component. There by increasing overall approach tendency than avoidance tendency.
- For those low in resultant AM($M_S < M_{AF}$), failure results in the persistence of an inertial tendency which has a higher avoidance tendency component than approach component hence, increasing overall avoidance tendency more than approach tendency. As illustrated in Figure 34

[75, 137, 102, 108].

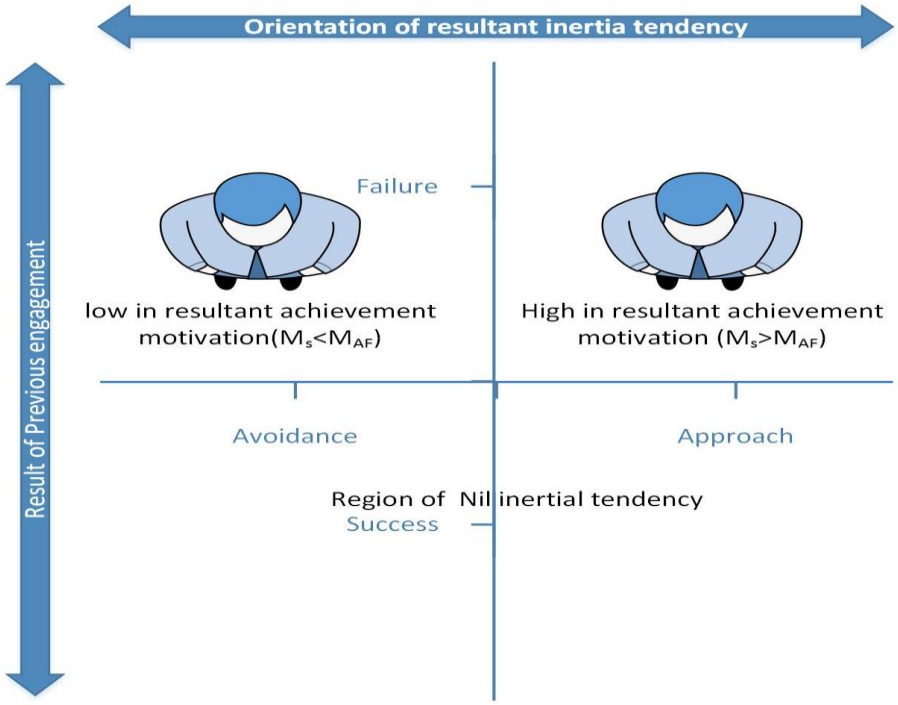


Figure 34 Relationship between result of previous task engagement and Orientation of inertia Tendency

Adapted from [102, 108]

The presence of inertial tendency does not discard the influence of probability of success (P_s). Failure at tasks influences the value of probability of success (P_s) at subsequent task. The value of Probability of success (P_s) aroused at a subsequent achievement oriented task is the subjective interpretation of probability of success influenced positively or negatively by previous success or failure. The shifts in probability of success (P_s) following failure is greater than the shift in probability of success(P_s) following success. Maximum inertial effects occur following failure at tasks of intermediate difficulty where Probability of success (P_s=0.5) as illustrated in the Figure 35 [75, 108].

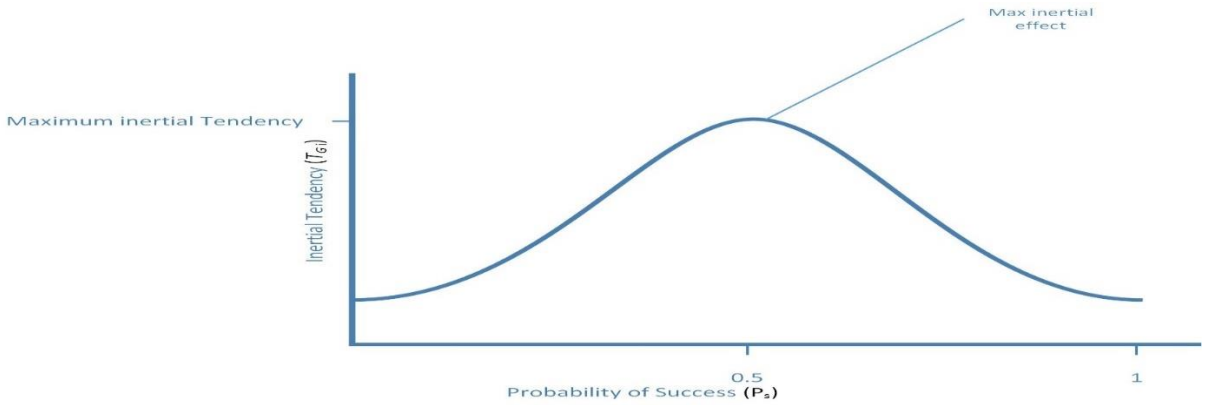


Figure 35 Variation of Inertia Tendency with probability of success

4.3.2.4.1 Persistence in tasks

When considered together, Probability of Success and Inertial tendency offer full conceptual and theoretical support to the observation that persistence is greater in failure for those high in resultant AM (M_s>M_{AF}) than in success. On the other hand, persistence is greater in success for individual's low in resultant AM (M_s<M_{AF}) than in failure [108, 75, 102, 11]. This evidently supports the notion that those high in resultant AM (M_s>M_{AF}) should be placed in the region of the ZPD that is close to the can't zone while those low in resultant AM should occupy the zone close to the can zone when consideration of development is being made [49].

4.3.2.4.2 Effects of success or failure

Under success condition, students high in resultant AM (M_s>M_{AF}) would engage more in achievement-related tasks at low level of probability of success (e.g. P_s=0.3) than at high levels of probability of success. (P_s= 0=95) Those low in resultant achievement (M_s<M_{AF}) would engage more in achievement-related task at high levels of probability of success (P_s= 0=95) than at low level of probability of success (e.g. P_s=0.3).

The situational and inertial sources of motivation come into play when considering persistence of behaviour. On continuous success, the initial AM approaches zero as motivation is satisfied in success as such inertial motivation does not persist.

$$T_{RG_i} = T_A + T_{G_i} \qquad (19)$$

On success, inertia tendency is equal zero $T_{G_i} = 0$

$$T_{RG_i} = T_A + 0 \qquad (20)$$

$$T_{RG_i} = T_A \qquad (21)$$

On continuous failure ,the inertial source of motivation and the situational source exists, as on failure intial achievement motivation persists

$$T_{RG_i} = T_A + T_{G_i} \qquad (22)$$

[75, 102]

On continual success, those high in resultant AM (M_s>M_{AF}) are more likely to choose difficult tasks (P_S=0.30) than easy tasks (e.g. P_S=0.90); while for those low in resultant AM(M_s<M_{AF}) are more likely to choose easy tasks over difficult tasks [75, 89].

On continual failure, those high in resultant AM (M_s>M_{AF}) choose to engage more in achievement related task than those low in AM.

4.3.2.4.3 Reduction of inertia motivation

Success leads to a reduction in achievement approach tendency for individuals high in resultant AM(M_s>M_{AF}) which is greater than the change in avoidance tendency, hence, a resultant reduction in motivation. In the case of an individual low in resultant AM(M_s<M_{AF}) there is a greater decrement in strength of the persisting avoidance tendency as such an increment in resultant motivation [108, 75]. When individuals high in resultant AM (M_s>M_{AF}) succeed, there is a reduction in AM. When individuals low in resultant AM(M_s<M_{AF}) succeed, there is a net increase in AM. Although Weiner, Feather and Atkinson's arguments are valid, the reduction in AM maybe due to other determinates of behaviour like change in level of curiosity or boredom for both low and high resultant achievement motivated individuals after success [75, 106, 11, 140]. This can be summarized by a quote from Feshbach and Singer,

> *"There exists on interaction between the effect of goal attainment and the strength of the tendencies initial to approach avoid the goal object"*

[130]

4.3.2.4.4 Programmed instruction

Learning programmes creates conditions that generate near absolute reinforcement (all things being equal). These generated conditions are better suited for those low in resultant AM(M_s<M_{AF}) as it results in an increase in motivation for low in resultant AM(M_s<M_{AF}) and reduced motivation for those high in resultant AM(M_s>M_{AF}).

The probability of success approaches unity (P_s→1) due to reinforcement and in turn, initial motive approaches zero. Failure becomes unlikely as there is a situation that tends towards continuous

success which pushes probability of success towards unity ($P_S \rightarrow 1$) while tendency towards nil failure pushes inertial motivation towards zero as pre-existing motivation is satisfied. This phenomenon is due to the effect of the continuous success on motivation of subjects high in resultant AM($M_s > M_{AF}$) and subjects low in resultant AM($M_s < M_{AF}$) [11]. According to Atkinson and Weiner, continuous repeat success propagates minimum and maximum motivation for high resultant AM($M_s > M_{AF}$) and low resultant AM($M_s < M_{AF}$) groups respectively [11, 59].

Long-Term Goals

Due to the nature of Atkinson's construct of AM, he is unable to predict or take into account the time effect on goals. I.e. Atkinson's theory does not take into cognisance the plausible differences in motivation effect of long-terms goals [59].

Increase in motivation is augmented by other deterministic forms of motivation or by the interaction between existing achievement and long-term duration of goals i.e time effect on AM. This is what gave rise to the inclusion of the third dimension of motivation in the consideration of this study which is the time dimension.

4.3.2.5 Summary

Achievement orientation	High resultant in AM ($M_s > M_{AF}$)	low in Resultant AM ($M_s < M_{AF}$)
Achievement need	High in achievement need	Low in achievement need
Anxiety	High anxiety	Low anxiety
Approach tendency	High approach tendency	Low approach tendency
Avoidance tendency	Low Avoidance tendency	High approach tendency
Maximum and minimum level of motivation	Maximum level of AM occurs at probability of success is intermediate (P_s=0.5) i.e. maximum point ⇒ P_s=0.5	Minimum level of AM occurs at probability of success is intermediate (P_s=0.5) i.e. minimum point ⇒ P_s=0.5
Effects of failure	Positive effect of failure on performance	Negative effect of failure on performance
Effect of Success	Negative effect of success	Positive effect of success
Level of Aspiration in Success	Tendency to select more difficult tasks on success (as it tends to shift towards (P_s=0.5))	Tendency to select easier task after success
Level of Aspiration in Failure	Tendency to select easier task after failure (as it attempts to shift towards, P_s=0.5)	Tendency to select more difficult task after failure (as it tends to shift away from, P_s=0.5)
Aspiration choice	Tendency to have little conflict when choosing between achievement related tasks	Tendency to have little conflict when choosing between achievement related tasks

Vocational Aspiration	Selects task of intermediate difficulty (congruent choice)		Selects tasks at high or low difficulty (over or under aspire)
Persistence	Persistence in failure	Greater persistence at easy tasks than difficult tasks Persist longer at failure in easy tasks	Greater persistence at difficult task than at easy tasks (shame is a key factor)
	Persistence at easier task (e.g. P_s=0.70)	Greater persistence than (M_s<M_{AF})	Lesser persistence than (M_s>M_{AF})
	Persistence at difficult task (e.g. P_s=0.05)	Lesser persistence than (M_s<M_{AF})	Greater persistence than (M_s>M_{AF})
Forced choice (Risk	Selects task of intermediate difficult (P_s=0.5); avoiding task of high or low difficulty (e.g. P_s=0.70 or P_s=0.05).		Selecting task of high or low difficulty (e.g. P_s=0.70 or P_s=0.05); Avoids tasks of intermediate difficult (P_s=0.5).
	More attracted to achievement related tasks		Less attracted to achievement related tasks
Programmed instruction	Programmed instruction reduces motivation as probability of success approach 1 (P_s→1) and moves away from maximum point (P_S=0.5)		Programmed instruction increases motivation as probability of success approach 1 (P_s→1) and moves away from minimum point (P_S=0.5)
Ability	Grouping based on ability cause marked improvement in performance		Grouping based on ability does not cause marked improvement
Area of specialization	Tend to select area of concentration with intermediate level of difficult. i.e. choice congruent with ability		Tend to select area of concentration with high or low level of difficult i.e. choice not congruent with ability, over or under aspire
Inertial tendency	On success	Non	Non
	On failure	Approach component > avoidance component (enhances resultant AM)	Approach component < avoidance component (enhances resultant AM)
	Consideration of	Persistence greater in failure than success (as a result of positive inertial tendency)	Persistence greater in success than failure (as a result of negative inertial tendency)

	Persistence in failure	Persist longer at failure in easy tasks	Persists longer at difficult tasks
	On continual failure	Chooses more achievement related tasks	Choose less achievement related tasks
	Resultant AM	In failure enhances resultant AM	Reduces Resultant AM
	On continual successzws	More likely to choose difficult tasks (e.g. P_s=0.30) than easy task (e.g. P_s=0.70)	More likely to choose easy tasks (e.g. P_s=0.70) than difficult task (e.g. P_s=0.30)
		Reduces Resultant AM	Enhances Result AM
Time effect on motivation	Improved motivation on long term goals		Reduced motivation and performance on long term goals

Figure 36 Behaviour exhibition based on AM orientation

[109, 113, 11, 110, 105, 125, 108, 75, 107, 75]

The figure contains a summary of the behaviour exhibition and motivation related exhibition observed and examined based on Atkinson's theory of AM. A lot of the observation revolve around the effects of changing AM symbolized by changing probability of such on the behaviour exhibited by the student with certain achievement orientations.

The notion of subjective value of success makes it possible to adjust the potential for a subject to engage in an activity by offering the clues that change the subjective probability of success (P_s). Therefore, if the nature of Motive for achievement and Motive for failure avoidance (M_s: M_{AF}) balance of the individual is known, the probability of success can be adjusted to a level that best suites engagement in the activity. Implying that, the subjective probability of success needs to first be measured and tracked during adjustment. Engagement in activity is selected in this particular case, as performance is a more complex concept to measure as it brings into context, definitions of performance and validity of the measures involved.

The link between AM theory and Dweck's self-theories as a result of the subjectivity of the probability of success (P_s) and the notion of 'perspective of self' coming into play is notable. The subjectivity offers a window for regulation of AM and hence control of engagement, also offering a window for the development of activities for optimal performance. Other theories can also be applied in this context including the source of motivation, dependent theories of motivation, and the time effect of

motivation based theories on motivation. This therefore, offers additional insights into regulation, control and potential to enhance engagement [66, 11, 141].

There is also a strong connection between Atkinson's theory of motivation and self-worth theories. This connection is on the basis of the shame concept in Atkinson's AM and effect of negative perception on motivation (personal responsibility) in Self-worth theories. This is also mirrored in Aaron T. Becks cognitive theory of depression [142, 89, 143, 141, 75].

In order to fully understand the motivation of a subject, an understanding of the nature of the source of the subject motivation and the time effect on goal attainment needs to be known [75]. The relationship between time and motivation i.e. the time effect on goal-related motion is examined by Raynor's experiment involving perceived instrumentality. The experiment established that lack or presence of perceived long term instrumentality influences and affects the level of AM, comparing strength of achievement needs with degree of long-term importance.

The relationship between time and achievement related motivation revolves around the anticipation of future goals. AM generated at a series of sequential and connected goals is influenced by motivation generated by the component goals. Perceived motivation towards a future goal or as a result of anticipation of a future goal is an accumulation of an individual's motivation towards activities or achievement related tasks than the need for tasks to be carried out in order to achieve the goal. Raynor states this as,

> "the motivation at the task confronting the individuals is a function of both future and immediately expected success and failure" [144]

In the context of AM nature or predisposition of subjects, those high in resultant AM ($M_s > M_{AF}$) performance are better than subjects low in resultant AM($M_s < M_{AF}$) when the goal is a long-term goal [144]. The implication of this in the context of CPD is that a structure for engaging with CPD can be established. This is applied later on in the approach to CPD engagement recommended for high inhibition and high excitement individuals.

4.3.2.5.1 Interpretation of domain

On careful consideration of the theory behind AM as espoused by Atkinson, McClelland, Wiener and Cartwright [11, 93, 75, 89], one can draw a number of conclusions that enable interpretation of the domain hypothesized in this study.

Points within the domain that reflect high resultant AM indicate that subjects at this point tend to perform better under achievement-related, point-based activities with a specific desire to measure

and record achievement [89].It also indicates that individuals at this point are more encouraged or motivated by failure [75, 11] as prior failure increases achievement striving. When individuals at this point achieve success at an endeavour, the AM is satisfied and begins to wane. However, when they fail, the AM is greatly increased by the fact that the motivation is not yet satisfied and by the creation of inertial motivation on the retry of the activity. Individuals at this point should be placed at the most advanced region of the ZPD (ZPD) closest to the can't zone (as illustrated in the Figure 32) [43, 11] as the level of productive motivation is continuously or more effectively maintained by the increased chance of failure for those high in AM.

In order to effectively understand behaviour, it must be clearly stated that behaviour is an over determined concept. As such, no singular school of thought, concept or notion can effectively define the entire field of behaviour [75, 76]. Theories of motivation are at best true approximation of the drive of behaviour.

On the other hand, those occupying the position that indicates low resultant motivation tend to perform better under tasks not directly related to achievement (non-achievement-oriented situations). Achievement-related tasks should also be masked in a way that avoids direct measures and record of achievement. It also indicates that individuals at this point are more encouraged by success than failure. When individuals at this point achieve success, the motivation to take part in additional activities that are achievement-oriented is multiplied and increased. However, when they fail, the resultant inertial tendency created greatly negatively impacts motivation [75, 129]. According to wiener,

"Prior failure further inhibits achievement striving"

[75]

Individuals at this point persist more in success than in failure. This individual should be at the least advanced point of the ZPD(ZPD) closer to the can do zone (as illustrated in Figure 32) as the level of productive motivation is continuously or more effectively maintained by the increased success or tendency of success in the Zone [43, 11].

Figure 37 contains details of the relationship between persistence and AM orientation.

AM orientation	Persistence tendency	Persistence at intermediate	Atkinson model evaluation	Resultant inertia tendency evaluation

		Level of difficult		
Students high in resultant AM (M_s>M_{AF})	Persistence is greater when the probability of success (P_s) is high than when it is low	Maximum point of persistence at task is when Probability of success (P_s) is at intermediate level (P_s=0.5)	When probability of success is high and failure occurs. The probability of success approaches the maximum point of persistence at task where P_s=0.5: While when Probability of success is intermediate or low as failure occurs probability of success (P_s) recedes from maximum point of persistence at task (P_s=0.5)	Inertia tendency generated is higher When probability of success is high motivation aroused is higher than when probability of success is low. On non-attainment of goals, the unsatisfied motivation is also greater when probability of success is high than when it is low.
Students low in resultant AM (M_s>M_{AF})	Persistence is greater when the probability of success(P_s) low that when it is high	Minimum point of persistence at task is when Probability of success (P_s) is at intermediate level (P_s=0.5)	Conversely, when probability of success is high and failure occurs. The probability of success approaches the minimum point of persistence at task for (M_s<M_{AF}) where P_s=0.5: While when Probability of success is intermediate or low as failure occurs probability of success (P_s) recedes from minimum point of persistence at task (P_s=0.5)	Inhibitory attribute is higher when probability of success is high than when probability of success is low after failure. Result inertia tendency is more inhibitory at high probability of success than low after failure. Hence greater avoidance of achievement task occurs at high probability of success than at low probability of success therefore persistence is higher.

Figure 37 Interpretation of points in the domain

4.3.3 Achievement Motivation (AM) in the context of work and education.

Achievement Motivation (AM) has gained new prominence especially in the context of work and educational outcomes [145]. According to Heggestad & Kanfer, the focus shifted from the individual differences and person-centred approach to the study of behaviour in the 1970s and 1980s. This focus

has however shifted back to individual differences and person-centred approach due to progress in personal psychology and application of said progress in the examination of academic and job engagement [146].

The need for achievement, affiliation and power are strongly associated with AM (as illustrated in *Figure 38*) and as such are reflected in many of the indicators of AM.

Figure 38 Need associated with AM

[75, 11]

4.3.4 Measuring achievement Motivation (Achieve Motivation Inventory)

There is general difficulty in the assessment of AM using personality tests and observation methods. In the context of engagement with professional related activity, achievement motivation is a construct that needs to be taken into consideration. This is because the personality factors are not adequate in determining the nature of a subject's engagement with activity especially in the context of persistence and adaptability [147, 148].

The nature of a subject's AM is often inferred from the energy and direction associated with exhibited observable behaviour. The strength and direction are often gleaned from an observable exhibition of behaviour such as choice decisions, persistence, effort, achievement, verbalization. This approach is often inadequate. This is because there are many other indicators of AM that are not directly observable. Furthermore, the subjective bias and nature of the observer also come into play therefore reducing the value of the supposed results [147, 149]. Self-reporting methods are utilised in measuring AM in various contexts, either to augment observation-based methods or as a principal method of motivation, as motivation that is relevant in many contexts (in this specific context education or developmental activity) is difficult to detect through direct observation [149]. The context in which AM is measured also influences the method of measurement. Movement and physiological indicators

such as heart rates are utilised in observing and measuring motivation in the context of sports and the military. Nevertheless, there are questions about the viability of these methods as the values recorded by these methods may be more of a reflection of ability rather than motivation. Hence, the validity of results is questionable when measuring motivation of subjects with varying ability [147, 149].

Atkinson viewed motivation as the collation of factors or determinates that predicate a response tendency (behaviour) as reflected in Atkinson's AM theory. This is in contrast to Hull's conceptualization of motivation as analogous to drive. Although it should be stated that Hull nevertheless fundamentally agreed with the principle of contemporaneity [11]. The Achievement Motivation Inventory (AMI) attempts to evaluate AM by taking into cognisance its factors and indicators (determinates). The AM inventory stands out as a widely accepted comprehensive cross-cultural test and cross-sector measurement for multifaceted AM [145, 147]. According to Annen, et al.,

> *"The AM inventory is so far the only scientifically established procedure that covers performance resp. achievement required characteristics."* [147]

The AM inventory is a multifaceted measure of AM and the indicators and conceptualization of the construct of AM evaluated by the AM inventory range from goal setting to confidence in success, to dominance. This construct is conceptualised by Annen, et al., and Byrne, et al. as comprising of multiple-order factor structure with first and second-order factors. However, the conceptualization of first order factors by Byrne, et al., and Annen, et al. are slightly different [145, 147]. The difference in the conceptualization of first-order factors form the basis of what would be termed as AM indicators profiles. The AM Inventory measures 17 facets or indicators of AM (As illustrated in *Figure 39*) first-order factors were identified across these 17 facets. These factors have medium to high inter-rater term correlation.

AMI facet	Brief definition and sample item
Compensatory effort	Willingness to expend extra effort to avoid failing at a work task, even if this effort results in over-preparation. So that I will not be subject to criticism, I prefer to double my effort
Competitiveness	Motivation derived from competing. A desire to be better and faster than others. It annoys me when others perform better than I do

Confidence in success	Confidence in achieving success even when there are obstacles to overcome. Even when faced with a difficult task, I always expect to achieve my goal
Dominance	Need to exercise power and influence over others; tendency to take initiative and to have control over activities.
Eagerness to learn	Desire and willingness to spend a lot of time enlarging one's knowledge for knowledge sake.
Engagement	The desire to be regularly engaged in an activity, usually work related; uncomfortable if nothing to do for long periods.
Fearlessness	Lack of fear of failing at difficult tasks; not nervous about performing in public or under time pressure.
Flexibility	Willingness to accept change and the enjoyment of challenging new tasks.
Flow	Ability to concentrate on something for a long time without being distracted by situational influences; tend to become lost to the outside world when absorbed in a task.
Goal setting	The tendency to set high goals and to make long-term plans for achieving these goals.
Independence	The tendency to take responsibility for one's actions; would rather make own decisions than take direction from others.
Internality	The belief that one's successes and failures are due to internal causes rather than to situational variables.
Persistence	Willingness to exert large amounts of effort over long periods of time to reach a goal.
Preference for difficult tasks	The tendency to seek out challenging rather than easy tasks; desire to seek greater challenges once the difficult task is done.
Pride in productivity	The sense of enjoyment and accomplishment derived from doing one's best at work.
Self-control	Ability to delay gratification and to organise oneself and one's work; a form of self-discipline.
Status orientation	The desire to attain high status in one's personal life and to progress professionally.

Figure 39 Indicator (Facets) of AM measured by AM Inventory

[145]

Byrne et al. identified three first-order factors across these 17 indicators (in line with the work of Schuler and Prochaska), while Annen et al. also identified another three first-order factors. The three factors identified by Byrne et al. are, F_{1a}= Independent, F_{2a}=ambition, F_{3a}=Task-related motivation.

Ambition (F_{2a}) is related to pride in one's productivity, status orientation and competitiveness (as illustrated in *Figure 42*). Independence (F_{1a}) is related to Self-reliance, Flexibility and Fearlessness (as illustrated in *Figure 41*). Task-related motivation (F_{3a}) is related to self-control, persistence and internality (as illustrated in *Figure 43*) [145]. These three factors identified by Annen et al., are F_{1b}= Self-determination & Goal setting, F_{2b}=Competitive thinking and F_{3b}=Activation [147, 145]. The three factors are as defined in *Figure 40* and are related to facets as illustrated in *Figure 44*, *Figure 45* & *Figure 46*.

Self-determination and goal setting (F_{1b})	how self-determined or self-confident a person is and how high they set their goals
Competitive thinking (F_{2b})	measurement of a subject (oneself) against others
Activation(F_{3b})	Stress and vitality experienced by a person when carrying out a task

Figure 40 Definition of each of the 3-factor solution for AM by Annen, et al.

Adapted from [147]

These First -order factors are linked to different profiles of indicators of AM with the greatest similarity occurring between the profiles of Independence (F_{1a}) and the profile of Self-determination & Goal setting (F_{1b}) and also between the profiles of Ambition (F_{2a}) and Activation (F_{3b}) & Competitive thinking (F_{2b}). The factor Self-determination & Goal setting (F_{1b}) encompasses all the indicator that form the profile of Independence (F_{1a}). The factor Ambition (F_{2a}) encompassing all the indicators that form the profile of Activation (F_{3b}) save the fearlessness indicator, also encompassing the factor Competitive thinking (F_{2b}) with the combination of Activation (F_{3b}) and Competitive thinking (F_{2b}) less the fearlessness indicator being equivalent to Ambition (F_{21}) [147, 145]. The *Figure 41*, *Figure 42*, *Figure 43*, *Figure 44*, *Figure 45* and *Figure 46* illustrate the motivation indicator profile for each of the factors and how they relate to the indicators or low-order factors.

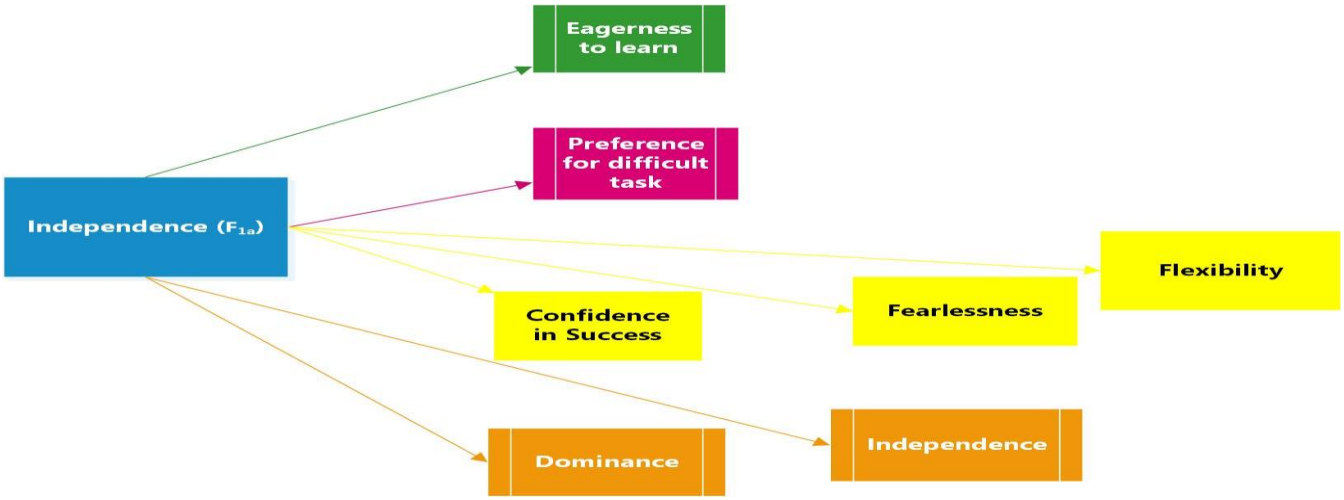


Figure 41 Motivation Indicator Profile for the Independence factor (F_{1a})

Adapted from [145]

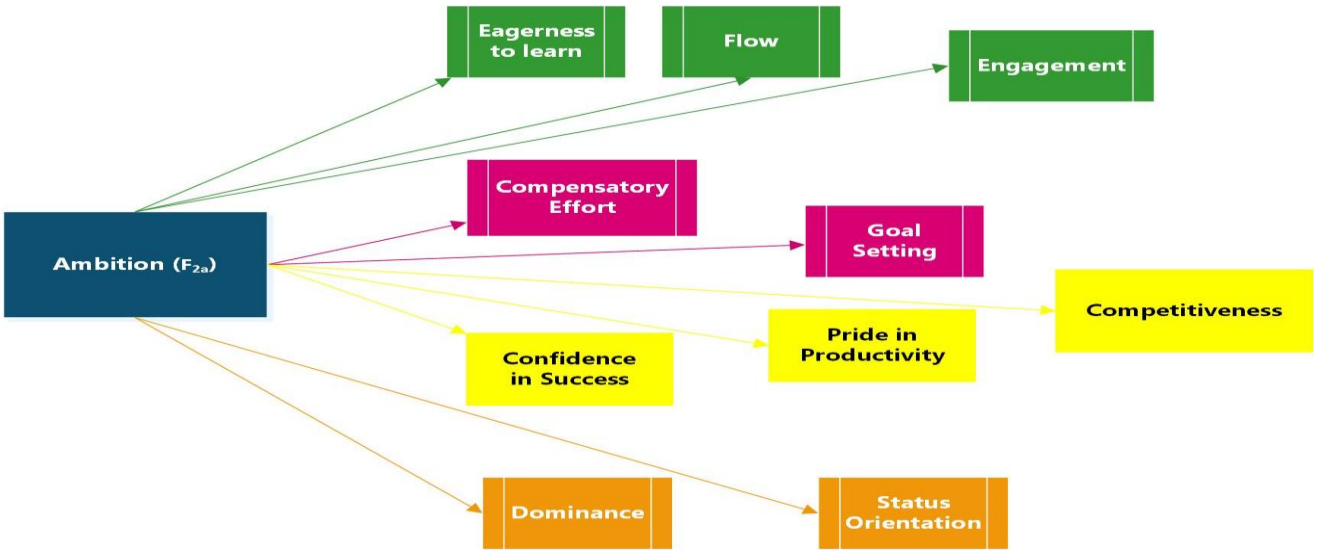


Figure 42 Motivation Indicator Profile for the Ambition factor (F_{2a})

Adapted from [145]

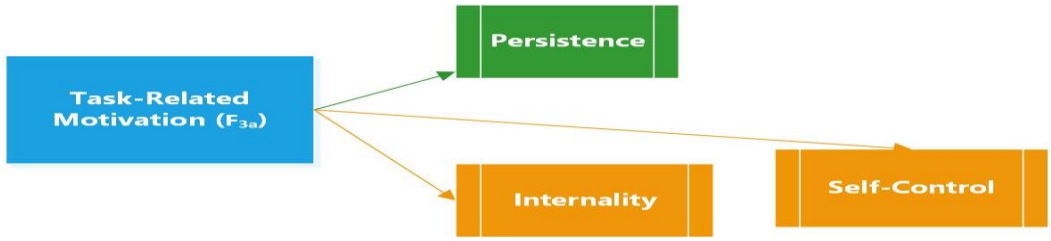


Figure 43 Motivation Indicator Profile for the Task-Related Motivation factor (F_{3a})

Adapted from [145]

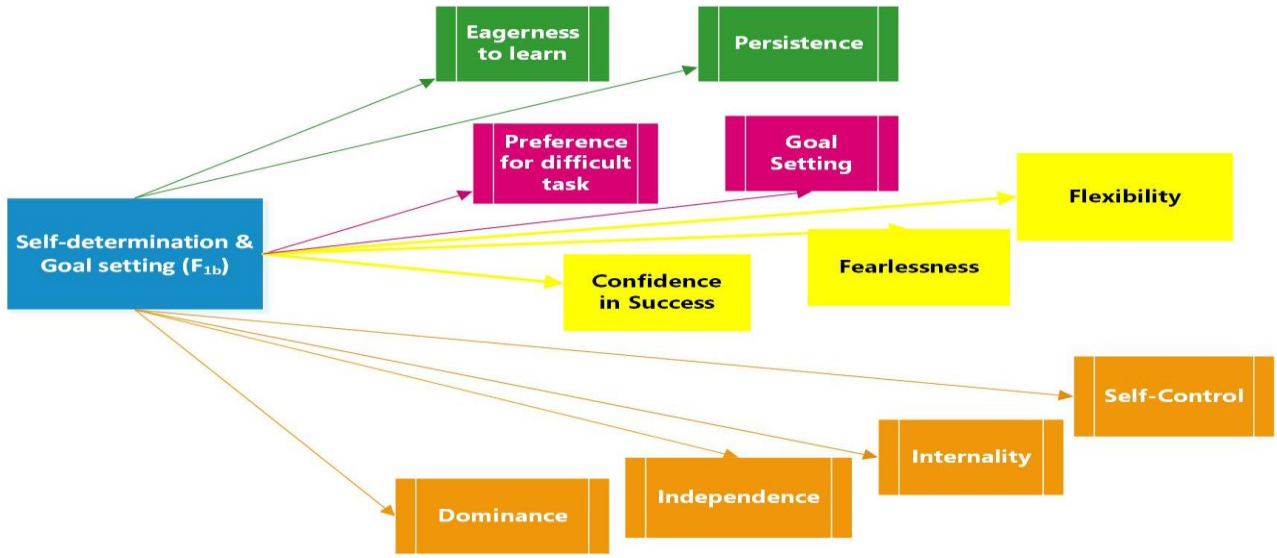


Figure 44 Motivation Indicator Profile for the Self-Determination & Goal setting factor (F_{1b})

Adapted from [147]

Figure 45 Motivation Indicator Profile for the Competitive Thinking factor (F_{2b})

Adapted from [147]

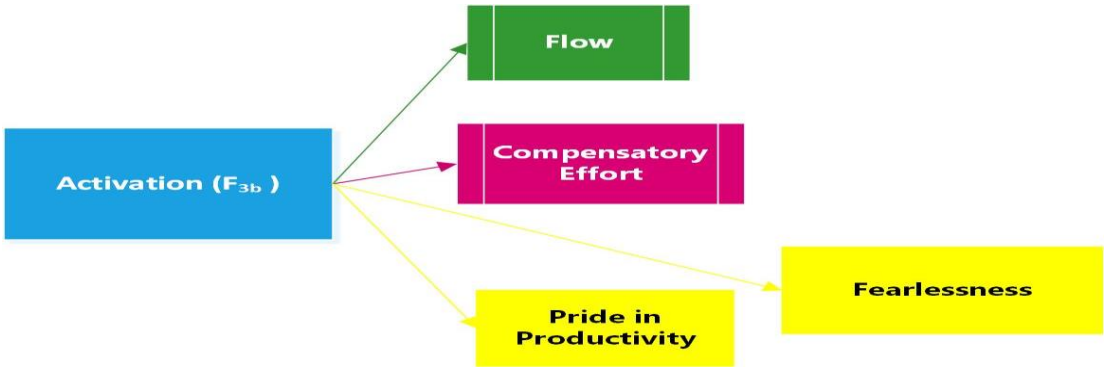


Figure 46 Motivation Indicator Profile for the Activation factor (F_{3b})

Adapted from [147]

These profiles can form the basis of AM profiles in the context of Continuous Professional Development. A comparison of LECPD and the AM profile should yield interesting results especially when the correlation is examined. The implication of this becomes even more interesting when considered in the context of other dimensions of motivation (SDM and TP).

Validity: The construct validity of the AM Inventory has been confirmed using principal component analysis and confirmatory factor analysis [147, 145]. The inventory has been confirmed to have cross-cultural equivalence by Byrne et al. [145]. According to Byrne et al.,;

> *"The combined results from the countries provide supportive evidence that the concept of AM, as measured by the AM Inventory (AMI), is highly similar across countries studied. Equivalent factor structure and the pattern obtained with AM Inventory across countries provide promising support that the AM Inventory, a comprehensive measure of AM, can be utilised across cultures."* [145]

The cross-cultural equivalency and applicability of the AM Inventory make it a suitable tool for measuring AM across the diverse sample population in the Universities of interest. This is especially valuable for the large volume of international students from varying backgrounds, particularly among postgraduates [145, 150]. The broad spectrum cross-sector application of the AM inventory was evidenced by Byrne et al.'s application of the AM inventory across various sectors of society ranging from university students to Industry Professionals.

Limitations: The downside of the AM inventory is that it is a form of subjective self-assessment as the subject is required to answer questions based on the subject interpretation of the right answer. The

subject might present results or answers they believe would please those administering the test or based on their perception of themselves.

4.4 Self-determined motivation (SM) theory

4.4.1 Overview

The exploration of the source dimension of motivation includes an examination of self-determined theories of motivation as defined by Deci & Ryan [112]. According to Lonsdale

> *"Deci and Ryan (1985) proposed that different types of motivation lie on a continuum according to their level of self-determination."*

[151]

The spectrum of self-determined motivation(SM) in the context of learning and engaging with learning activity range from intrinsic to extrinsic (as defined by [152]) depending on the perceived source and level of autonomy of motivation. Although Intrinsic and extrinsic motivation might appear antagonistic, research has established that they exist on a continuum linked to the concept of internalization [152, 66]. The process of internalization can be utilized to transform extrinsic motivation to intrinsic motivation. Internalization according to Schafer (1968) as cited in [152] is:

> *"a proactive process through which people transform regulation by external contingencies into regulation by Internal Process."*

[152]

4.4.2 Background of Self-determination theory

Motivation is often considered as a unitary phenomenon, with varying applications across multiple fields. The value of motivation changes depending on situation and context.

Motivation is a multifaceted and multidimensional concept whose value varies with the situation, condition, context and other factors. According to Ryan and Deci, motivation varies in both level and orientation [66]

SDM is an outlook of motivation in the tradition of empirical psychology that results from an inductive and deductive expansion on an investigation to determine factors and conditions that affect and how they affect motivation [112]. According to Ryan, there is a relationship between the dimension of SDM and the needs for autonomy competence and relatedness. Extrinsic motivation is often perceived as representative of external control or regulation, while intrinsic motivation is representative of internal control or self-regulation. The various forms of SM vary on a scale of level of autonomy, with extrinsic motivation at the least autonomous range of the continuum and intrinsic at the autonomous end of the spectrum [153].

Self-determined theory of motivation can be termed as a theory that views motivation along the source dimension of motivation. It attempts to categorize motivation based on its location along the source dimension depending on the nature of the source of motivation, by ranking various formations of motivation based on the reason or goals that give rise to the motivation. The source of motivation in this context refers to the reason or goals that result in an action [66] [112].

Intrinsic motivation is the motivation that results from fully internalized motives. Activities involved in intrinsic motivation are often enjoyable, or interesting to subjects. Interest and enjoyability play a fundamental role in deciding to engage in action. Extrinsic motivation is the motivation that results from external motives and activities involved and it often produces external outcomes. External outcomes, or environmental factors play a fundamental role in deciding to engage [66, 112, 153].

The nature of the source of motivation has been shown to affect the perception of past events and performance in ongoing events. It also affects the likelihood to engage in activities [112]. The nature of motivation in the context of the source is a key construct in educational and sports research. Considerations in research revolving around education and sports have over 170,000 hits on google scholar with key terms, (intrinsic, extrinsic motivation and education). The sizable extent to which extrinsic and intrinsic types of motivation (the source dimension), especially in developmental and educational context is an illustration of the applicability and importance of the construct. [154, 155, 156].

Intrinsic and Extrinsic motivation exist along a continuum with varying characteristics and level of autonomy along the continuum as illustrated in Figure below. The various forms of motivation are beneficial in different circumstances, depending on the nature and context of the task the motivation is directed towards.

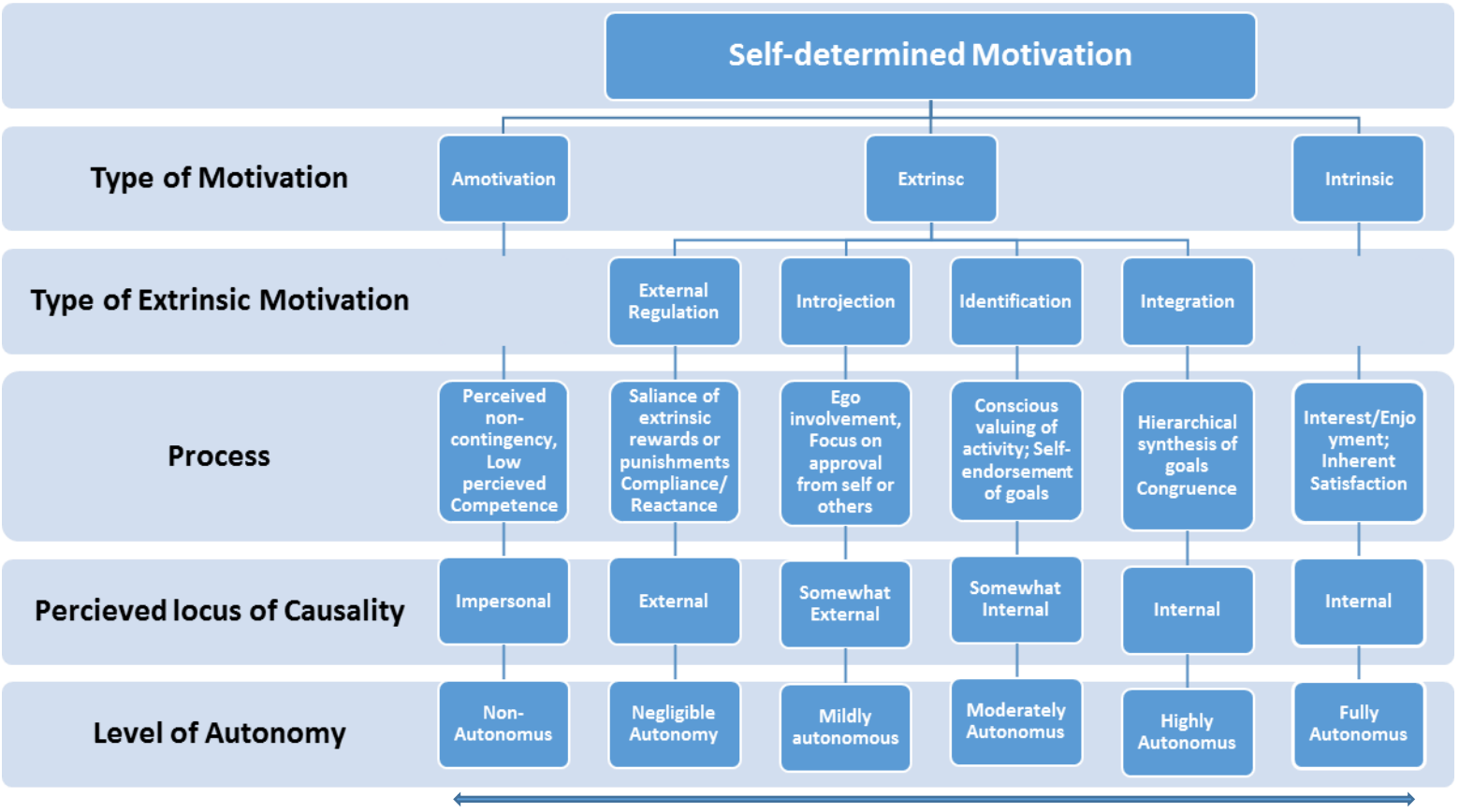


Figure 47 Types of SM

Adapted from [153, 66, 157]

SM theory seems to equate autonomy with acceptance of value or utility which is not necessarily true. An individual can engage in an autonomous action and nonetheless be conflicted about it, especially if there are multiple events with autonomous value. SM theory assumes that all humans are born as active creatures who engage in endogenous activities that do not require exogenous incentives. This assumption is at best circumstantial as engagement at birth may be due to the exogenous incentives that seem to have been so easily discounted. This is in contradiction with Vygotsky's take on internalization and child development [158, 112].

4.4.3 Extrinsic motivation

The nature of the source of motivation is often linked to performance, learning and creativity enhancing or impeding them depending on the form and context of the motivation. There are various forms of extrinsic motivation, and although the extrinsic motivation is often frowned upon, different forms are beneficial in different scenarios [112, 66, 159, 160].

Extrinsic motivation's likely impact on the subject of the motivation (in this case the learner) is dependent on the level of internalization reflected in the type of extrinsic motivation exhibited. Four types of extrinsic motivation exist as shown in Figure 47 and Figure 48 with varying orientations of perceived locus of causality and level of autonomy. More internalized extrinsic motivation is less likely to cause resentment and elicit a willingness to engage as illustrated in Figure 49. The nature of the task also has a bearing on the reaction to varied sources of motivation [75, 66, 157].

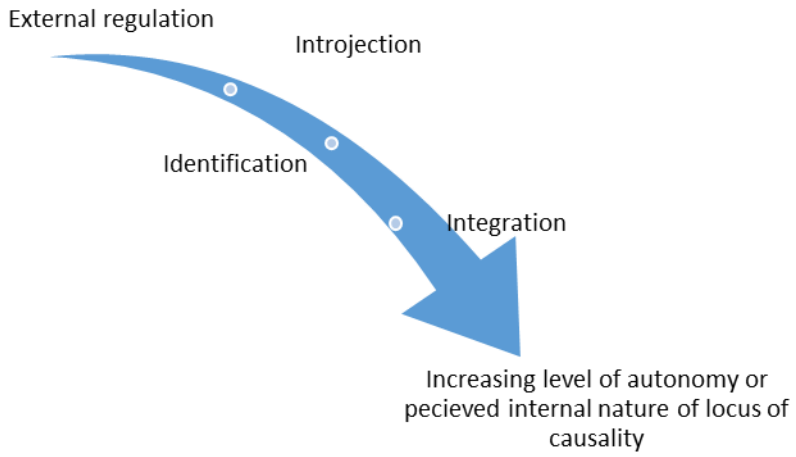


Figure 48 Types of Extrinsic motivation

Adapted from [153]

	Range of Extrinsic motivation		
Type of Extrinsic motivation	External regulation or Introjection	Identification	Integration
Level of Autonomy	Propelled	Self-endorsed	Own Volition
Potential attitude	Resistance, Resentment. Disinterest	Attitude of willingness	Inner acceptance of utility of task
Locus of Causality	External	Somewhat Internal	Internal

Figure 49 Attitudes exhibited in various Extrinsic motivation states

Adapted from [66, 157]

4.4.3.1 External regulation

An external regulation form of extrinsic motivation occurs in a situation where the source of motivation resulting in an exhibition of behaviour is as a result of external contingencies. In this context, the Locus of Causality is considered to revolve around the said external contingencies. Motivation in this context is regarded as purely extrinsic and at the far end of the Intrinsic-Extrinsic motivation continuum [153, 112].

In the context of CPD, this would be likened to situations in which the motivation to engage, results from the subject being compelled to engage in CPD related activities. For example, a student motivated to engage in CPD because the student is either threatened with consequences such as failure of degree. [2, 32].

4.4.3.2 Introjected regulation

Introjected regulation form of extrinsic motivation occurs in a situation where the source of motivation resulting in an exhibition of behaviour is exogenous to the extent that it is utilized to elicit endogenous motivation, through the use of 'coercion' or 'Seduction'. Hence, the motivation is not purely autonomous and cannot be termed as resulting from ‘true’ or ‘free’ choice. It is often described as being reflective of exogenous forms of motivation in the context of control [153, 112].

In metaphoric terms, this is similar to manually jump-starting (push starting) a car by rolling the car down a slope. The initial motion resulting from the effects of external gravitational forces is the extrinsic motivation and the motion arising from the force generated by the car engine after it starts once it gains enough momentum is the intrinsic motivation.

In the context of CPD, this would be likened to situations in which the motivation to engage, results from making the subjects aware of the possible benefits or consequences of said engagement, to the extent to which the subject's intrinsic motivation is elicited. For example, a student engaging in CPD activity because he is reminded or informed that it would help the student secure employment in the student’s industry of choice [2, 32].

4.4.3.3 Identified regulation

Identified regulation form of extrinsic motivation, occurs in a situation where the source of motivation is external although the motivation is self-endorsed, thereby mimicking internally sourced motivation; for example, engaging in activity because of self-identified instrumentality. This form of motivation is often differentiable from intrinsic motivation with the fact that the activity is engaged in; not because it is interesting, but for instrumental related reasons. Apart

from integrated motivation, this is the most autonomous form of extrinsic motivation. The locus of causality is seen as somewhat internal [153].

This can be likened to a subject learning to drive because it gets the subject to work on time which results in an improved performance at work or succeeding at achieving a promotion.

In the context of CPD, this would be analogous to situations in which the motivation to engage is as a result of self-identified justification for engagement, with the goal of improving performance and succeeding at professional related endeavors. For example, a student being motivated to engage in CPD activity because the student believes and self-identifies that the knowledge and skills developed as a result of engagement would help the student secure employment in the industry of choice [32, 2].

4.4.3.4 Integrated regulation

An integrated regulation form of extrinsic motivation is the most internalized form of motivation with an internal perceived locus of causality and a sense of autonomy similar in nature to intrinsic motivation. This type of motivation occurs when the external source of motivation is fully integrated. This kind of motivation is distinct from intrinsic motivation by virtue of the fact that the activity that is the focus of the motivation it is engaged in because it is personally important for a valued outcome rather than because it is interesting [153, 112].

This could be likened to subjects learning to drive because it gets the subject to work on time and punctuality is valued by subject. In the context of CPD, this would be a situation in which the student engages in CPD because the student values the knowledge and skills they would gain from engaging in the CPD related activity [2, 32].

Motivation ranging on the level of autonomy (as displayed in Figure 49) , and feeling of SM and endorsement are useful in contexts where intrinsic motivation cannot be relied upon. Especially in cases when subjects are engaged in activities that are not seen as interesting or naturally engaging and also in cases where external motivation is utilized to inhibit engagement with detrimental activities. Although, the advantages of intrinsic motivation are often touted, all forms of motivation are useful in different situational contexts [75, 66, 153, 155, 161, 159].

In the context of CPD, where the motivation for engaging in CPD activity including career related and external reasons, extrinsic motivation is not considered detrimental to the circumstance and condition. However, the exact usefulness of extrinsic motivation depends on the particular nature of the CPD.

Since most of the activities involved in CPD and learning are not considered intrinsically interesting, a key consideration of how to motivate students to value and self-regulate external pressure is through internalization [158, 66]. The sense of personal commitment improves with a perceived level of autonomy. Figure 51 reflects the varying sense of personal commitments and its association with perceived level of autonomy. The categories of SM can be linked to Maslow's hierarchy of needs as illustrated in Figure 50

	Type of SM	Needs
Level of Autonomy ↕	Introjection	Self-esteem
		Ego
	Identification	Life goals
		Identification
	Integrated	Assimilation
		Internalized
		Volition

Figure 50 Self -determined motivation and needs

[66]

Type of SM	Amotive	External	Internal
Level of Autonomy	No autonomy	Low to high Autonomy	Fully Autonomous
Variation in level of autonomy	Based on level of Autonomy ↔		
Level of commitment	Unwillingness	Passive Compliance	Personal Commitment
Variation along the Personal Commitment Continuum	Based on sense of personal Commitment ↔		

Figure 51 Level of Autonomy and Level of Personal Commitment

[66, 153]

4.4.3.5 Intrinsic motivation

According to Ryan and Deci, intrinsic motivation is defined as,

> *"the doing of activity for its inherent satisfactions rather than for some separable consequence".*
>
> [66]

Intrinsic motivation revolves around internal reasons for engagement with activity. This is indicative of situations in which individuals engage in an activity for the sake of engaging in the activity and for internally instrumental purposes. This also demonstrates situations in which individuals engage in an activity for reasons based on internal considerations, and not related to or dependent on external stimuli, consequences or perceived instrumentalities like a positive experience, exploration, interest, curiosity, fun. [112]

Intrinsic motivation can be defined in terms of nature of task, or satisfaction derived for engagement in an activity [66, 12]. Activity theories illustrate that, apart from being intrinsically motivated as an individual, the nature of activity can mediate in aiding the manifestation of intrinsic motivation [158].

Intrinsic motivation can, again be considered based on Skinner's interpretation of behaviour as the motivation to engage in an activity which reward is the activity itself, or from a Hullian point of view. Intrinsic motivation can be considered as a Hullian or Skinner concept i.e. activity whose reward is the activity itself or activity which fulfils psychological needs. The intrinsic motivation proposed by Ryan & Deci is in line with the Hullian's approach which addresses pre-existing psychological needs such as competence needs, autonomy needs or relatedness [66, 112].

Operationally, intrinsic motivation is often defined in terms of 'free-choice', 'task- specific' or 'domain-focused' measures as shown in Figure 52. 'Free Choice' measures experiments by creating an experimental scenario where a subject can make a free choice to continue to engage in tasks by leaving the scene of the task after completing the compulsory component of the task. To make this interesting and ensure the engagement with the task is free choice, distracting activities are also included in the scene. The task-specific measures are utilized to engage the subject in a self-report of interest and enjoyment of tasks or activities. General 'domain-focused' measures are also used. The domain, in this case refers to a broad generic context such as school, sports, work [153, 66].

According to Ryan and Deci,

"Self-determination theory is specifically framed in terms of social and environmental factors that facilitate versus undermine intrinsic motivation."

[66]

Although intrinsic motivation is endogenous, circumstances can exist that 'catalyse' the intrinsic tendency of a subject. There is evidence that there is a conditionality to the exhibition of intrinsic motivation tendency with social and environmental factors or task-related factors enhancing or impeding intrinsic motivation. Intrinsic motivation can be operationally defined in terms of task, or the person. The figure below shows the operations definition of motivation taking into cognisance context.

	Context	Measure types
1	Behavioural Measures	Free-choice measures
2	Experimental measures	Task-specific measures
3	Field-studies	Domain focused measures

Figure 52 Operational measure of intrinsic motivation

[66]

Conditions internal to self enable satisfaction of the basic needs of intrinsic motivation; the need for competence (also known as self-efficacy) and need for autonomy, (also referred to as internal perceived locus of causality (IPLOC)) enhance the intrinsic motivation of subjects. This effect forms the basis for the sub-theory to SM theory which is referred to as cognitive evaluation theory. This theory seeks to identify the social context that satisfies the said base needs and enhance intrinsic motion.

4.4.3.6 Cognitive Evaluation Theory

According to Ryan and Deci,

"CET evaluates the relationship between a subject's self-determination and competence, and behaviours exhibited by subjects with a specific look at factor and condition the initiate and regulate behaviour."

[66]

Cognitive Evaluation Theory suggests that self-determination and competence effects are the critical consideration in the design and selection of activities for the initiation and regulation of motivation. Cognitive Evaluation Theory is described as,

"the effects of events that initiate or regulate behaviour on motivation and motivationally relevant process."

[112]

Cognitive Evaluation Theory includes three main propositions:

1. The first proposition revolves around the need for autonomy or self-determination and is expressed in the form of Perceived Locus of Causality. It posits that the relationship between Perceived Locus of Causality and events or task, positive or negative, influences intrinsic motivation.

   Events or conditions that enhance a positive or internal locus of causality, improves intrinsic motivation while those that enhance a negative or external locus of causality impede intrinsic motivation. The more self-determinist the perceived locus of causality, the more it improves internal motivation. Perceived locus of causality is attributed to self-control, while intrinsic motivation is attributed to support for autonomy [112, 66, 162].

   There is a relationship (positive connotation) between perceived locus of causality (LOC) and creativity, cognitive flexibility, stable emotional tone, and self-esteem. Intrinsic motivation (IM) is a function of Locus of Causality (LOC) [112].

$$IM = f(LOC)$$

Adapted from [112, 66]

2. The second Proposition revolves around the relationship between competence, nature of challenge and source of motivation. It posits that conditions and situations that satisfy the need for competence or improves the feeling of competency in relation to optimal challenging activities enhance intrinsic motivation. In the framework of self-determination, improvement in Perceived Competency (PC) results in improving intrinsic motivation in a challenging situation. Intrinsic Motivation is a function of perceived competency. Given that the situation is optimal.

$$IM = f(PC)$$

Adapted from [112, 66]

The feeling of competency is improved by succeeding at an activity within the ZPD (Optimal Competency Activity) so long as there is a perception of autonomy or self-determination. A quest for mastery is enhanced in this situation. Although this stands true in this situation, the

theory does not take into cognisance the effect of failure or those in whom success actually reduces motivation [75, 112].

3. The third proposition revolves around the effect the different salient aspects of events relevant to initiation, and regulation of event have on a subject and the interplay with intrinsic motivation. The three elements are informational, controlling and amotivating aspects which act to alter the perceived causality and competence.

   According to Deci & Ryan, the individual salience of the informational, controlling and amotive potential aspects of condition and situation that result in initiation and regulation of behavior affect the level of intrinsic motivation. They influence the level of intrinsic motivation by enhancing internal perceived locus of causality and competence,promoting external perceived locus of causality, and impeding perceived competence respectively. This in turn, promotes intrinsic motivation, extrinsic motivation, and amotivation respectively.

   The resultant effect of these aspects determines the overall effect of the event. Informational aspects are the availability of choice, and positive feedback. Controlling aspects are conditions such as deadlines, surveillance and amotive aspects tend to be negative feedback. This implies that the motivating effect of events and actions that affect behavior in the context of self-determination is a resultant of individual intrinsic, extrinsic and amotivating effects of the condition or activity [112, 153].

$$RM = f(IE, EE, AE)$$

   Where RM= Resultant motivating effect.

   IE= Intrinsic Effect

   EE= Extrinsic Effect

   AE= Amotivating Effect

   [112, 66]

   Facilitators of intrinsic motivation are optimal challenge, effective and promoting feedback, freedom from demeaning evaluation, and external events such as reward and Feedback (Positive enhances and negative feedback promote amotivation) [112, 162, 66]. Figure 53 illustrates some of the factors that improve or reduce intrinsic motivation.

Enhancing	Diminishing
Internal Perceived Locus of Causality	External Perceived Locus of Causality
Optimal challenging activity	Non-optimal challenging activity

Positive perceived competence	Negative perceived competence
Perception of responsibility for success	Perception of responsibility for failure
Positive feedback	Negative feedback promotes amotivation
Choice	Lack of choice
Lack of deadline	Deadlines
Lack of surveillance	Surveillance

Figure 53 Factors Enhancing and Diminishing Intrinsic Motivation

Adapted from [66, 153, 162]

The limitation to the CET occurs for activities that the subjects do not find intrinsically interesting as such concepts of intrinsic motivation that do not apply in those condition interest are often exhibited as an appeal of novelty, challenge or aesthetic value. Some of the indicators of the intrinsic value of activity are novelty, challenge, and aesthetic value. The extrinsic nature or value of activity is often indicated by the activity having a separable outcome, sanction for failure and instrumentality of the goal [112, 66].

4.4.4 Measuring Self-Determined Motivation (Academic Motivation Scale)

Vallerand, et al., refers to motivation as, “one of the most important psychological concepts in education”. Motivation in the context of learning is associated with various indicators of positive engagement such as curiosity, persistence, learning and performance [163].

The academic motivation scale (AMS) is a tool for measuring the motivation of learners in the context of official pedagogic institutions. As a tool for measuring motivation, the cross-cultural validation of AMS has been established. The AMS was originally known as the ‘Echelle de Motivation en Education'. It was developed in France and modified for use in English speaking Countries. There are numerous versions of the AMS optimised for use in various languages and cultures such as adaptation for Latin America, French-speaking, English-speaking and Asian populations with validity confirmed [164, 163, 165].

The academic motivation scale as illustrated in Figure 54 measures the first-order factor of SDM. This is reflected in the design of the scale which comprises of 28 items across seven subscales. The subscales are in line with the form or types of motivation as identified by self-determination theory of motivation [66].

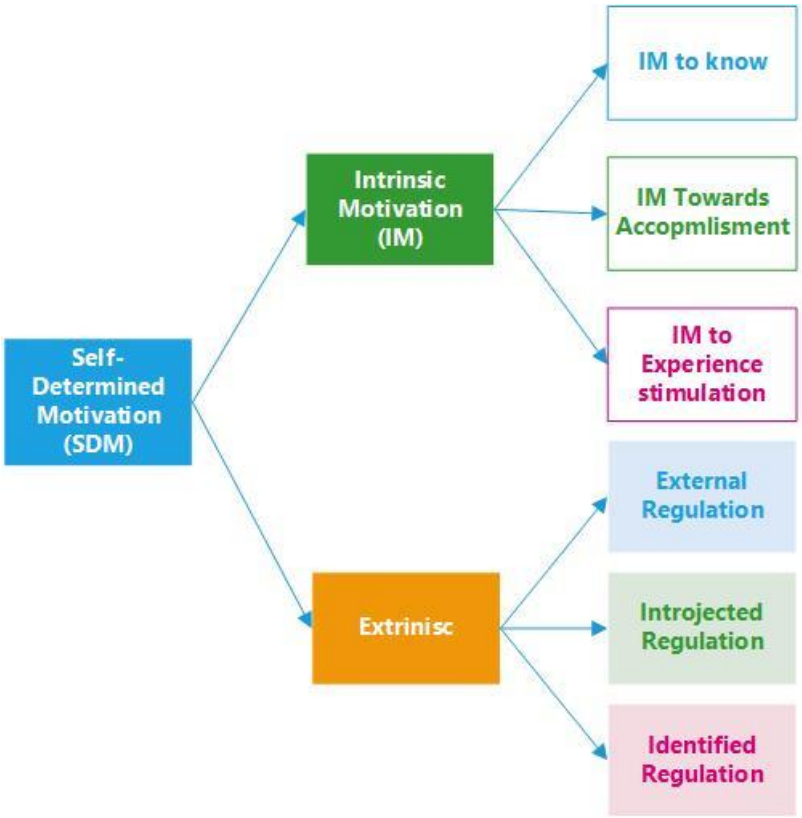


Figure 54 Factors of SDM

The need for autonomy, competence and relatedness are strongly associated with SDM (as illustrated in Figure 55) and as such are reflected in many of the indicators of SDM.

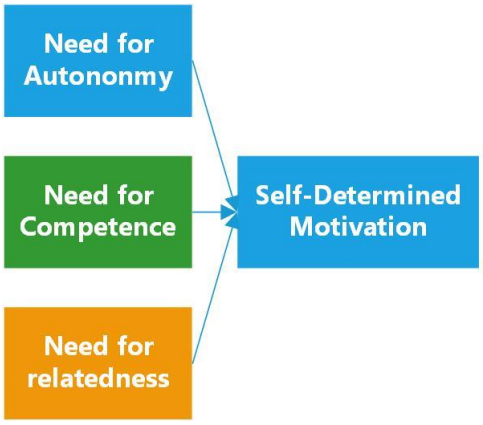


Figure 55 Needs associated with SDM.

[66]

According to Vallerand, et al., the scales assessing three types of intrinsic motivation include intrinsic motivation to know, accomplish things, and experience simulation. The three types of extrinsic

motivation include external, introjected and identified regulation and amotivation [163]. The validity, internal consistency, psychometric validation, stability and inter-rater reliability of the academic motivation scale has been tested and confirmed by the likes of Vallerand, et al., Stover, et al. [163, 164, 165, 166].The academic motivation scale measures what is described as a "students' rather stable motivational orientation towards education" [163]. The Academic Motivation Scale has a 7-factor structure. The academic motivation scale has concurrent and construct validity and is in line with a prediction based on the cognitive evaluation theory [112, 163].

The operation definition of constructs and conceptualizations within the Academic Motivation Scale (AMS) is equivalent to the conceptual definition of the constructs by Ryan & Deci [112, 163]. The intrinsic/extrinsic motivation measured by the Academic Motivation Scale is operationally defined in terms of the source of motivated behaviour. According to Vallerand, et al.,

> *"Conceptual definition of intrinsic/extrinsic motivation which refers to one's perceived reason for engaging in a given activity (the 'why' of behaviour), be they for the activity itself or reasons lying outside the activity."*
>
> [163]

The academic motivation scale adopts a multidimensional approach to the measurement of motivation. Similar to other motivation measurement instruments such as achievement motivation inventory that measures motivation as a multidimensional construct [147, 163].

Intrinsic motivation often refers to motivation to exhibit behaviour for the pleasure of said exhibition of behaviour. Intrinsic motivation as a construct is often approached either as a global or differentiated & specific construct [163, 66, 112]. The academic motivation scale approaches intrinsic motivation as a differentiated construct with three differentiated types, intrinsic motivation to know, intrinsic motivation to accomplish and intrinsic motivation to experience stimulation.

[164, 163, 166, 165]

1. Intrinsic motivation to know: In general terms, this is associated with knowledge acquisition and validation. In the specific context of education, it is strongly associated with exploration, curiosity, learning goals, intrinsic intellectuality and learning [163].
   Intrinsic Motivation to know can be defined as engaging in an activity or exhibiting behaviour primarily for the satisfaction derived from learning, acquiring knowledge and gaining

understanding. It is intrinsic motivation in the context of learning and understanding related exhibition of behaviour or engagement with activity [163, 164].

2. Intrinsic motivation towards accomplishment is a construct that cuts across many fields such as development physiology or educational research. This can be related to the need for competency as defined by Ryan and Deci [66]. It is defined as engaging in an activity or exhibiting behaviour primarily for the satisfaction derived from accomplishing or creating something [163].
3. Intrinsic motivation to experience stimulation: stimulation in this context can be in the form of sensory pleasure, aesthetic experience, fun or excitement, flow, a peak experience. It can be defined as engaging in an activity primarily for the satisfaction derived from stimulating sensation resulting from engaging in said activity or exhibition of said behaviour [163].

The academic motivation scale measures extrinsic motivation as defined by Ryan & Deci [163, 112, 66, 165, 166, 164]. The scale measures three forms of extrinsic motivation which vary according to the level of autonomy and internalisation. They are external regulation, introjection, and identification type of extrinsic motivation.

1. External regulation refers to extrinsic motivation regulated by rewards and constraints.
2. Introjected regulation is reflective of level of internalisation of proponent or past external regulation or occurrences.
3. Identification form of extrinsic motivation occurs when a subject through internalisation, identifies with and sees personal value in engaging with an activity which is externally motivated. Identification is reflective of how much a subject identifies with external regulation and has internalised motive due to it. It occurs when a subject has transmuted the perceived source of motivation from a purely external one to a somewhat internal one in such a manner that the decision to engage in activity or exhibit behaviour is perceived to be self-selected by the subject. When a subject identifies with the need to engage in activity or exhibit behaviour even though the source of motivation is extrinsic.

[163, 66]

Figure 56 illustrates examples of situations in which certain types of motivation are said to be exhibited.

	Type	Example

Intrinsic motivation	-To know	I engage with developmental activity such as reading a book for the sheer pleasure that they experience while learning something new
	-Towards accomplishment	I go “above the call of duty” when engaged in a CPD related activity. I exceed requirements for success in developmental activity to experience pleasure from a more substantial accomplishment.
	Experience stimulation	In the context of CPD, this might be likened to those who engaged in CPD activities such as training and class for the stimulating sensation they derive from attending class or conferences
Extrinsic Motivation	External Regulation	I engaged in CPD activity because I am forced to by my supervisor or professional organisation or departmental regulation
	Introjected Regulation	I engaged in CPD because that what goo students or employees do.
	Identified Regulation	I engaged in CPD because it is important to me.

Figure 56 Examples showing exhibition of SD Behaviour

[66, 163]

4.6 Internalization

Internalization can be viewed from many perspectives. It can be considered from a motivational perspective as per Deci & Ryan, or from a perspective of learning as per Vygotsky and Smidt [153, 43, 26].

Internalization is the process often reflected in the move from inter-psychological understanding to intra-psychological understanding. Intra-psychological function is described as what happens inside learners. It can be roughly termed as a process of making knowledge or understanding 'yours' [26].

Internalization can be further described as the process of becoming conscious and self-aware of knowledge or understanding gained. It is a form of synchronization of information or knowledge gained with self, taking ownership of knowledge to such an extent that it appears like knowledge emanates from self. Irrespective of interpretations of internalization from either learning or motivational perspectives, internalization is difficult to examine without taking into consideration social contexts and interactions with self, and other entities. According to Sandra Smith, internalization must be seen in the context of social interaction and systems of meaning or signs and symbols also called semiotic systems which mediate function [26].

Internalization is a process by which individuals convert external stimulus or environmental factors to the internal drive. Internalization of knowledge or motivation is the process through which a learner takes ownership of knowledge through assimilation. Hence, externally and environmentally sourced knowledge or motivation is effectively assimilated to enable generation of self-sourced knowledge or motivation [66, 26, 58].

Internalization is a critical aspect of understanding human thoughts and how humans think and reason. [43, 26]. According to Smidt,

> *internalisation is the process by which a learner gains control over external processes."*
>
> [26]

Through internalisation, external sources of stimuli and motivation are embedded and transformed into internal sources of forms of motivation. In the context of motivation to engage in activities, internalisation is the process by which a subject gains control of motivation such that externally sourced motivation is converted to internally sourced motivation. Motivation to engage in activity can be generated in the absence of an external source of motivation [158, 153, 66].

Internalization can also be defined as migrating motivation from a state in which engagement in an activity is dependent on external factors to one in which engagement in activity results from or persists in the absence of external sources of motivation. It is a process of converting external perpetuated motivation to internally perpetuated motivation [66, 26, 75].

According to Schafer Internalization is,

> *"a proactive process through which people transform regulation by external contingencies into regulation by internal processes."*
>
> [153]

Smidt's definition of internalization was in the context of thinking and speech, as such focused on conversion of external process or stimulus in the formation of understanding of language and culture, reflected in the ability to use signs and symbols as a cultural tool. Vygotsky also framed his discussion of internalization in the context of 'culturally produced sign system'. Vygotsky held the point of view that internalisation was a critical component in the behavioural modification and development of individuals. Vygotsky's notion of internalization was as a mechanism that aided transformation of exogenous motives, stimuli or knowledge into endogenous motive, stimuli or knowledge in order to achieve development. According to Vygotsky, this was the key separator of 'early and later forms of individual development' [43, 26].

Internalization can also be seen as the capacity of an individual to apply given knowledge to carry out the task.

The higher mental function of generalization: This process requires the subject to understand the features of a given concept fully (the defining characteristic) and then utilize the concept in view of other contexts. An example is the use of 'word length' to invent and create stories. Another instance is the migration from reading because a learner is told to read, to reading because of self-motivation to read [43, 26]. The nature or effect of internalization is reflected in the ability of an individual to transcend from performing activities because they are told to carry out the actions and conduct the same activities because they desire to carry out the activity [26, 167, 43].

Employing Piaget's concept of development, internalization is the transition from outer speech to inner speech. The process of internalization is a multifaceted concept which revolves around the ability to convert external substance to internal substance. The concept is reflected in various activities and is applicable when considering various constructs from language to learning, to motivation.

Internalization is aided by processes and activities such as vocalization and reflection (this is also a key factor in the evaluation of CPD) [26, 43, 66, 75, 112, 32].

Internalization is a useful concept in the context of CPD from the point of view of motivation and learning constructs. In terms of motivation, internalization can be utilized to migrate motivation to engage in CPD from one orientation to (e.g. external to internally sourced motivation) an orientation more suitable for engagement with a particular type of continuous professional activities. In terms of learning, internalization can be used by the student to achieve better results (learning) from CPD activity that the student is engaged in. As such, internalization is a fundamental concept in the study of student engagement with CPD [26, 66, 32, 2].

Internalization in the context of learning activities such as CPD, can be achieved by pointing out features of importance and establishing chronological order of activities and events that enable understanding. It can also be achieved by establishing frameworks for exchange between learners and facilitators of learning i.e. negotiation and establishing a holistic understanding of learner internalization requirement of successful learning [158, 66]

4.6.1 Internalization: In the context of Self-Determined Motivation (SM)

Internalization and self-regulation aid in improving the positive behaviour outcome of motivation by influencing the value and regulation of behaviour. Internalization sometimes referred to as internalization and integration, is defined as,

> *"the process of taking in a value or regulation, and integration is the process by which individuals more fully transform the regulation into their own so that it will emanate from their sense of self."*

[66]

This transformative characteristic can be useful in the context of CPD as it indicates that a subject can employ internalization to transform his motivation tendencies to one more conducive to the kind of continuous professional activity the subject wants to engage in. Different motivation orientations may be adopted in different scenarios and conditions of interaction and tasks [66, 112, 2].

Developing a more Intrinsic motivation through internalization is a natural component of the development of humans, and in the process of developing high cognitive function and problem-solving ability, curiosity, inquisitiveness and playfulness indicative of intrinsic motivation, play a pivotal role [153, 158].

Internalization and integration are conglomerate. Integration is a process reflective of the general extent to which a subject has evolved their orientation of the source of motivation. Integration is the process through which changes occur to the subject's perception of origin of motivation. The level of integration is reflective of the level of change that has occurred to the perception of origin of motivation. Full integration would be indicative of the subjects who have managed to change fully, the perspective of external sources of motivation to the furthest form of internal source of motivation therefore transforming the locus of causality to an internal locus of control.

Internalization can be used to achieve a spectrum of motivation based on the level of integration. The components of this spectrum include, introjection and integrated (self-regulation) If the context is controlled. It supports competency and relatedness if the context is supportive of autonomy and competence respectively. Figure 57 illustrates developmental process of internalization and regulation, potraying the different phases of internalization and the process involved at each phase of the internalization continuum. It displays the varying transtitions from amotive to fully intergrated extrinsic motivation [112, 153, 66].

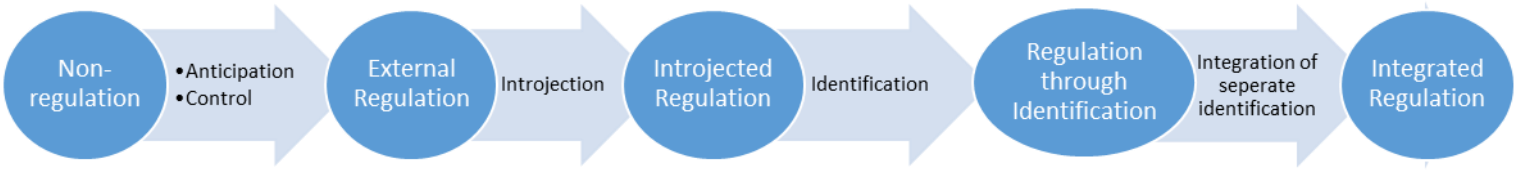


Figure 57 Internalization Continuum

[112]

Concept facilitating internalisation in the context of learning and Continuous Professional Develemonet (CPD) offers optimal challenges (in line with ensuring students in ZPD), effective and relevant feedback, relatedness, meaningful rationale, and a supportive environment for competence relatedness and autonomy. Relatedness of mediators can aid internalization. The concept of relatedness is also confirmed by activity theory which states that students are more likely to engage if mediation is done by an individual with whom they share a common background [26, 167, 43, 66].

The limitations of internalization are that increases in internalization do not categorically result in extrinsic motivation being transformed into intrinsic motivation as the initial source of the motivation

persists. This limitation at the same time does not imply that an individual that engages in persistent internalization cannot change their motivation tendencies or orientation [66, 112].

4.7 Time Perspective

The influence of time on motivation is a well-considered concept. The consideration of the relationship between these two well-explored constructs revolves around the subject's perception of the utility of action. An understanding of the temporary perspective of a subject (presents perspective in the context of future result of occurrence) involves evaluating how motivation influences conception of the future [12]. According to Schmidt and Weiner,

> *"Time perspective can be defined as a cognitive operation involving both an emotional reaction and a preference for locating action in a specific time frame."*

[168]

Time Perspective is a construct that attempts to evaluate and conceptualize the relationship between time (the past, present or future in this context) and motivation. Conceptualisation and consideration of the subjectivity of time can be linked as far back as to the likes of Albert Einstein [169]. According to Bonwell,

> *"Time perspective is a preferential direction of an individual's thoughts toward the past, present, or future, which exerts a dynamic influence on their experience, motivation, thinking, and several aspects of behaviour."*

[170]

The activities of sentient beings are first and foremost in the context of "the now". It involves understanding the past as the now that was and the future as the now that is to come all in the context of activities engagement and establishing meaning by consideration of factors that lead to engagement with activity.

According to Suddendorf et al.,

> " *Mental time travel comprises the mental reconstruction of personal events from the past (episodic memory) and the mental construction of possible future events."*

[171]

Human motivation to engage with activities to achieve the desired goal can be evaluated from the process involved in attaining the goal or from the goal attained. Kauffman describes this as regarding the journey or the destination [12].

Motivation theories such as SDM theories tend to focus on the process rather than the goal. This focus does not discount the influence that the nature of perception of the goal has on motivation. Understanding the effect of the goal gives access to other means of altering, adjusting or interpreting motivation of humans as illustrated by the AM theory. Furthermore, the concept of utility or instrumentality of a goal as illustrated by expectancy-value theory is particularly important. [93, 59, 152, 83, 172].

Apart from the immediate effect of achieving immediate goals, the time perspective and nature of the goal have to be considered when considering utility especially in education as well as in CPD. The goals that are key drivers are often long term as a notion of the end goal is often a component of educational planning and professional planning [66].

In the investigation of improvement of education and CPD, it may be significant to understand the nature of time effect on goal perspective as a component of education and professional development is the identification of long-term goals [32]. According to Kauffman,

> *"The promise of long-term rewards, therefore, is a critical aspect of motivation, educational and non-educational.*"
>
> [12]

The effect of time perspective has been a key consideration for many researchers and is considered to be of great importance when attempting to investigate or understand the motivation of the learner. Future time perspective is a theory by Nuttin and lens is one of prominent theories [173] [168] [12].A few of these constructs are contained in Figure 58

CONSTRUCT	**ARTICLE**	**Author**
Time perspective	Perspectives on Time.	[170]
Temporal extended self	Placing Motivation and Future Time Perspective	[174]

	Theory in a Temporal Perspective	
Future possible selves	International Studies in Time Perspective	[175]
Delay gratification	Academic Delay of Gratification, Future Goals, and Self-Regulated Learning	[176]
Consideration of future consequences	The Consideration of Future Consequences: Weighing Immediate and Distant Outcomes of Behaviour	[177]
Time horizon and discounting	Predicting Natural Resolution of Alcohol-Related Problems: A Prospective Behavioral Economic Analysis	[178]
Time orientation.	Time Perspective Theory; Review, Research and Application -- Essays in Honour of Philip G. Zimbardo	[179]
Balanced Time Perspective	A New Measure of Time Perspective: Initial Psychometric Findings for the Balanced Time Perspective Scale (BTPS)	[180]

Figure 58 Constructs related to conceptualization of time and human behaviour

[181] [177, 178]

The importance of the potential impact of evaluation, consideration and utilization of the temporal dimension of motivation when examining learner/student's motivation in the context of learning and development activities is supported by Dornyei [182]. Dornyei states that,

> *"time dimension is relevant to the study of motivation in at least two crucial areas: to account for (a) how motivation is generated and (b) how it fluctuates and further develops overtime"*

[182]

Apart from highlighting the importance of motivation in this context, some of the notions in this study can be found in the research carried out by Dornyei. The conceptualisation of combining temporal dimension with the source dimension (Self-determined) is supported by Dornyei who highlighted the compatibility of combining self-regulation and the temporal dimension of motivation especially in the context of locus of control, intrinsic motivation and autonomy [182, 66].

Future time perspective, delay of gratification, along with various other constructs that conceptualize the effect of time on the temporal orientation of motivation have a real and significant effect on self-conception and a learner's motivation to engage in a learning activity. The role of future time perspective is often considered when evaluating self-regulation, instrumentality, the stability of goal, AM, self-concept, ethnic and gender differences in students. From the perspective of the influences and consequence of future time perspective on motivation and cognition. Future-oriented motivation and self-regulation of tasks associated with future goals, either directly or indirectly through network intermediate goals linked to the future goal increases the perception of utility and by effect instrumentality of goal [183, 176, 66, 177, 184, 174, 12].

This intermediate goal is referred to as "proximal goals" by Miller and Brickman. Miller and Brickman postulated that,

> *"personal valued future goals influence proximal self-regulation through their impact on the development of proximal sub-goal leading to future goal attainment".*

[185]

This revolves around the concept that a proximal task motivation and self-regulation can be positively influenced by tasks whose goal is to be realized in the future if the goals of the proximal task are a

sub-goal of the goal to be realized in the future. This is as a result of the potential increase in perceived instrumentality of the proximal tasks. This increased instrumentality is due to a combination of the instrumentality of the goal of the proximal task and the future goal. The increased instrumentality, in turn, has a positive influence on the incentive, meaning, engagement with activity or tasks, persistence and achievement. [185, 59, 83]

The effect of future time perspective on perceived instrumentality can influence behaviour resulting from SM and other sources of motivation. This change in instrumentality, caused by the time perspective along with other factors affect the learner's motivation and engagement and when considered in the context of self-determined motivation and AM, yields a greater understanding of the learner's motive [176, 59].

Factors that aid in improving the positive effect of time perspective, particularly in the context of motivation, persistence, self-regulation and achievement include 1) the nature of the future goal, 2) clarity and understanding of instrumentality of proximal goal, 3) the degree of specificity of content, and 4) understanding of given future goal and its instrumentality [59, 174]

The importance and criticality of time perspective are emphasized by Kauffman and Husman's statement that,

> *"an understanding of the development, quality and function of students' aspirations for their futures should be central to models of motivation."* [12]

This importance is no different for CPD. This is because, models of motivation for a forward facing time oriented learning and development activity should involve consideration of time. There have been serval attempts to develop measures and methods for evaluating varying dimensions and effect of time orientations, some of them are mentioned in the proceeding section.

4.7.1.1 Future Time Perspective

The future time perspective is a prominent component of time perspective as it is one perspective that is forward looking [173, 175]. This forward-looking perspective has resulted in some calling for motivational research to focus primarily on the future time effects on motivation [186, 187] . This has plausible uses in behavioural prediction, especially in the context of success and failure-oriented subjects. Future time perspective can be applied to the analysis and evaluation of varying behavioural phenomena such as frustration, depression, mental disturbance and student investment in education [186, 187].

4.7.2 Evaluation of Time Perspective

The ability to measure a construct allows for in-depth exploration and understanding of the construct, especially in determining the relationship between the said construct and other conceptualizations. Measurement is the formation of an operationalization of a construct within a particular conceptual framework, a variety of measures of the said construct reflexing the different conceptual bases [188].

In the evaluation of dynamics and influences of time and the construct of time perspective, a consideration of measurability of dimensions, orientation and facet need to be explored particularly in the context of the future time perspective and conceptualization of the construct. To this effect, many instruments for measuring different dimensions, orientations and facets of the construct exist. In the case of this research, three measurement instruments or scales for weighing the construct of time perspective were considered.

After a consideration of procedure and results, this range of measures were selected for their particular usefulness in establishing a holistic understanding or representation of the time perspective construct and the multidimensionality of the individual conceptual framework. [188, 12, 179, 170, 168, 173]

The three measures focus on different facets of the constructs. One of the most popular of this is the Zimbardo Time Perspective Inventory (ZPTI) which presents an iteration of the somewhat less popular Stanford Time Perspective Inventory (ZTPI) [189, 169]. The second measuring instrument to be considered is the Multidimensional Future Time Perspective Questionnaire, an iteration of the generic Future Time Perspective Scale [190] [191]. A third of the trio to be considered is the Facet-Designed Future Time Perspective Questionnaire. The third instruments was designed in an attempt to develop a map of the domain of Future Time Perspective. The instrument reflects applications of Borg and Canter's facet approach to the measurement of Future Time Perspective [173].

The consideration of multiple measurement instruments is based on what is termed the "Multi-directionality" and "Multi-dimensionality" of the construct of time perspective much like many other developmental constructs. Individually each of these scales measure multiple dimensions, orientation or facets of the same construct (Time Perspective). However, the Multidimensional Future Time Perspective Questionnaire and Facet-Designed Future Time Perspective Questionnaire both focus on the future component of time perspective. [192]

4.7.2.1 Zimbardo Time Perspective Inventory (ZTPI):

The Zimbardo Time Perspective Inventory is used to determine the orientation of the individual's perspective regarding position on the time continuum i.e. past, present or future leaning orientation. The validity of the Zimbardo Time Perspective Inventory measures is questioned by Mello & Worell, especially in the context of structural validity. This criticism is strengthened by the knowledge that an insufficient number of validation studies were presented in support of Zimbardo Time Perspective Inventory (ZTPI) [193, 179]. Nevertheless, the Zimbardo has been found widely applicable by many researchers [194, 184, 180].

The Zimbardo Time Perspective measures the attitude towards the past, present and future time frames or dimensions from five different perspectives namely: Past- Positive, Past-Negative, Present-Hedonistic, Present-Fatalistic and Future. Each reflecting various attitudes towards time which are exhibited in various manners and indicative of awareness and underlying mental status as follows: 1) Past-Positive reflects a subject with a sentimental attitude towards the time-foregone (the past) which indicates possibly low depression and anxiety, high in self-esteem/happiness. 2) Past-Negative reflects a subject with an aversive attitude towards the time-foregone; indicative of low future awareness and high depression/anxiety. 3) Present-Hedonistic reflects a subject with reckless attitude towards time as a whole indicative of low future awareness and high sensation-seeking. 4) Present-Fatalistic reflects a subject with a helpless and hopeless attitude towards time as a whole indicative of low future awareness and high anxiety aggression. 5) Future reflects a subject with a conscientious attitude towards time as a whole indicative of low depression/anxiety and high future awareness [169, 168].

The five dimensions present interesting implications when considered in the context on CPD. If the dimensions are considered in the context of CPD, predictions of the likely behaviour and attitudes of students that fall within each of the dimension can be made. This would consequently inform the design and selection of CPD activities for subjects that reflect different dimensions.

4.7.2.2 Multidimensional Future Time Perspective Questionnaire

Neugarten is considered by many as the trailblazer of Future Time Perspective. His arguments revolve around the reorientation of an individual's time perspective as they progressed through with focus and outlook changing along with the reorientation and acting together to result in changes in motivation, anxiety, attitudes and behavioural exhibitions and personality traits. [195]. The multidimensional Future Time Perspective Questionnaire was developed by Brother et al. to explore

this relationship. The multidimensional Future Time Perspective questionnaire seeks to approach Future Time Perspective in the context of age-related categorization. [190]. The three age Categorizations are: Young-adults (18-39), Middle-aged adult (40-59), Old-adult (60-93).

The relevant attitude dimension factors in the context of the multidimensional Future Time Perspective questionnaire approach are Future as open, Future as limited, and Future as ambiguous. The dimensional factors were identified based on a combination of theoretical investigations and analytical studies related to time perspective. 1) Future as Open, reflecting the focus of the subjects on future opportunities. 2) Future as Limited, reflects the focus of the subjects on the limitation of the future. 3) Future as Ambiguous, reflects the subject's focus on the uncertainty of the future in the context of the relation of goals to lifespan.

The relationship between the exhibition of the factor and age categories is due to varying outlooks and time perspectives with age. The effect of time is separated from that of other influencers by including control variables of optimism, depressive symptom, self-rated health and social desirability.

The convergence and divergence tested using satisfaction of life scale (SWLS) for evaluating well-being and Neophyte factor inventory for assessing personality traits. The effect of dimensional factors was correlated with satisfaction with life and personality traits. Establishing correlation of Future as Open with optimism, satisfaction with life and extroversion; Future as Limited with depressive symptoms and neuroticism; Future as Ambiguous with both sets of correlating constructs. [196, 197, 190].

The association of each of the factors with age is negative for future as open, positive for future as limited, great ambiguity for young adults.

This has implications for the evaluation of engagement with CPD. Students with an open perspective of future may, under certain conditions, tend to engage in activities that aid professional development, while subjects who perceive their future as limited may be more reluctant to engage. On the other hand, students who view their future as ambiguous may experience difficulty in selecting CPD activities to engage in.

4.7.2.3 Facet-Designed Future Time Perspective Questionnaire

The Facet-designed Future Time Perspective(FTP) questionnaire evaluates Future Time Perspective (FTP) from a varying array of scope, level and object. It measures a resultant attitude made up of

cognitive, affective and intentional components related to the future time perspective in the context of the learner.

The dimensions are:

- Object of Future Time Perspective facet
- Extension of Perspective
- Valence of Perspective

The three dimensions are measured across eight perspective facets comprising of short and long term future time perspectives of study and professional career, personal development, social relations and leisure time. Eight subscales comprise both negative and positive components.

4.7.2.3.1 Object of Future Time Perspective

This perspective seeks to incorporate considerations regarding the exact nature of subject's future time-perspective by focusing on the nature of subject's interests and concerns with the future time-perspective.

The interests are often categorized into facet based interests such as: i) School and professional career, ii) Personal development, iii) social relationships and, iv) Leisure time [198, 173].

4.7.2.3.2 Valence

The instrument is utilized to evaluate valence through balancing negative and positive components of the perspective facets. The valence of perspective dimension is the subjective value of the relevant future perspective and in essence, a motivation facet.

4.7.2.3.3 Extension of perspective

This perspective revolves around the extension of the time-perspective into the future, as the future in the context of FTP can be the long-term or short-term. The nature of the present conception of future regarding perspective requires an understanding of duration tendency of such unit of time-perspective.

The facets of future time-perspective have interesting implications when considered in the context of CPD related activities. A subject's objects, valence and extension facet can inform the nature of their pattern of engagement with development activities such as CPD. The object of future time-perspective can inform the area of concentration of CPD the subjects engages in. The valance and extension facets can inform how instrumentality of the CPD activities and the behaviour the subject will exhibit when engaged in short- or long-term development activity, change with time.

4.7.2.4 Holistic View of Time Perspective

The three instruments when utilised together in the context of CPD, give a holistic view of the subjective influence of time on engagement with CPD across a broad range of dimensions. These dimensions include: Past perspective, Future perspective, Present perspective, Future as open, Future as limited, Future as Ambiguous

Object of Future Time Perspective: extension of perspective; Valence

Long & Short-term School and professional career

Long & Short-term Personal development

Long & Short-term social relationships

Long & Short-term Leisure time

4.8 Academic engagement

The term 'academic engagement' is often mixed up with academic participation or participation in academic activities.

Williams J.D described academic engagement as:

> *"the extent to which students identify with and value schooling outcomes and participate in academic and non-academic school activities."*
>
> Williams, J.D (2003) as cited in [10]

Although academic participation may be utilized as a rough indicator of academic engagement, a clear distinction must be made between both terms. Student's high level of academic participation does not mean that the students have a high level of academic engagement. Academic engagement is often a combination of a student cognitive, behavioral and emotional engagement. As such, it is often difficult to accurately measure as students engage in individual academic activities.

Chapter Five

5 Conceptual framework

The conceptual framework of the study revolves around the key consideration of AM, SMD, the time perspective and the effect they have on the resultant motivation of the learner, (in the context of CPD) which in turn directly influences the LECPD.

The components of the conceptual framework were identified and the frame work established with consideration for the key notion of utility. The components of the conceptual network were selected to ensure an optimum spread of utility of the network. Overlapping utility of theoretical concepts in the network was avoided.

The conceptual framework is illustrated in the Figure 59:

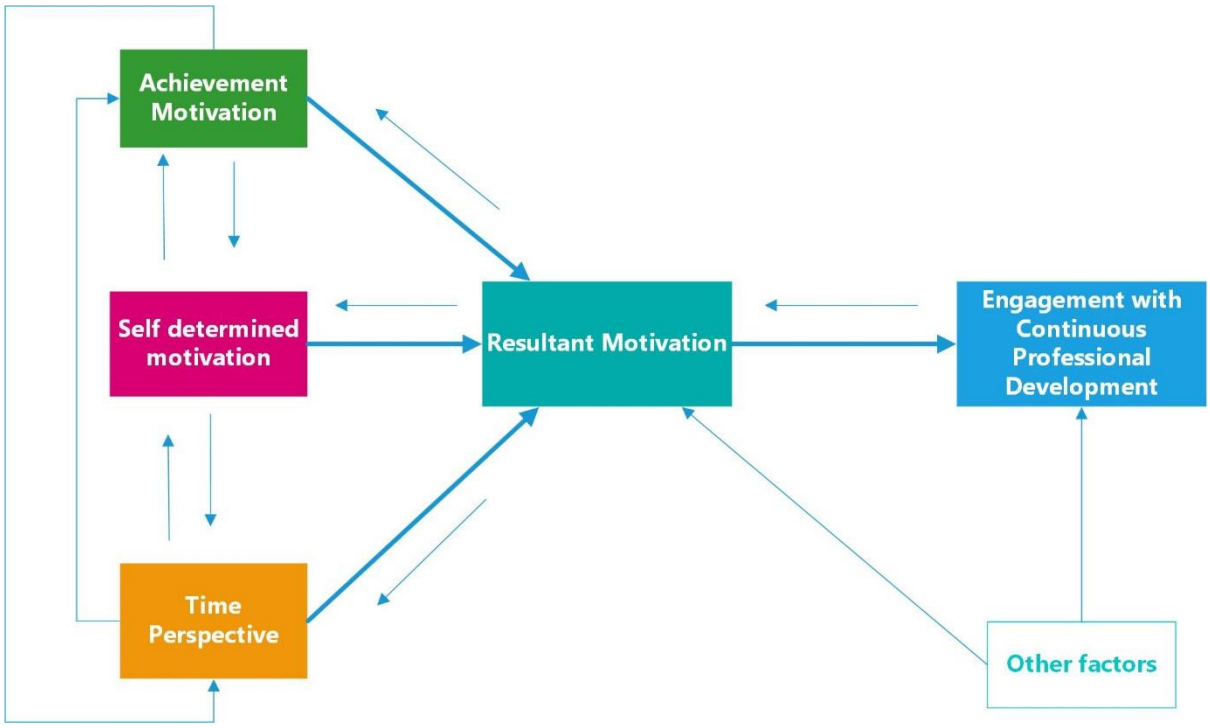


Figure 59 Model for engagement in CPD

5.1 Findings of literature review.

The findings of the literature review illustrate that the motivation to engage with CPD can exist in various dimensions and that the most important dimension of motivation in the context of CPD are in the milieu of source, intensity and time. A multi-dimensional domain was postulated, reflecting three dimensions of motivation. The points in this domain can be linked to level of engagement with CPD with each point reflecting source of motivation, time perspective and intensity of motivation. The source of motivation takes into cognisance the level of autonomy; time perspective takes into cognisance the time effect on motivation, and the intensity of motivation takes into cognisance the approach and avoidance components of AM, all depending on the exact nature of engagement with CPD.

The three dimensions of motivation are used to create a 3D domain with each point in the domain having varied significance. The selection of these dimensions is based on the ability of these dimensions to present a holistic range of factors affecting learning and CPD.

The hypothesis is then based on the concept that the points within this domain signify or correlate with the level of engagement with varying forms of CPD. The positive and negative connotation of the significances of a point depends on the form and nature of CPD activity in question. Points in this domain represent either intrinsic or extrinsic motivation, short or long- term motivation and avoidance or approach-oriented AM. The significance of this motivation would then be determined based on the nature of the motivated activity being considered.

For example, there would be varying significance and interpretation of the points in the domain for:

- CPD activity aimed at a short term or long-term development
- Nature of primary focus of CPD E.g. Promotion, satisfaction,
- Engagement in CPD necessitated by policy and law
- Cross disciplinary nature of CPD
- Level of autonomy of decision to engage with CPD
- Career stage or life phase of the participant in CPD activity. I.e. Progressing or termination activity
- Nature of the CPD activity in the context of structure i.e. structured or non-structured career progression
- Structure in term of a laid down system that informs or feeds motivation or activities to be performed.

5.2 Motivation in the Context of Research

The question concerning the kind of motivation that needs to be considered remains when considering student motivation in the context of CPD. CPD in the context of the research is often a form of self-determined learning in which the learner decides which activity would be best suited for their professional development and engages in that chosen activity. Although there are different theories and school of thoughts of motivation, self-determined theory of motivation is a preferred theory of motivation to be considered, when considering CPD in the context of University based learners. Since the learners exist in an academic context of a University, academic motivation may need to be looked at as the basis for initial motivation to engage in CPD activity.

Due to the nature of CPD and the fact that professional development is being looked at from the point of view of future development or at least a point of view of developed competency for future utilization and professional development of the learner, three forms of motivation seem most relevant:

1. Source based motivation in the form of intrinsic and extrinsic motivation which exists on two ends of a scale of level of autonomy of action. Particularly of interest is an instrumental form of extrinsic motivation.

   However, extrinsic motivation cannot be considered in isolation of intrinsic motivation, as many theories postulate that the positive functionality of extrinsic motivation is based on the ability of extrinsic motivation to build on existing intrinsic motivation in learners. [22]
2. Time Bound in the context of Future Time Perspective theory, a theory which revolves around the perceived effects of future goals on the current behaviour of a learner.

   Future Time Perspective theory posits that:

   > *"The temporal distance of student goals, paired with the perceived instrumentality of a current task, will influence student actions in the present"*
   >
   > [199]
3. Level of motivation possessed by the learner in the context of AM Theory. AM can either be achievement oriented or failure-avoidance oriented. [8]

5.3 Time Effect and Self-Determined Motivation (SM)

In consideration of motivation to engage with activities with a goal in mind, especially in a context where the value of goal may affect motivation, it is important to consider time orientation or perspective. This is true in both the context of Achievement motivation and Self Determined Motivation. The connection between AM and time perspective is easier to establish due to the strong

association of AM with task value and instrumentality. However the connection between SM and time perspective require more indepth consideration to establish [11, 161, 75].

Exploring the connection between source of motivation and time effect on motivation especially when considering intrinsic motivation and future time perspective, may require reflection on the relationship between instrumentality and intrinsic motivation. Instrumentality is of particular importance in considerations of FTP as time perspective is associated with the perceived instrumentality of the task and correlates positively with the instrumentality of the future task. This is supported by Husman et al's recommendation that endogenous instrumentality with strong focus on future orientation and time perspective should be central to research revolving around a learner's engagement [161, 153].

The relationship between intrinsic motivation and instrumentality is described as "independent interdependence" with the two variable serving different motivational functions [161].

Future orientation or time perspective separates endogenous instrumentality form task value. The importance of including time orientation in measurements involving task value of goals is supported by Husman, et al. [161]

5.4 Achievement Motivation (AM) and Self-determination

AM theory and SM theories complement one another in the sense that they can explain what is beyond the preview or remit of the other. AM theory explaining the effects of intensity and orientation of motivation while the other explains the effects of the source of motivation [11, 153].

SM and AM appear orthogonal as they consider different conceptions of motivation with little consideration in common. Even when similar factors or constructs are being examined, they are done from entirely different perspectives.

Part of the task of the research is to establish the shape and model of the domain that develops based on data collection, as it concerns CPD.

5.5 Motivation and Zone of Proximal Development

There is support for the notion that motivation affects the position of the learner in the ZPD by possibly creating new Zones of Proximal Development. There is literal evidence pointing to the link between activity theory and motivation theory. Hence, there is a plausible link between activity theory and ZPD [26, 63, 43].

There are stages in the development of a learner, as indicated by Vygotsky's conceptualisation of development and activity theory. These said stages of development represent the transition from one lifetime position to the other (Change in position in society such as changing; class, schools, job) [158]. This change in position results in a change in motivation which in turn affects the position in the ZPD [26]. Activity theory is linked to motivation due to a change in position resulting in emotional change, hence, resulting in a change in the subjective assessment of the probability of success. A change in subjective probability of success leads to change in motivation as probability of success is one of the key determinates of level of AM [75, 11, 8] .

The change in stages of development as such is linked to the ZPD as a change in the subjective probability of success means a change in the distance between the can and can't zone. Also, the region between stages of development is affected by motivation. i.e. motivation affects position in ZPD [43, 26, 75]. Figure 60 illustrates this relationship.

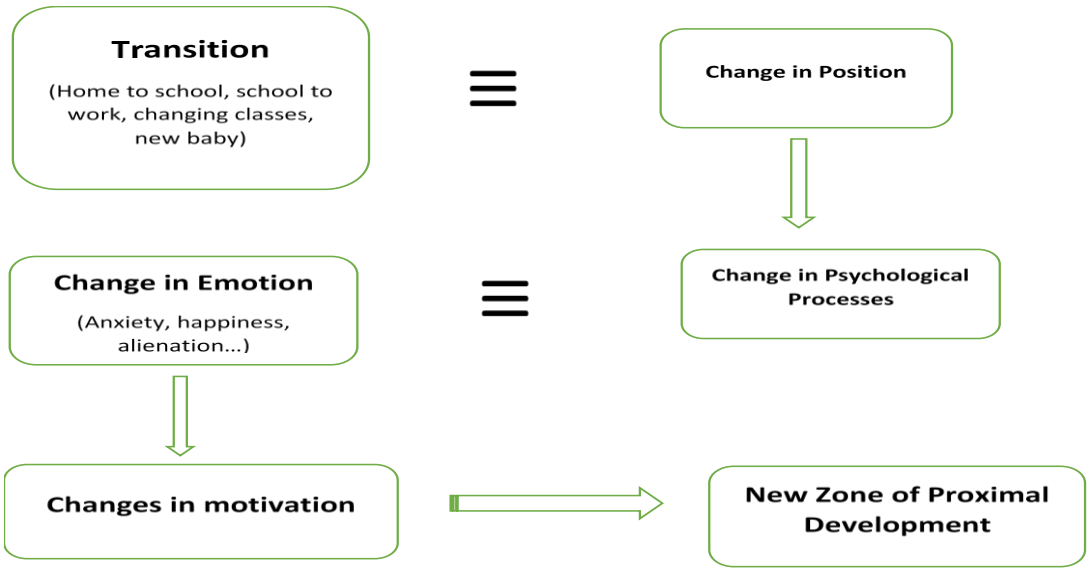


Figure 60 Transition, Motivation, and ZPD

Adapted from [26, 75]

An alternative way of looking at the relationship between AM and the Zone Proximal Development is through the lens of the concept of recall.

5.6 Relationship between Motivation, Recall, Zone of Proximal Development and CPD

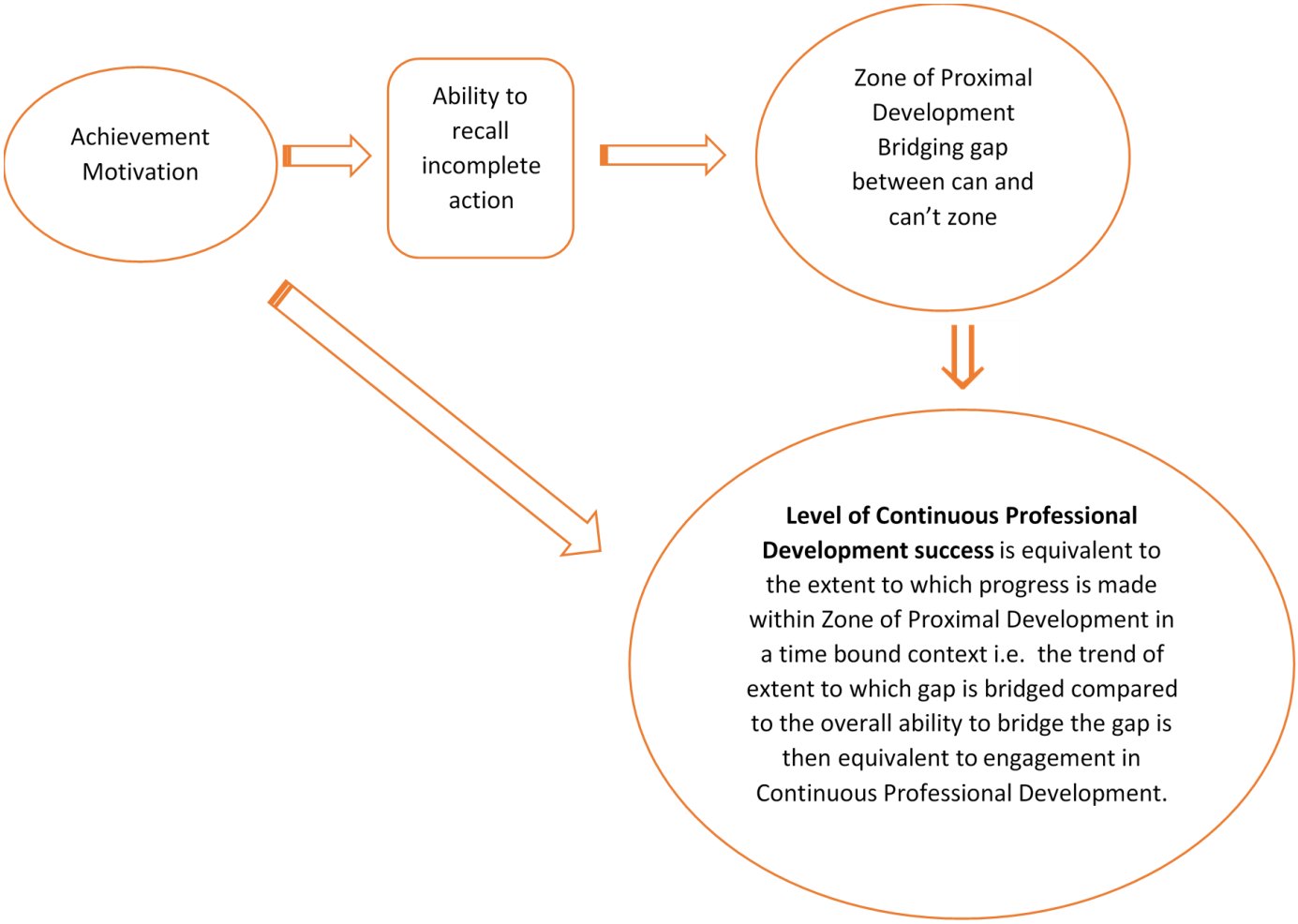


Figure 61 Relationship between AM, Recall, ZPD and Continuous Professional Development

Adapted from [11, 75, 43, 26, 52]

Atkinson conducted a study where he attempted to compare a subject's ability to recall with the level of AM of the Subjects. This study yielded results that showed that the subject's ability to recalling incomplete actions is proportional to the subject's level of AM [75, 11, 8]. AM affects the recall of uncompleted (incomplete) tasks more than that of completed tasks, with those high in resultant AM($M_S > M_{AF}$) more likely to exhibit this trend that those low in resultant AM ($M_S < M_{AF}$). This affects

learning if considered in the context of Vygotsky's ZPD which states that most development is achieved in the ZPD which is the zone between can and can't Zone [105, 49, 204].

These findings have various implications when considered in the context of Vygotsky's ZPD (illustrated in Figure 61). One of the functional processes of bridging 'the can' and 'can't zone' of knowledge is the learning process. In order to explain this, there is a need to explore the process of learning. In order to learn, a learner must be able to scrutinize the reason the learner can't perform the said action and then chart a path to being able to carry out the action that the learner can't perform at that duration of time. The learner must be able to progress from an inability to carry out an action or understand a concept to an ability to carry out the action or understand the concept in within a limited duration of time, (i.e. the process of learning involves recalling knowledge through the reproduction of externally provided information or knowledge).

The ability to recall the incomplete action is a key ability in the learner analysing why the learner failed in said action, which then forms the basis of an alteration (be it small or large) of action and possible future attempts at completing the task. For learning to take place, one must be able to understand what he or she has done wrong and be able to conceive what needs to be done right. Even if one is told the answer to a problem, they must still nevertheless be able to comprehend or recognize what they have done wrong. The relationship between recall ability and learning is then obvious from the above statement. The ability to recall, then stands as a noteworthy component of the process of learning. For those who fail to complete an action due to the fact that it is in their "can't zone", (or the fact that they do not complete the action puts the action in the can't zone) recalling the incomplete action then becomes a noteworthy component of their learning process.

The process of learning to do what was not possible to initially do, requires an ability to recall. This involves recalling what one failed at, how and why one failed in the process to carry out an action or understand a concept: as learning to an extent involves failing. For the learner to learn what the learner has not succeeded in learning before and be able to do what the learner has not done before, the learner has to be able to recall. Not that recalling is the principal factor in learning, but nevertheless, it is a noteworthy element in the process of learning (recalling is sometimes described as reflection) [75, 43, 11].

It should be noted though that the ZPD is a moving zone (as illustrated in Figure 62) as the subject learns or develops and the "can't zone" becomes the "can zone" and a new "can't zone" arises [43, 75, 26, 58].

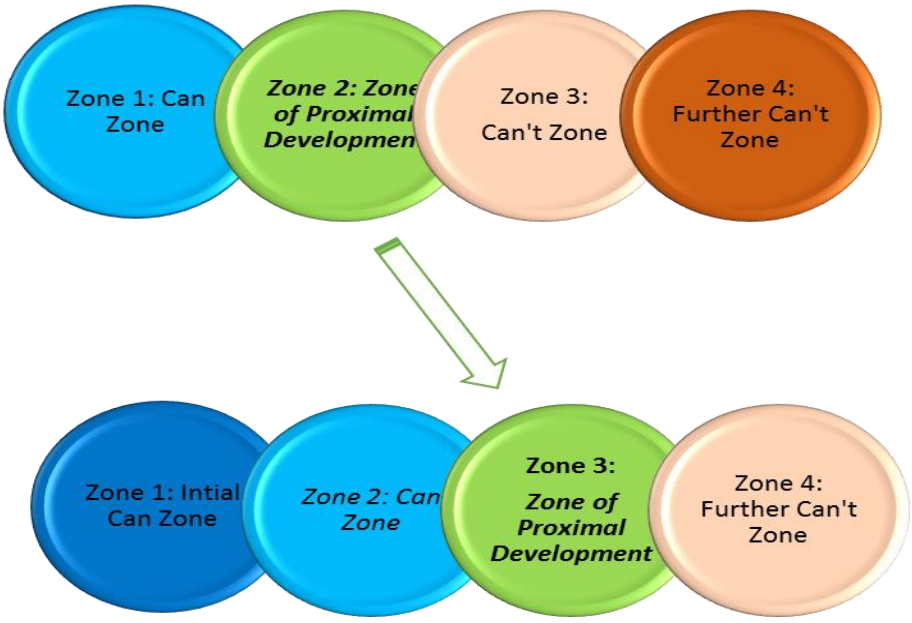


Figure 62 ZPD Migrating with Development/Learning

Adapted from [43]

The ability to recall incomplete actions is shown to be related to the level of AM by Atkinson's study. The study investigated the recall of incomplete and completed tasks after subjects receive relaxed, neutral, or achievement-related instructions. Farley and Mealie's study also confirms that AM orientation or nature of an individual affects the level to which the individual can recall an incomplete action (an action they failed at). There also exists a link between recall ability and the time-bound ability to bridge the 'can' and 'can't zones', which is analogous to learning or development. Given that recalling incomplete action is important to learning, (bridging the ZPD) one can infer that AM orientation is important to bridging the ZPD. The extent to which the learner has been able to develop within the ZPD is indicative of the level of CPD when the development activity is in the context of professional development. CPD is conceptualised as the level to which a person develops his or herself within the region of proximal development in a time bound fashion. The proportionality of AM to the process of bridging the gap or ability to bridge the gap has been established above. As such, it can be construed that the level of AM is positively proportional to the LECPD, [105, 43, 204].

CPD in the definition adopted in the ZPD section of this write-up was established regarding the extent to which an individual bridges the ZPD. An individual's ability to engage in CPD at an instant in time is the ability of the individual to bridge the existing gap in the ZPD (this is in the context of activities beyond the scope of a major learning activity. Based on this definition, it can also be inferred that the CPD is proportional to the level of AM as illustrated in Figure 61 [43, 26, 75].

5.7 Resultant Motivation to Engage in CPD

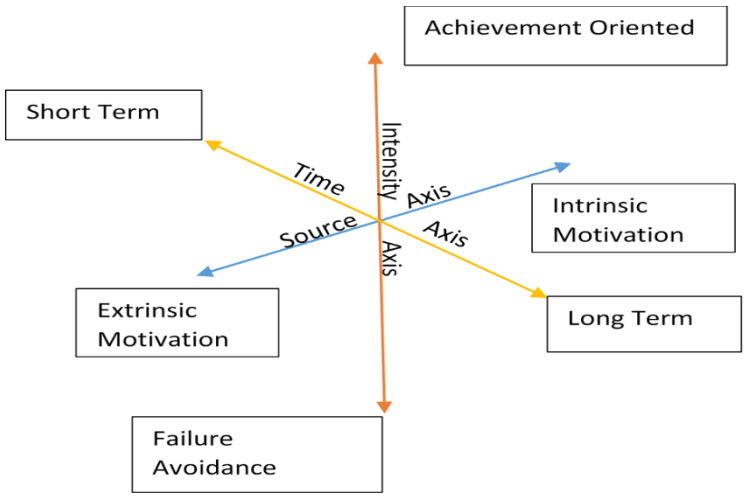


Figure 63 Illustration of Dimensions of CPD Motivation

In order to determine the holistic motivation towards engagement with CPD, the relevant dimensions of motivation may be combined. In order to achieve this, the three dimensions of motivation of interest may be placed on 3D Cartesian Domain (as illustrated in Figure 64) in such a manner that each dimension forms an axis of three Dimensional Cartesian coordinate system as illustrated in Figure 63 and Figure 64:

5.7.1 Axis

Source Axis: This axis (as illustrated in figure 2 and 3) is a continuum with one end being infinitely intrinsic motivation, and the other end being extrinsic motivation. The negative value on the scale of this axis may represent extrinsic motivation although it should be noted that extrinsic motivation is not a true negative of intrinsic motivation.

Intensity Axis: This axis represents the level of AM displayed by an individual with the achievement-oriented motivation laid at one end, and failure avoidance-oriented motivation at the other. The negative value on the scale of this axis represents failure avoidance.

Time axis: The time axis is unique in the sense that the negative domain of time does not exist, and as such the time axis has no values below 0. The time index value represents the extent of the effect of time on the learner's motivation. The upper end of the scale of this axis may represent long-term oriented motivation, and the end of the scale approaching zero represents short-term oriented motivation.

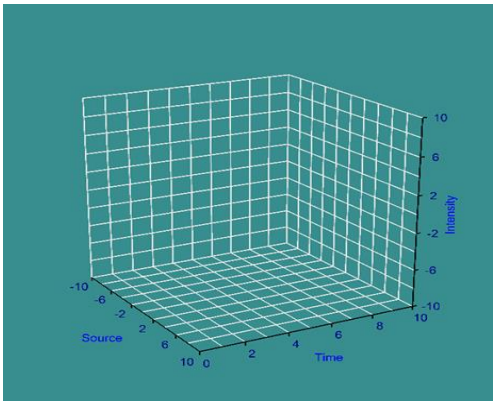


Figure 64 Illustration of the Domain of Motivation

The major aim of such a measure as suggested above may be to aid transforming the nature of the learner's motivation through internalization or creating the necessary conditions in order for a learner to be best positioned to succeed in CPD. It is a mechanism that would present the learner or supporting organisation with an ability to track holistically, a learner's motivation in the context of professional development. This can possibly give an individual or organization an opportunity to either improve the individual's motivation or provide mitigating factors to aid in achieving CPD with their current level of motivation.

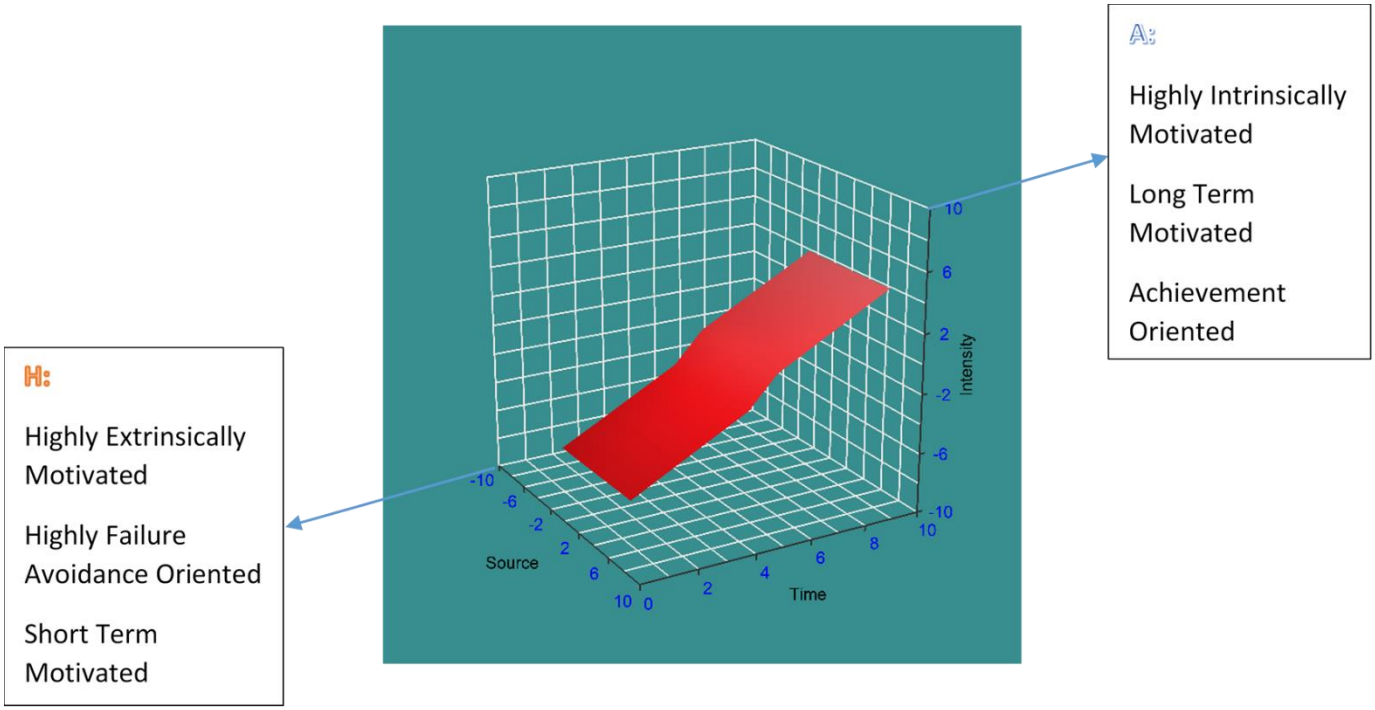


Figure 65 Hypothetical Illustration of Population Plot

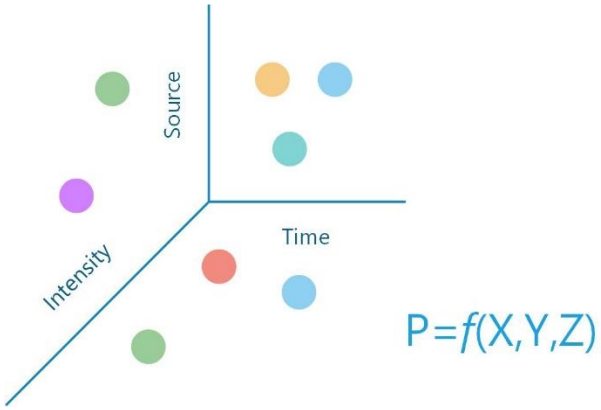


Figure 66 Populated domain: Individual Cluster based Plot

5.7.2 Populating the Domain

In order to populate the domain, data would be collected utilizing established scales and instruments for each of the dimensions of motivation and plotting as illustrated by the hypothetical plot in Figure 65 or Figure 66 .

Figure 67 contains a list of instruments that were considered.

Abbreviation	TITLE	Purpose
AMS	Academic Motivation Scale	Academic Motivation, Intrinsic and extrinsic Motivation
SMTSL	students' motivation toward science learning (SMTSL	Self-efficacy, active learning strategies, science learning value, performance goal, achievement goal, and learning environment stimulation.
PLOCQ	Perceived Locus of Causality Questionnaire (PLOCQ)	(SM theory) Contextual Motivation: external regulation, introjected regulation, identified regulation, intrinsic regulation
SIMS	Situational Motivation Scale (SIMS).	(Self- determination theory) Situational Motivation: external regulation
MAE	Motivation and Attitudes in Engineering (MAE) instrument	assesses long-term goal related expectancy, and perceptions of present and future tasks/goals
AAPSS	Attitudes and Approaches to Problem Solving survey	Assessing Short-term goals in the form of short-term task Self-efficacy
AMI	AM Inventory	Designed to measure level of AM
ZTPI	Zimbardo Time Perspective Inventory	Designed to measure past, present and future Time Perspective
MFTPQ	Multidimensional Future Time Perspective Questionnaire	Designed to measure future Time Perspective: open, ambiguous and limited
FDFTPQ	Facet-Designed Future Time Perspective Questionnaire	Designed to measure future Time Perspective: object, extension and valence

Figure 67 Test and tools under Consideration

5.7.3 Significance

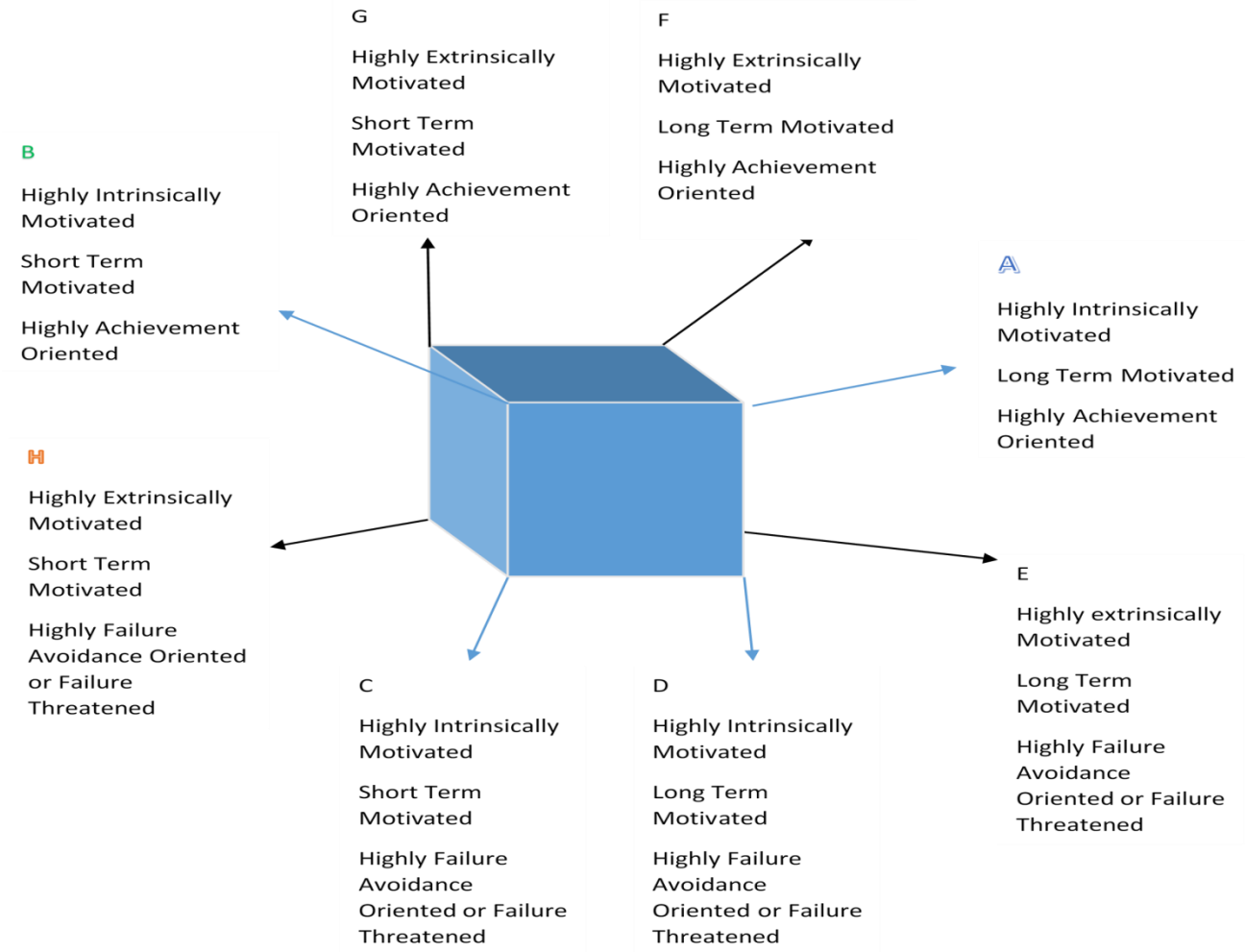


Figure 68 Potential significance of quadrants and points in the domain

Point A (including points in the same vicinity and quadrant) potentially reflects the optimum form of motivation for long term professional development or engagement with CPD focused on long term career development. As point A represents a point with:

- High Level of Intrinsic motivation which is suggested by [205] as the preferred form of motivation for CPD,
- Long Term Oriented Motivation which is Ideal for Long Term Development goals
- Achievement Oriented Motivation which is a preferred form of motivation for improved probability of achieving Success [8]

Figure 68 illustrates the possible significance of various quadrants and points in the domain.

5.7.4 Validation

In order to validate this, comparisons need to be made between the prediction based on the motivation position in the domain and the CPD engagement or performance of individual. This is a comparison of Students Resultant Motivation with level of CPD Engagement.

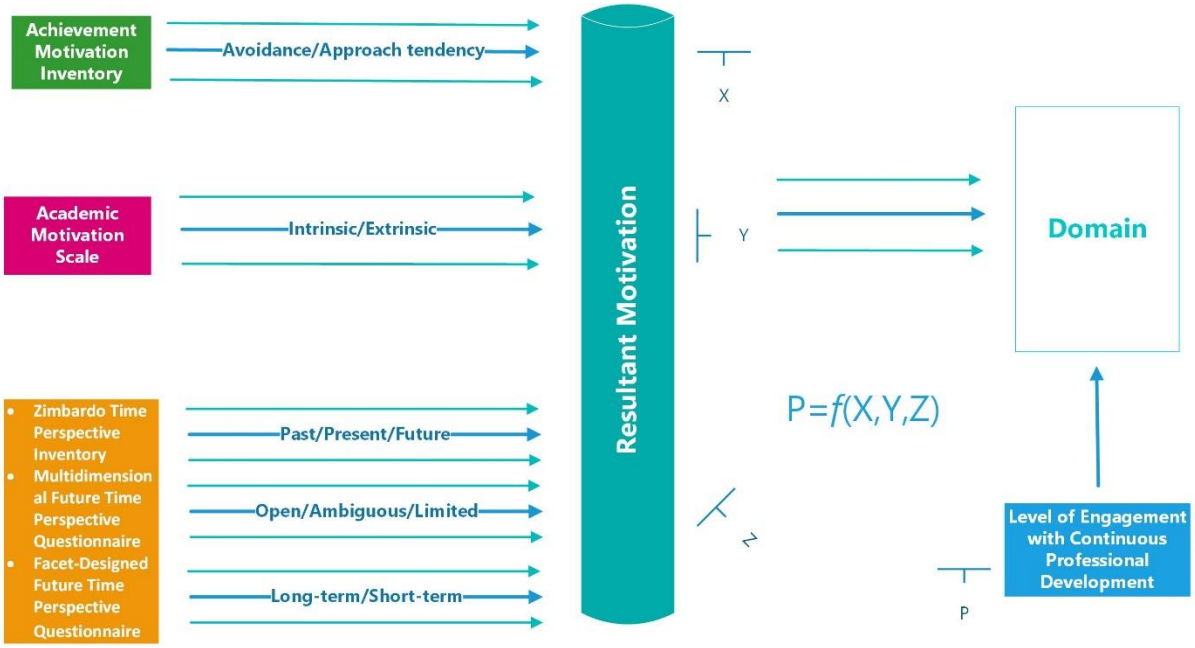


Figure 69 Model of Hypothesis

A model of the hypothesis as illustrated in Figure 69 illustrates how measurement instruments can be used to validate the domain. In this particular context, the model illustrates how data collected along the three axis of motivation can be combined together to determine the true nature of the equation of the domain and shape of the domain that exists between the level of engagement (P), source axis of motivation (Y), intensity axis of motivation (X) and time axis of motivation (Z). As illustrated in Figure 66 and Figure 65, there is more than on plausible shape of the domain. The true shape of the domain would only be known after the true nature of the equation 23 after populating the domain through data collection.

$$P = f(x, y, z) \quad (23)$$

Chapter Six

6 Research Method

This chapter presents the methodology that was used to achieve the aims and objective of this research. This research focuses on the comparison of the motivation towards engagement with CPD to Level of engagement with Continuous Professional Development (CPD) for Engineering Students' (EES) studying in the North of England and South West Nigeria. The motivation towards engagement and Level of Engagement with Continuous Professional Development (LECPD) were examined based on three dimensions of motivation.

6.1 Research Questions

The research question is:

What motivates Engineering Students (EES) to engage with CPD?

- What is the relationship between Engineering Students' (EES) motivation towards CPD and Level of engagement with CPD?
- To what extent can engineering Students' Level of Motivation towards CPD be used to predict their engagement with CPD?

The research questions were further refined to generate sub-question in a number of categories as follows:

- Measurement
    - Can the level of engagement with CPD be measured?
    - How can the level of engagement with CPD be measured?
    - How can the value of different subsets of dimensions of Motivation towards engagement with CPD be aggregate?
    - How can the level of engagement with CPD be compared to the associated Motivation towards engagement with CPD?
- Importance of CPD
    - What Level of Importance (LP) do students attach to varying aspects and items of CPD?

- Do students attach different levels of importance to different aspects of professional development ranging across said groupings?
- Does the Level of Importance (LP) attached to aspects of CPD vary across demographic features?

- Relationship
  - What is the nature of the relationship between LECPD and dimension of motivation including associated subsets?
  - To what extent, if at all does LECPD have a relationship with motivation profile?
  - Which element of motivation profile has the most Pronounced relationship with LECPD?
- Overarching relationship
  - What is the relationship between aspects of CPD and dimensions of motivation when effects occur simultaneously?
  - What is tier of motivation variables have a better relationship with Level of engagement with CPD
- Prediction
  - To what extent, if at all can LECPD and its respective aspects be predicted from motivation profile?
  - What is the model for predicting the value of LECPD and its respective aspects using elements of individual's motivation profile?
  - What is the most suitable model for predicting Level of engagement with CPD among the different tiers of motivation variables?

6.2 Hypothesis

On the basis of the above research questions, a number of hypotheses were developed

6.2.1 Level of Importance of CPD

The hypotheses related to the level of importance of CPD and associated hypotheses are presented in Figure 70.

	Overall	Sub -hypothesis		
	Hypothesis	Hypothesis	Hypothesis	Hypothesis
1.1	Individual Students attach different LP to items and Aspects of CPD.	There is a difference in the Mean LP attached to different CPD items of within a disparate range of Subjects Areas, Skill Categories and Activity categories.	Mean LP is different for different aspects of professional development ranging across said disparate range.	There is a difference in the mean LP attached to aspects of CPD across demographic groupings.

Figure 70 Hypothesis examining Level of importance of Aspects and Items of CPD

6.2.2 Relationship

The hypotheses related to the relationship between Level of engagement with CPD and Motivation towards engagement with CPD and associated hypotheses are presented in Figure 71.

	Overall	Sub –hypothesis		
		First-Order	Second Order	Third Order
	Hypothesis	Hypothesis	Hypothesis	Hypothesis
2.1.	There is a relationship between LECPD and first-order variables, Second-order variables and Third order variables of the identified and emergent dimensions of motivation.	There is a relationship between LECPD and first-order variables of identified and emergent dimensions of motivation	There is a relationship between LECPD and Second-order variables of identified and emergent dimensions of motivation	There is a relationship between LECPD and Third-order variables of identified and emergent dimensions of motivation
2.2.	Different dimensions of motivation have	Different dimensions of	Different dimensions of Self	Different dimensions of Zimbardo Time

	different level of Relationship with level of engagement with CPD.	Achievement motivation have different level of Relationship with level of engagement with CPD.	Determined Motivation have different level of Relationship with level of engagement with CPD.	Perspective Inventory have different level of Relationship with level of engagement with CPD.
2.3.		Different dimensions of Multidimensional Future Time Perspective have different level of Relationship with level of engagement with CPD.	Different dimensions of motivation have different level of Relationship with level of engagement with CPD.	
2.4.	Compared to other dimensions of motivation, 'Achievement motivation in the context concerted effort' (AMSUB_F1_Index) has a greater relationship with LECPD.	Compared to other first order dimensions of motivation, Intrinsic motivation to experience stimulation ('To_Experience_Stimulation_IM_Index') has a greater relationship with LECPD.	Compared to other Second order dimensions of motivation, 'Achievement motivation in the context concerted effort' (AMSUB_F1_Index) has a greater relationship with LECPD	Compared to other Third order dimensions of motivation, 'Combined value of Future Time Perspective using Factor analysis Index (Based on rotated)' (FTP_SUB) has a greater Relationship with LECPD

2.5.	Compared to other dimensions of Achievement motivation, Affinity for Challenge form of Achievement motivation (AM_F5_Index) has a greater relationship with LECPD.	Compared to other first order dimensions of Achievement motivation, Affinity for Challenge form of Achievement motivation (AM_F5_Index) has a greater relationship with LECPD.	Compared to other Second order dimensions of Achievement motivation, 'Achievement motivation in the context of concerted effort' (AMSUB_F1_Index) has a greater relationship with LECPD	Compared to other Third order dimensions of motivation, Resultant Achievement motivation (AMSUB_F1F2_Index) has a greater Relationship with LECPD
2.6.	Compared to other dimensions of Self Determined motivation, Intrinsic motivation to experience stimulation ('To_Experience_Stim ulation_IM_Index') has a greater relationship with LECPD.	Compared to other first order dimensions of Self Determined motivation, Intrinsic motivation to experience stimulation ('To_Experience _Stimulation_I M_Index') has a greater relationship with LECPD.	Compared to other Second order dimensions of Self Determined motivation, 'Level of Self determined motivation less amotivation' (SDM_F1_Index_5) has a greater relationship with LECPD	Compared to other Third order dimensions of Self Determined motivation, SDM Combined value on basis of perceived level of Autonomy indicative of the overall resultant of Self Determined motivation (SDM_Direct_Auton omy_Index5) has a greater Relationship with LECPD
2.7.	Compared to other dimensions of Zimbardo Time	Compared to other first order dimensions of	Compared to other Second order dimensions of	Compared to other Third order dimensions of

	Perspective Inventory, 'Positive dimensions of Zimbardo time perspective' (ZTP_F2) has a greater relationship with LECPD.	Zimbardo Time Perspective, Present Hedonistic (Future ZTPI) has a greater relationship with LECPD.	Zimbardo Time Perspective Inventory, 'Positive dimensions of Zimbardo time perspective' (ZTP_F2) has a greater relationship with LECPD	Zimbardo Time Perspective Inventory, overall resultant of Zimbardo time perspective (ZTP_F1F2) has a greater Relationship with LECPD
2.8.	Compared to other dimensions of Multidimensional Future Time Perspective, 'Positive dimensions of Multidimensional time perspective' (MDFTP_F2_Index) has a greater relationship with LECPD.	Compared to other first order dimensions of Multidimensional Future Time Perspective, 'Opportunities Multidimensional Time Perspective' (Opportunities_I_MDFTP) has a greater relationship with LECPD.	Compared to other Second order dimensions of Multidimensional Future Time Perspective, 'Positive dimensions of Multidimensional time perspective' (MDFTP_F2_Index) has a greater relationship with LECPD	Compared to other Third order dimensions of Multidimensional Future Time Perspective, overall resultant of Multidimensional Future time perspective (MDFTP_F1F2_Index) has a greater Relationship with LECPD
2.9.	Compared to other dimensions of Future Time Perspective, 'Combined value of Future Time Perspective (FTP_SUB) has a greater	Compared to other first order dimensions of Future Time Perspective, extremely opened future time	Compared to other Second order dimensions of Future Time Perspective, 'Future Time Perspective Focused on Opportunities'	Compared to other Third order dimensions of Future Time Perspective, 'Combined value of Future Time Perspective' (FTP_SUB) has a

	relationship with LECPD	perspective (FTP_F2) has a greater relationship with LECPD.	(Focus_on_Opportunities_FTP) has a greater relationship with LECPD	greater relationship with LECPD

Figure 71 Hypothesis examining Relationship between LECPD and motivation I

6.2.3 Overarching relationship

There is a relationship between the given variables set for level of engagement with Aspects of CPD and the other Variables set of dimensions of motivation. The hypotheses related to the overarching relationship between Level of engagement with CPD and Motivation towards engagement with CPD and associated hypotheses are presented in Figure 72

	Overall	Sub –hypothesis		
		First-Order	Second Order	Third Order
	Hypothesis	Hypothesis	Hypothesis	Hypothesis
3.1	There is a relationship between LECPD and cumulative effect (latent variates) of first-order variables, Second-order variables and Third order variables of the identified and emergent dimensions of motivation respectively.	There is a relationship between LECPD and cumulative effect (the latent variate) of first-order variables of identified and emergent dimensions of motivation	There is a relationship between LECPD and cumulative effect (the latent variate) of Second-order variables of identified and emergent dimensions of motivation	There is a relationship between LECPD and cumulative effect (the latent variate) of Third-order variables of identified and emergent dimensions of motivation
3.2	Different tiers of motivation variables have different	Over all First-order variables have a stronger	Overall, Second-order variables have a stronger	Overall, Third-order variables have a stronger relationship

	extents of relationship with Level of engagement with CPD	relationship with level of engagement with CPD than Second order and Third-order variables of identified and emergent dimensions of motivation	relationship with CPD than Second order and Third-order variables of identified and emergent dimensions of motivation	with level of engagement with CPD than Second order and Third-order variables of identified and emergent dimensions of motivation

Figure 72 Hypothesis examining Relationship between LECPD and motivation II

6.2.4 Predictability

The hypotheses related to the prediction of Level of engagement with CPD and associated results are presented in Figure 73

	Overall	Sub –hypothesis		
		First-Order	Second Order	Third Order
	Main Hypothesis	Sub -Hypothesis	Sub -Hypothesis	Sub -Hypothesis
4.1.	There are predictors of LECPD among first-order variables, Second-order variables and Third order variables of the identified and emergent dimensions of motivation.	There are Predictors of LECPD among first-order variables of identified and emergent dimensions of motivation	There are Predictors of LECPD among Second-order variables of identified and emergent dimensions of motivation	There are Predictors of LECPD among Third-order variables of identified and emergent dimensions of motivation
4.2.	Different dimensions of motivation have different level of	Compared to other first order dimensions of motivation, Affinity	Compared to other Second order dimensions of motivation,	Compared to other Third order dimensions of motivation,

	effect on level of engagement with CPD.	for Challenge form of Achievement motivation (AM_F5_Index) has a greater effect on LECPD.	'Achievement motivation in the context of concerted effort' (AMSUB_F1_Index) has a greater effect on LECPD	Resultant Achievement motivation (AMSUB_F1F2_Index) has a greater effect on LECPD
4.3.	The suitability of models for predicting Level of engagement with CPD is different for the different tiers of motivation variables	First-order variables are better at predicting and modelling level of engagement with CPD than Second order and Third-order variables of identified and emergent dimensions of motivation	Second-order variables are better at predicting and modelling level of engagement with CPD than Second order and Third-order variables of identified and emergent dimensions of motivation	Third-order variables are better at predicting and modelling level of engagement with CPD than Second order and Third-order variables of identified and emergent dimensions of motivation

Figure 73 Hypothesis examining Predictors of LECPD I

6.2.4.1 Aspects of CPD

The hypotheses related to the prediction of Level of engagement with Aspects of CPD and associated results are presented in Figure 74.

	Overall	Sub –hypothesis			
		Plan	Action	Result	Reflection
	Hypothesis	Hypothesis	Hypothesis	Hypothesis	Hypothesis
5.1.	There are Predictors of level of engagement with the Plan, Action, Result and Reflection aspects	There are Predictors of level of engagement with the Plan aspect of CPD among	There are Predictors of level of engagement with the Action aspect of CPD among first-order	There are Predictors of level of engagement with the Result aspect of CPD	There are Predictors of level of engagement with the Reflection aspect of CPD among first-order

	of CPD among first-order variables of the identified and emergent dimensions of motivation.	first-order variables of identified and emergent dimensions of motivation	variables of identified and emergent dimensions of motivation	among first-order variables of identified and emergent dimensions of motivation	variables of identified and emergent dimensions of motivation
5.2.	Different dimensions of motivation have different level of effect on level of engagement with the Plan, Action, Result and Reflection aspects of CPD respectively.	Compared to other first order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Plan aspect of CPD.	Compared to other first order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Action aspect of CPD.	Compared to other first order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Result aspect of CPD.	Compared to other first order dimensions of motivation, 'AM_F5_Index denotative of 'Achievement Motivation in the context of Affinity of Challenge' has a greater effect on Level of engagement with the Reflection aspect of CPD.
5.3.	The suitability of models based on First-order motivation variables for predicting Level of engagement is different for	Level of engagement with Plan aspect of CPD is better predicted and modelled by First order variables of identified and	Level of engagement with Action aspect of CPD is better predicted and modelled by First order variables of identified and	Level of engagement with Results aspect of CPD is better predicted and modelled by First order	Level of engagement with Reflection aspect of CPD is better predicted and modelled by First order variables of identified and

	different aspects of CPD.	emergent dimensions of motivation than Level of engagement with other aspects of CPD.	emergent dimensions of motivation than Level of engagement with other aspects of CPD.	variables of identified and emergent dimensions of motivation than Level of engagement with other aspects of CPD.	emergent dimensions of motivation than Level of engagement with other aspects of CPD.

Figure 74 Hypothesis examining Predictors of LECPD II

6.3 Methodology Details

A pragmatic research philosophy as defined by Creswell is adopted, to achieve in-depth understanding and knowledge of what motivates EESs to engage with CPD. Pragmatism is a set of philosophical approaches and positions that revolve around the key idea that philosophical activity or approaches should be about getting results by finding solutions to problems rather than building systems. Pragmatism is considered as the key philosophical paradigm for mixed method research [206, 207, 208]. Figure 75 illustrates the research approach for this study [14], illustrating the research design and procedure.

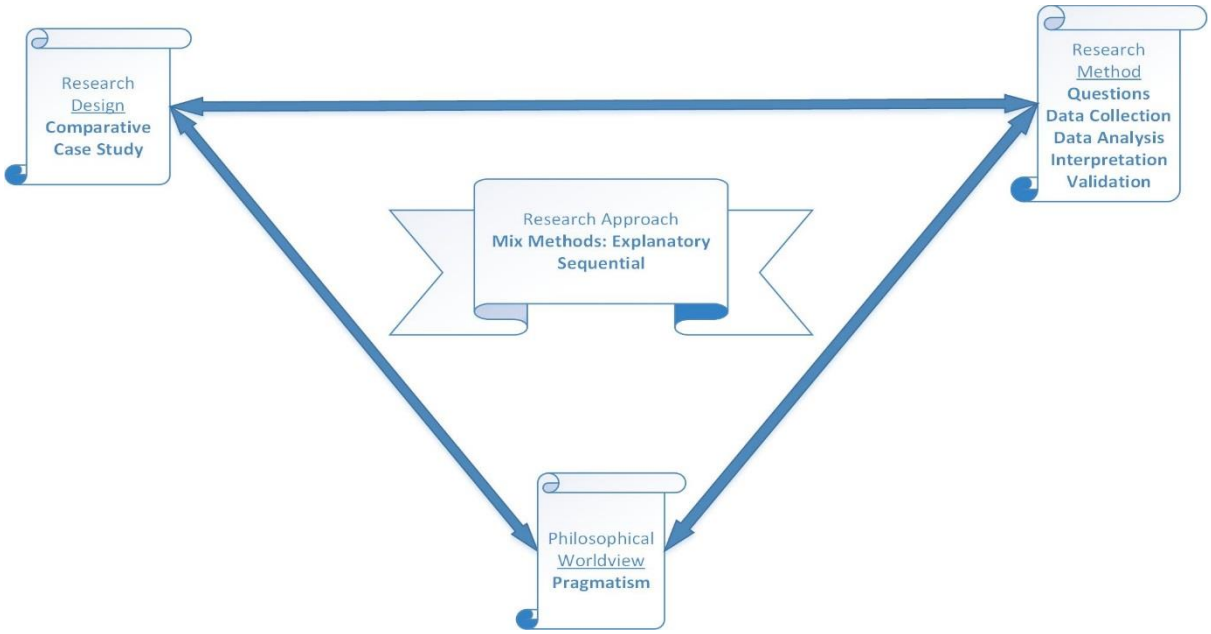


Figure 75 Research Approach

A Comparative Case Study was carried out using an Explanatory Sequential mixed method approach involving quantitative and qualitative data collection methods; this can be described in research notation as a, "[Quan→qual= explain results]" type of research. The data collection methods utilised to collect empirical evidence in the form of numerical and verbal data from statistically independent population samples (prototype of the research approach is illustrated in Figure 76) [14].

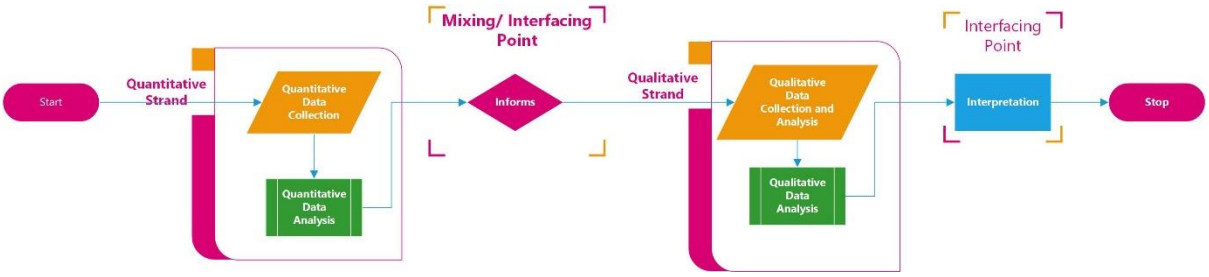


Figure 76 Explanatory Sequential research prototype

The Explanatory Sequential Mixed method comprises a quantitative component using a questionnaire survey approach (hoping to establish the overall picture of the interaction of parameters being measured), sequentially followed by an explanatory qualitative component involving in-depth interviews.

The purpose of this selected two-phase method is to obtain statistically (quantitative) results from a sample, and then follow-up with a few individuals to probe results in more depth for each case (University) and across cases (Universities).

In the first phase, the quantitative hypothesis addressed the relationship between the level of motivation and LECPD for EESs. In the second phase, qualitative semi-structure interviews were used to explore aspects of engagement for individuals representing a different combination from the quantitative results.

6.4 Instrumentation

Self-perception surveys exploring motivation towards engagement with CPD and level of engagement in CPD formed the quantitative research questionnaire. The questionnaire was made of established psychometric tests and questionnaires, which measure source, intensity and time dimensions of motivation and a questionnaire developed in this study for measuring the Level of engagement with CPD. In particular:

- The tool that was used for measuring intensity dimension of motivation in the form of achievement motivation is the achievement motivation inventory [145, 209].

- The tool that was used for measuring source dimension of motivation in the form of self-determined motivation is the academic motivation scale [154, 164, 163].
- The tool used for measuring the time dimension of motivation is a combination of the 1) Zimbardo TP inventory, 2) Multifaceted TP inventory/ Future Orientation Scale and 3) Future Time Perspective Inventory [169, 190, 210, 211, 173, 212]. The postulated tool for measuring the LECPD (details as shown in Chapter 8).

See Appendix 1: Level of and Motivation towards Engagement with CPD Questionnaire

6.4.1 Semi –structured interview

The content and protocol of the interview were informed by the results from the quantitative phase, as the objective of the interview was to explore and elaborate on the results of statistical tests. The semi-structured qualitative interviews with individuals were used to gathered data to understand why and how variables contribute to the results with regards to MP and LECPD. Interviews were semi-structured face-to-face interviews with a clearly stated agenda and open-ended questions. Figure 77 contains the interview questions.

Interviews Question
Activity
1. What do you define as CPD or PD activities
2. In what way do your students engage with CPD?
a. What are the indicators of engagement with this activities?
b. What do you think is the level of engagement with this activities?
3. Given the definition of CPD presented, what are the activities termed as CPD activities in your institution?
Measurement
1. What is the institution's CPD strategy?
2. Is there a pre-existing method for measuring or evaluating the LECPD?
a. If Yes, what is the fitness of existing measure of CPD?
b. If No, how would you gauge the LECPD? –
3. Do you measure LECPD at the individual student level? What measures do you use?
4. What parameters should be included in a measure of the level of engagement with CPD

5. **Do you think there is value in having a measure?**
6. **Did you have a chance to take a look at the model used in this research?**
a. **Do you agree with the model of measurement of CPD used? If yes or no, why?**
Process
N.B.: Process implying the process of developing CPD as a skill
1. **What do you think are the steps that a student should take to develop professionally?**
2. **What do you think a good professional development process should look like?**
3. **Using Kolb's Learning Cycle as an example, what do you think the process cycle of engagement with CPD should contain?**
4. **Do you believe there is a difference between Continuous Professional Development and development of employability skills?**
Based on Quantitative results
1. **Is the mean MP high or Low in the Department of your university?**
2. **What do you think is responsible for the high/low LECPD and MP in your university?**
3. **Why are the LECPD and MP different for EES from certain ethnic groups in the department of your university**
4. **Why are the LECPD and MP different for Engineering Students (ES) across income classes in the Engineering department/faculty of your university**

Figure 77 Interview questions

6.5 Sampling

For this research, there were two important considerations in selecting the sample, the Universities and the number of participants from each.

6.5.1 University Selection

The identification of Universities to examine comprised a geographical approach focusing on Research-intensive universities in the North of England (NE) and Southwest Nigeria geographic regions as illustrated in Figure 78. Universities in the North of England (NE) are research intensive White Rose Universities and Universities in the South West Nigeria(SWN) are the Research Intensive University of Ife, University of Ibadan and University of Lagos.

S/N	Geographic region	Universities	Population Size	Total Population Size	Quantitative Sample Size (Confidence 95%, Margin of error 5%)	Stratified Quantitative Sample size	Qualitative Sample Size
1	SWN	Obafemi Awolowo University	919	4370	353	74	4
2		University of Ibadan	820			66	4
3		University of Lagos	710			57	4
4	NE	University of York	620			50	4
5		University of Sheffield	760			61	4
6		University of Leeds	541			44	4
Total			4370			353	24

Figure 78 Proposed Sample Details

[213, 214, 215, 216]

6.5.2 Participants

The participants selection procedure were different for the quantitative and qualitative phases of the research. For the first phase(quantitative), a stratified random sampling approach was employed in order to examine MP and LECPD across sub-samples based on the hypothesis. This sampling approach enables how they vary across sub-samples to be observed, allowing the levels of congruence or disjunction between responses to be charted. Nominal Characteristics of the samples were collected i.e. sex, ethnicity, income class, nationality, department, the degree of study, year of study [217, 218]. An overall sample size of 353 was determined using the Krejcie and Morgan's table for determining sample size, based on the National Education Association's formula for determining needed sample size taking into consideration a population size of 4370; Confidence of 95% and Margin of error of 0.05 [214, 219].

For the second phase (qualitative), purposive sampling was utilised to ensure all dimensions of interests are captured, and arising themes and codes were followed [220].The eventual qualitative sample size depended on the point at which empirical saturation occurs and practical constraints [221]. The overall proposed qualitative sample size of 24 was selected based on Guest, Bunce and Johnson's recommendation for ideal data saturation sample size of 12 for subjects in a similar cultural context or within a relatively homogenous group [216]. Given that there are two cultural contexts or

distinct relatively homogenous groups (ESSs in SWN and NE) an overall sample size of 24 was selected; this is also in line with Baker and Edwards recommendation for sample size selection [221]. A proposed sample size of 4 was selected in each university based on Romney, Batchelder, and Weller's recommendation of a sample size of 4 for subjects with a similar level of expertise or area of expertise [215]. The proposed sample size of 4 indicative of 95% confidence with subjects that have 0.7 Average level of competence in the area of expertise [215]. The overall proposed qualitative sample size is also in line with Baker and Edwards recommendation of sample size selection. The proposed details of the sample for both the quantitative and qualitative phases are shown in Figure 78. Figure 79 contains additional details of the participants for the qualitative phase.

After receiving ethical approval, the questionnaire was given to EESs studying in the departments across the universities under consideration. Semi-structured interviews were conducted on a 'critical case' basis from the quantitative results. Interview participants were those who are in key positions and with knowledge into the EESs' experience of engaging with Continuous Professional Development.

Job Role	Justification for inclusion in Qualitative sampling	Sample size
Professional Development and Lifelong Learning representative of the Departement	They engage with EESs in the context of career/Professional development	1
Professionals in charge of education/pedagogy in the Department	They engage directly with EES in the context of improving knowledge and skill base.	1
Professionals involved in university/industry collaborations in the department	They are engaged with organisations in industry and are aware of professional development requirement.	1
University EESs	They are adding the EES's perspective on engagement with Continuous Professional development.	1
	Proposed Qualitative Sample Size for each University	4

Figure 79 Proposed Qualitative Sample details for each university

6.6 Stages in Research

The research will be divided into following stages.

6.6.1 First Stage: instrumentation, piloting and data collection for Quantitative Phase

This stage included instrumentation, piloting of instrument for the quantitative phase of data collection and commencement of data collection; the piloting of the quantitative instruments was carried out using proximal subjects at the University of York. Necessary adjustments were made to the format of the questionnaire based on the results of the pilot studies.

The piloted questionnaire was then be administered to the sample population; starting with sample populations at the White Rose Universities in the NE and followed by the sample population at the Obafemi Awolowo University, University of Ibadan and University of Lagos. In the first phase, the quantitative Hypotheses addressed the relationship between the level of Motivation towards engagement with CPD and LECPD for EESs. In the quantitative phase, the instrument was administered to collect data related to CPD engagement and motivation towards engagement with; data was gathered from 510 students across six universities in Southwest Nigeria and the North of England as shown in Figure 80.

S/N	Geographic region	Quatitative data sample size	Qualitative data sample size
1	SWN	401	12
2	NE	106	8
Total		353	20

Figure 80 Collected Data sample details

This specific sequence was due to logistic reasons, so as not to have to travel to Nigeria more than once and to have identified potential areas of query based on the sample population in the UK. The quantitative data is then analysed using descriptive and inferential statistic; these include T-tests for independent samples, one-way analysis of variance, T-tests for the correlation coefficient(significance of correlation) and regression analysis [222]. The results of the analyses were then utilised to inform the design of qualitative phase; this includes the selection of participants, refining qualitative research and interview questions. Figure 81 illustrates the procedure for this implementation.

6.6.2 Second Stage: instrumentation, pilot and data collection for qualitative Phase

This stage followed sequentially after the quantitative phase. The design of this phase was informed by and evolved due to the results from the quantitative phase. 20 Semi-structured Interviews were conducted as shown in Figure 80, and interview data analysed. The 20 semi-structured interviews were used to explore aspects of engagement with CPD from an interpretivist point of view. The procedure for this stage is illustrated in Figure 81.

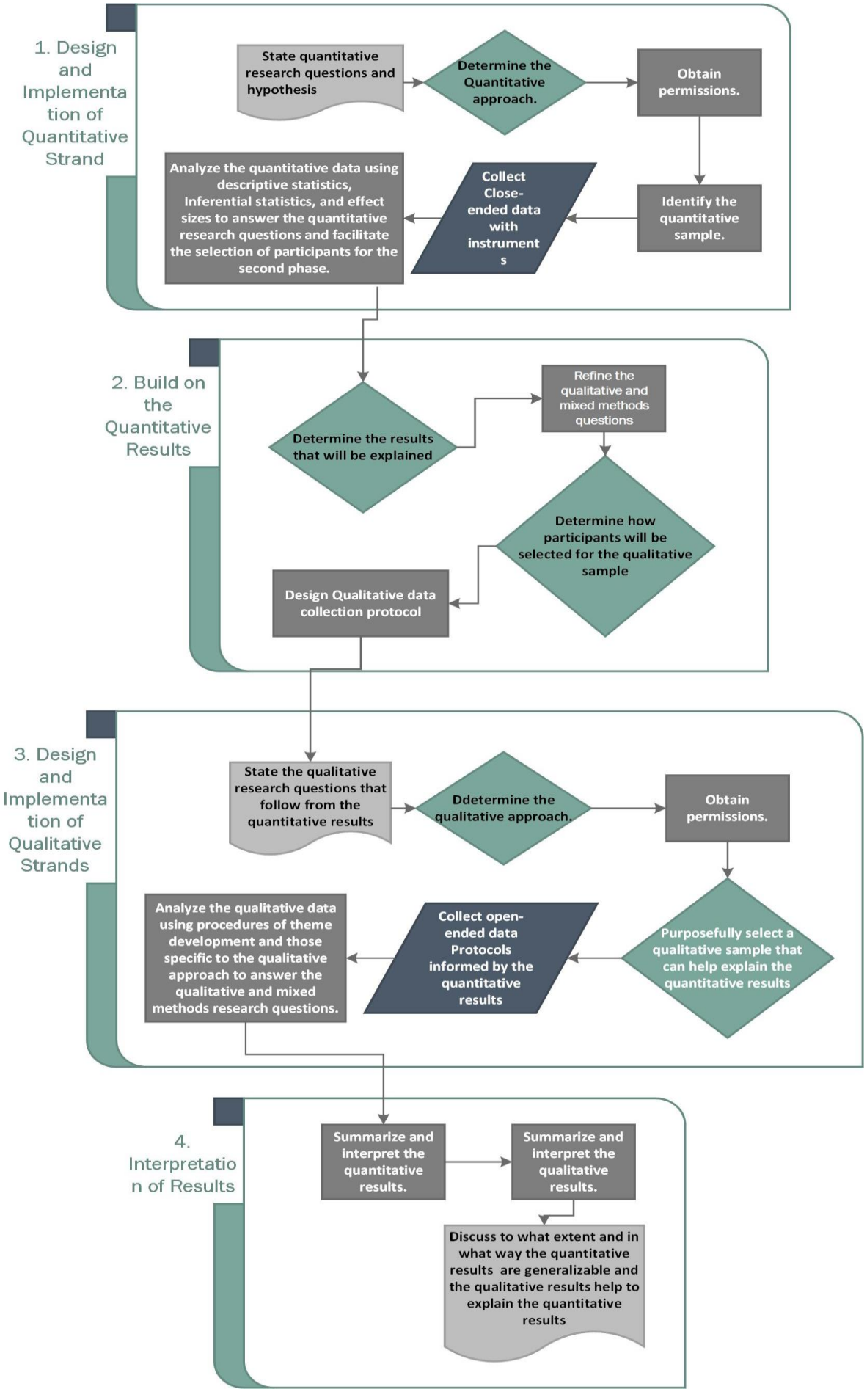

1. Design and Implementation of Quantitative Strand
State quantitative research questions and hypothesis
Determine the Quantitative approach.
Obtain permissions.
Identify the quantitative sample.
Collect Close-ended data with instruments
Analyze the quantitative data using descriptive statistics, Inferential statistics, and effect sizes to answer the quantitative research questions and facilitate the selection of participants for the second phase.
2. Build on the Quantitative Results
Determine the results that will be explained
Refine the qualitative and mixed methods questions
Determine how participants will be selected for the qualitative sample
Design Qualitative data collection protocol
3. Design and Implementation of Qualitative Strands
State the qualitative research questions that follow from the quantitative results
Ddetermine the qualitative approach.
Obtain permissions.
Purposefully select a qualitative sample that can help explain the quantitative results
Collect open-ended data Protocols informed by the quantitative results
Analyze the qualitative data using procedures of theme development and those specific to the qualitative approach to answer the qualitative and mixed methods research questions.
4. Interpretation of Results
Summarize and interpret the quantitative results.
Summarize and interpret the qualitative results.
Discuss to what extent and in what way the quantitative results are generalizable and the qualitative results help to explain the quantitative results

Figure 81 Basic Procedure for implementation of Explanatory design

Adapted from [14]

6.6.3 Third Stage: Data Analysis

The Data analysis involved an independent analysis of the data collected from each case (University) and comparative analysis of the configuration of data and results across cases (universities).

Quantitative data was analysed with the aid of SPSS and the results compared; the analysis involved descriptive and inferential statistics. Qualitative data was analysed with the aid of qualitative software such as NVIVO. The interviews were recorded, transcribed and iteratively coded. General procedure for data analysis as illustrated in Figure 82 was followed while carrying out the analysis to ensure good quality data analysis.

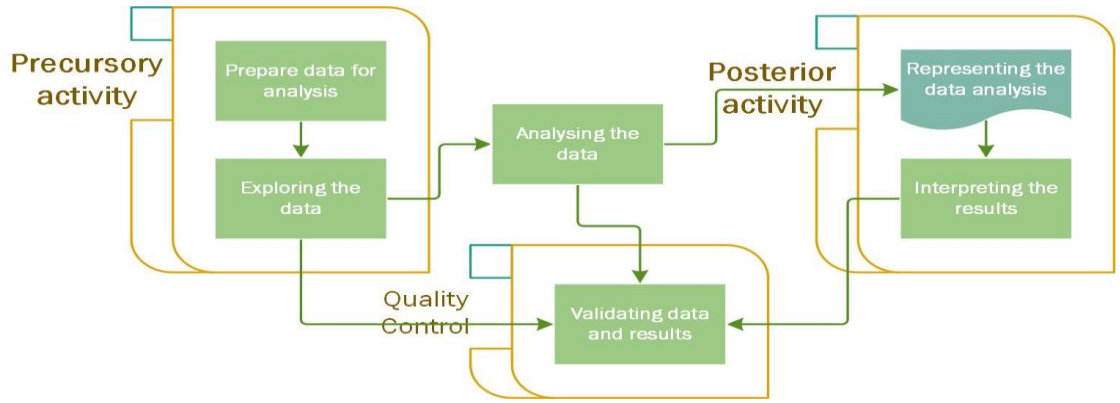


Figure 82 General Procedure in Data Analysis

Adapted from [14]

6.6.3.1 Quantitative Analysis: Statistical measures for quantitative analysis

In undertaking research, the importance of selecting the right variables for analysis and utilising the appropriate analysis method cannot be overstated. The choices made in this regard must as much as possible reflect the complexity of factors being considered. These choices are important when engaged in research focused on learning, knowledge transfer and motivation. This is because most related constructs and concepts are multidimensional. As such multivariate analysis methods are used extensively in this study [218, 223]. The statistical methods below are used in the analysis of the

quantitative data collected in the course of this study, the data computation ad analysis is carried out using SPSS and Excel packages. This subsection only highlights some of the statistical methods that would be used. Details of their application would be contained in later sections.

6.6.3.1.1 Factor Analysis

Factor analysis is a parsimonious branch of statistical science that is well suited to the type of research studies focused on human behaviour and psychology hence, it is well suited for this study. According to Harman (1976), the origin of Factor analysis can be traced back to the need for "mathematical models for the explanation of psychological theories of human ability and behaviour" and is linked to a branch of statistical analysis called parsimony [224]. Factor analysis is useful for examining if there is a connection between a set of observed variables with a group of unobserved Factors; it evaluates the linear relationship between the variables and factors. [225]. Factor analysis is a reductionist data analysis technique that is often used to explore the underlying relationship and patterns with data and is very useful in exploring multidimensional constructs and identifying key constructs and concepts within. Factor analysis uses mathematical procedures to examine the variances of observed variables and identify clusters of shared variance and in so doing glean underlying patterns [226, 227].

Factor analysis allows for the identification of the hypothesised latent variables that represent a broad set of variables. Factor Analysis is of relevance in this inquiry which is an exploratory sequential study to discover the factors that best represent the multiple dimensions of the interaction of CPD motivation and time perspective. In identifying the number of factors that effectively represent a multidimensional construct, there is a need to evaluate: the theoretical components of the construct; the logic behind or purpose of required construct and also statistical consideration of the relationship between the factors.

According to James Brown (2009), factor analysis is "applied to a single set of variables when the researcher is interested in discovering which variable in the set form coherent subsets that are relatively independent of one another".

Principal components analysis (PCA), exploratory factor analysis and Confirmatory factor analysis (CFA & EFA) are three procedures of carrying out factor analysis. PCA and EFA are used for dimension reduction, while CFA is used for theory testing [228, 229]. PCA Analyses Variance while EFA analysis Covariance; PCA focused more on the Variance Unique to each variable, while EFA is more focused on variance common among variables [229]. EFA is used to confirm or account for the relationship among established variables, i.e. common variance. PCA- Explores patterns emerging in data and examines

all variation. For this study, exploring the relationship between LECPD and motivation a PCA is used; as this study is more interested in patterns emerging in the data [228].

Factors generated using factor analysis are new hypothetical latent variables; the number of factors is usually less than the number of Variables. The linear relationship between them is indicated by Loadings which are, in essence, correlation Coefficients. The factor loadings' are explored to determine the nature of the factors (hypothetical variables) and the existing variables components they represent. The correlation coefficient can range from 0.00 to 1.00 and 0.00 to -1.00 [228, 225].

Interpreting factor loadings depends on the researcher, the construct being researched, and the approach taken in a particular area of study. To understand the factor loading an arbitrary cut-off point needs to be selected; for behaviour related research, this is often a factor loading of 0.30/0.40. Although depending on the observed patterns and theoretical underpinnings, a lower or higher cut-off point can be selected.

Also, of importance is the commonality in the results of the factor analysis. The commonalities inform us about how well the variables are accounted for by the factor analysis. The commonality is the common variance; in essence, the variance of the existing variable across the factor (Hypothetical latent variable). A positive or high communality shows that the components effectively represent the existing variable, i.e. the variation or variance in the value of the existing variable is explained by the new factors (hypothetical variables) [228].

Selection of Components

To determine the factors that are to be selected, some combination of the following is usually applied: Kaiser's Stopping rule, Scree test, number of non-trivial factors, a priori criterion, Percent of cumulative variance. i.e. a combination of different methods can be used to make the most persuasive possible argument for factors selected [230]

When Using the Kaiser's Stopping Rule as selection criterion Factors included are those with eigenvalues > 1.00. Using the Scree Test, factors are selected as the slope of the scree plot approaches zero; as the plot stops descending and becomes flat, ignoring the transition point. The factor being trivial or non-trivial can also be used as selection criteria.

Trivial factors do not have up to two or three variables above the cut-off point of 0.30 hence not selected. Factors can be chosen using a priori criterion based on existing research or theoretical underpinning. The percentage contribution to cumulative variance can also be used as a selection criterion by selecting factors that contribute the most to the cumulative percentage's variation, ignoring factors that only contribute minimally. This selection criterion is important because the higher

the variance, the higher the explanatory power, a cumulative variance or explanatory power of between 50 to 60% is good enough for most researchers, 10 to 30% is very good for research related to human behaviour [230, 218].

Rotation

Rotation involves rearranging the results of factor analysis about a three-dimensional axis to enhance the interpretation of results. Rotation of the sums of Square loading enables another perspective of the relationship between the hypothesised latent variable (factor) and the existing variables to come to light. In a case where the said relationship in the form of the hypothesised structure of factor loadings are not apparent from the initial result of factor analysis, a rotation might reveal a commensurate hypothetical structure of loadings that is more distinct and easier to interpret [225]. Rotation enables more straightforward interpretation by seeking to achieve a simple optimal structure in which each factor represents a trenchant agglomeration of apposite variables characterised by relatively high factor loadings on a soupçon of factors [227, 231, 223, 218].

The interpretation of the results of factor analysis is subjective and arbitrary, so also is the selection of factors. To this effect, there are many methods of carrying out the rotation of the initial result of factor analysis with each method effectuating a different interpretation. Arguably the widely used and preferred rotation method used in this study is the varimax rotation. The varimax rotation seeks to achieve orthogonal factors which are independent of each other and have as little overlap as possible. The Varimax rotation increases the prominence of outstanding variables by maximising their loadings ($\rightarrow 1$) while reducing the prominence of others by minimising their loadings as much as possible ($\rightarrow 0$). In so doing Varimax rotation maximises the variance of square loadings for each hypothesised latent variable (factor); hence each factor identified by Varimax rotation as much as possible reflects a distinct subset of variables as opposed to all the variables [218, 225]

Note:

An item variable having a low factor loading and in essence, not having a correlation with either of the factors does not categorically mean that there is no relationship between the hypothesised latent variable and the existing variable or that theoretical conceptualisation that postulated link is wrong. It only means that the link in question is not apparent for the type of participants sampled by the research. Although It is generally recommended that a factor should have at least three variables/items, there are conditions under which factors that have less than three variables can be

adopted. When there is theoretical support, and the variables that load on the factor have a high factor loading or level of correlation (possibly > 0.7) [232, 227, 233]. In all, the primary goal in selection of rotation should be achieving a simple structure representative of the interaction between the base variables of items.

Factor Analysis in this Research

Factor analysis within the context of this research is used both to reduce items/variables and to explore how certain variables interact together to derive a resultant—using factor analysis to ascertain how variables that are theoretically proven to interact together can be combined. In effect, while carrying out factor analysis, not only the direct results of factor analysis need to be considered, the theories underlying the constructs being examined must also be considered. To be able to utilise the results of the factor analysis in even further analysis, a composite variable is created, which represents the value of the generated factor for every individual in the data set. The composite variables are sometimes referred to as factor scores; there are a variety of methods for computing and using factor scores. The choice of factor scoring method to be used depends on the data, constructs being examined and the preference of the researcher. In this study, a method using weighted sums above a cut-off value is utilised this is because this approach takes into consideration the items loadings values while cutting off variables that do not load on the factor to a reasonable extent. The cut-off point is often arbitrary and based on theoretical considerations of how the variables/Items should interact and what makes logical sense on the basis of theoretical knowledge of constructs being examined.
The factor loadings for variables above the selected cut-off point are multiplied with the respective observed value of the same variable. The value derived from this multiplication is then summed up (items with negative factor loading would be subtracted) to give the values of the composite variable. This method ensures that the composite variable (Factor score) is stable across samples. It also ensures that the contribution of each observed variable to the value of each composite variable is in proportion to the variables factor loadings. This method also has the added advantage of the composite variable being to a similar scale with the observed variable, making the composite variable more directly interpretable and understandable in the course of the research. Adoption of this method in this study is based on an appreciation of the advantages offered in terms of directly understand the data [234].

6.6.3.1.2 T-Test

The T-test is a statistical hypothesis test based on the student t-distribution that can be used to evaluate if there is a significant difference in the mean of two sets of data. The T-test is often

considered as a special case of an Analysis of Variance (ANOVA). There are two types; there is the Independent sample T-test, and the paired sample T-test. The independent sample T-test assumes that the data sets being compared are independent groups, but the variables being explored are the same While the Paired t-test assumes that the group is the same, but variables are different or same variable but at different times. In using the T-test, there is an underlying assumption that the data is parametric and based on random sampling. It is also assumed that one of the variables is a categorical variable and other is a continuous variable. In the course of this study, both types of T-tests are utilised [218].

In carryout, the t-test the results that are most important are the mean of the variables, the significant of the result of the Leven's test for equality of variances, the significant level of the equality of means. The Levene's test determines if equality of variances is to be assumed or not; If the Leven's test is significant, inequality of variance is assumed. The significance level for the T-test for equality of mean, based on the assumed equality or inequality of variances, is then used to figure out if there is significant difference in the mean of both groups or variables [218].

6.6.3.1.3 Analysis of Variance (ANOVA)

ANOVA is a method of comparing means of more than two groups, the typical null hypothesis for the ANOVA is that there is no statistically significant difference between the means of the groups. The underlying assumptions are the same as the T-test; in fact, some would go as far as to describe the T-test as a particular case of ANOVA. The basic assumptions of the ANOVA are that the data is normal, parametric and that the random sampling was utilised. There is also an assumption that one of the variables is categorical (independent variable), and the other variables are continuous (dependent variables) [218, 235].

In carrying out the ANOVA, the results that are most important in the context of this study are 1) Difference in means. 2) The significance level of the ANOVA to determine the overall significant difference between the groups. 3) The significance of the results of the Turkey test pinpointing the actual nature/patterns of the differences in means, i.e. how the groups differ [218, 235]. The one-way analysis of variance is used extensively in this quantitative research to test the differences between sub-groups.

6.6.3.1.4 Reliability test

Reliability in quantitative analysis is about the extent of reliability of a measuring instrument; Reliability tests are measures of internal consistency. There are two primary forms of reliability tests,

the alpha Coefficient (Cronbach alpha) and the Split-half technique. The alpha coefficient approach examines the inter-item Correlation of the Instrument to give a coefficient (referred to as Cronbach's Alpha) which reflect the extent of inter consistency. There are varying positions on the level of Corban Alpha that is acceptable; nevertheless, it is generally accepted that anything less than <0.60 Represents and unacceptably low level of internal consistency. The significant difference between this approach and the Split- Half approach is that as indicated by the name, the items are split into matched halves. The correlation coefficient between both halves is used to determine the Split-half coefficient of reliability as with the Cronbach alpha any value <0.60 Represents and unacceptably low level of internal consistency. In Cronbach, alpha is also calculated for both split halves.

In this study, both methods will be used to examine the reliability of instruments designed to measure the level of engagement with CPD. The other instruments (measuring motivation) used in the study have been tested for internal consistency by previous researchers who developed the instruments [218, 222].

6.6.3.1.5 Correlation

Correlation implies the nature of the relationship between two variables in terms of how they vary relative to one another, i.e. how changes in one variable affect the changes in another variable. The correlation coefficient represents the linear relationship between these variables in terms of their variance to one and the other. In this study, the correlation coefficient is used in evaluating relationships between many critical constructs and variables being examined. The coefficient of Correlation ranging from -1.00 to +1.00 denotes the nature of this relationship; Correlation analysis helps in determining: 1) if there is a relationship as indicated by the significances level of correlation coefficients. 2) The direction of the relationship, as indicated by the positive or negative value of the coefficient, with a negative value indicating an inverse relation. 3) The magnitude, indicating the extent of the relationship or its effect size [218, 222].

6.6.3.1.6 Regression

Regression analysis is a method of analysis that enables the prediction of a dependent variable based on some independent variables. With the dependent variable being the explained variable while the independent variables being the explanatory variables. The prediction is based on the covariance of the variables in question. Regression analysis is utilised in this study as it allows for the prediction of the value of LECPD using the variables representing the various dimensions of motivation (AM, SDM and TP). Stepwise multiple regressions used in this study enables the determination of the variables

that best serve as predictors of level of engagement with CPD and determine the best fit-model for predicting LECPD [218, 222, 235].

In carrying out multiple regression, some of the essential results are 1) the value of Adjusted R-Squared (a more accurate variant of the R-squared) which denotes the explanatory power of the model, by illustrating the level of variance in the dependent variables that is explained by the independent variables. 2) The significance level of the regression. 3) The standardised coefficient Beta coefficient. 4) Collinearity statistic and VIF which indicate multicollinearity, which is undesirable. A VIF level of less than 10 is acceptable [218, 236].

According to Carsten et al., "Collinearity refers to the non-independence of predictor variables" (Dormann, et al., 2013). In regression, analysis care must be taken to avoid multicollinearity which occurs when there are numerous covariates in the model and the level of Correlation between the some of the independent the variables is very high. Multicollinearity results in the incorrect prediction of the relationship between explained and explanatory variables and as such researchers need to be especially careful about this when carrying out regression [237, 236, 238].

6.6.3.1.7 Canonical Correlation

In this research, Canonical Correlation is used to get a holistic view on how all the variables of LECPD (Independent variables) and all the variables of motivations interact with one another and examine which of this links are significant. Canonical Correlation is a form of analysis that can be utilised to compares a set of independent variables (Covariate Group) against a set of dependent variables (Criterion variables group). Some describe bivariate correlation and Multiple regression analysis as particular forms of Canonical Correlation. Canonical Correlation examines how the variables interact with each other through latent variables and how each variable load on said latent variables [218, 239].

Canonical Correlation is useful in evaluating the relationship of a multidimensional construct (independent variables) and other variables without needing to combine the effects of the multidimensional construct or focus on a particular subgroup. This method allows the researcher to get a holistic picture of how all the sub-variables that make up the independent variable interact with all the dependent variables. Canonical Correlation allows the researcher to holistically view the pattern of interaction between all the variables and determine which of the links are statistically significant—also allowing the researcher to understand the extent of shared variances between the two sets of variables across all canonical functions.

In using canonical Correlation, the research needs to 1) examine the statistical significance of the entire canonical model. 2) Then examine the number of Canonical functions or Latent variables looking at explanatory power and statistical significance of each factor to determine which to exclude or included. 3) Then examine the effect size indicated by the wiki Statistic, with value <0.7 being considered acceptable. 4) Examine the Canonical loadings and coefficients, which some consider to be the most acceptable approach to interpret canonical Correlation. Canonical loadings can be interpreted in the same manner as factor loadings in factor analysis [240, 239, 241].

6.6.3.2 Qualitative analysis

The Qualitative analysis was approached using a combination of models and techniques recommended by Philip Burnard and those recommended by Boyatzis [242, 243]. Philip Burnard recommends a 14-step method for carrying out qualitative analysis. This method was very informative in carrying out qualitative analysis process, although some steps were achieved using Qualitative analysis Software [242]. The qualitative analysis was also informed by Boyatzis recommendation regarding thematic analysis and code development, taking into cognisance Boyatzis postulation regarding data condensation and coding into themes [243]. Richard E. Boyatzis insights were particularly crucial in bridging the philosophical dissonance that exists between the quantitative and qualitative aspects of the research [243, 244]. The transcription process was vital to achieving effective qualitative analysis as such Davison's postulation, and Sandelowski's Model informed the process [245, 246]

According to Davidson, transcripts should not be presented as inevitably transparent, but as the result of careful deliberation and a sequence of choices requiring expatiation [245]. The guiding principle regarding the transcription process employed in this study is Sandelowski description of the ontology of transcription as "both realist and constructed". The transcription process was approached in a manner that took in cognisance the constructed reality of the research process without forgetting the need to be selective. Realities created by the approach to research, the semi-structured nature of the interview process and the constructs being examined [246].

The four critical questions advocated by Sandelowski in the selection of the transcription process were utilised in deciding the transcription approach. The question revolving around 1: The necessity of transcription for the research goal 2) What parts of the interview should be transcribed or discarded. 3) notation system that needs to be used in the transcription process.4) The supplementary purpose of the interview would serve [246]

Pursuant to the pragmatic outlook guiding the research, interviews were entirely recorded, and verbatim transcription was carried out. This ensured all crucial analytical information was captured and preserving the interview for analysis, future research or scrutiny. The cross-cultural nature of the interview and varied use of English across cultures also made it essential to carry out full transcription to ensure that the context of important aspects is fully preserved to aid in establishing meaning and capture of communicated information content. The handling of the data is especially important if the secondary analysis is carried out in future beyond the remit of this particular aspect of the study. The need for selective was catered for through the structured interview question, the design process focused on research goals, provision of adequate brief during the interview process to establish context and selection of aspects of transcript used for further analysis.

Further analysis was carried in line with the exploratory sequential design of the study, and this informed the aspects of the transcript selected for said further analysis. Further analysis was done after categorisation of the transcript and imputation into Qualitative analysis Software. Excel was used to carry out preliminary categorisation and preparation of the data to be entered into the NVivo Qualitative analysis Software, NVivo is then used for further analysis.

Philip Burnard 14 steps approach that guided the analysis are as follows: 1) Notes taken during the interview. 2) Transcripts read through and notes made. 3) The transcript is read through, and headings or categories (nodes and sub-nodes) made. 4) Headings are surveyed and grouped under high order headings, 5) all headings and categories are reviewed, 6) Test validity of head categories, 7) Transcripts are read alongside headings and categories, ensuring all relevant aspects of interviews are covered by categories and headings, 8) all Transcripts are coded to categorisations and headings (nodes), 9) Coded transcripts under each heading are collected, 10)all coded transcript and categories are aggregated, 11) validity of categorisation process is once again examined, 12) all categories and data are aggregated alongside all records, all records are kept including Transcripts and interview recordings. 13) The writeup proceeds heading by heading when referencing transcripts and records. 14) The need to link data to literature or not is determined; the writeup proceeded on this basis [242].

Boyatzis recommendation was used to guide the process of coding, and the use of Excel and NVivo enabled the process to be accelerated. While carrying out the analysis Bazeley recommendations of avoiding over-reliance on themes and direct quotes are taken into consideration [247]. Bazeley's postulation on the use of NVivo in the qualitative analysis is also utilised to guide the use of NVivo. Also taken into consideration was Bazeley recommendation on integrating qualitative data in mixed-method research [244]. The results of the analysis are presented in Chapter 0.

6.7 Ethics and Ownership

Ethical approval was given for the study by the Physical Sciences Ethics Committee (PSEC) at the University of York, UK, Ethics reference code is Gbadebo031116. The participation in the study was on the basis of informed consent; efforts were put in place to ensure that participants remain anonymous.

Chapter Seven

7 Investigating Students' perspective of Level of Importance of aspects of Continuous Professional Development

As with any concerted effort to encourage growth and development, there is a need to establish mechanisms for observing progress. To encourage students to engage with continuous professional development (CPD) there is a need to understand students' engagement and the level of importance (LP) that students attach to varying aspects of CPD across subject areas, skill areas and activities types. At current, there is limited research into students' perception of the LP of varying aspects of CPD; and furthermore, there is no specific study elaborating on students' perspective on said individual aspects. This Chapter argues that students attach varying levels of importance to different aspects of professional development ranging across said areas. Firstly, the Concept of CPD and the items of professional development considered in the study are introduced. Then, the chapter elucidates on the relevance and preponderance of understanding student's perception on the LP of certain aspects of CPD. After describing the data collection and analysis process, light is shed on patterns of note in the data, especially those that strongly align with or stand in contrast to expectations. Lastly, a description is given of plausible further applications of the results of this study particularly regarding CPD related research.

7.1 Introduction

The global job market is highly competitive, and there is a need to ensure that university graduates are highly competent and equipped with directly transmutable industrial grade skills and knowledge. The importance of students developing a wide array of skills, knowledge and competences are well-established. Especially as regards to enhancing future prospects. Universities encourage students to engage in professional development in one form or another as one of the mechanisms for developing said Direct Transmutable Industrial Grade Skills & Knowledge (DTIGKS), although not always so named. Apart from traditional mechanisms for imparting knowledge such as classroom-based learning, institutions have embraced an array of professional development approaches ranging from competitions to awards and internships. Although universities may define and label their activities differently they are essentially continuous professional development (CPD) activities [1, 2, 3] [248, 249, 250].

At current, there is limited research on students perceptive of the LP of varying aspects of CPD with no specific study elaborating on students' perspective on said individual aspects. In this article, the concept of CPD and the items of Professional Development in the context of students are introduced. It discusses and sheds light on the relevance and preponderance of understanding students' perspective of LP of certain aspects of CPD.

7.2 Level of Importance of CPD

The relevance and preponderance of understanding students' perspective on LP of certain aspects of CPD cannot be overstated when exploring ways that ensure students develop into well rounded individuals. Particularly in pursuit of developing graduates with DTIGKS, who can 'hit the ground running' when they enter the industry (Labour Market). This is important given the nature of the supply and demand for skills in the engineering discipline set, described by some as 'replete with uncertainty and variable practice' [251].

The need to improve the level of skills and knowledge can also be seen through the lens of massification of higher education, a transformation from elite to masses focused higher education system. The massification of higher education has resulted not only in increased numbers of students and diversity in higher education, but also in intensification of inequality, deterioration of service quality, and increased uncertainty of outcomes for potential graduates in term of securing a place in the labour market. In turn, this has created a need for students to distinguish themselves (beyond the boundaries of traditional degree offerings) to secure a good position in the Industry [23, 24, 252]. Student centric CPD activities within universities have offered an important route for students to advance accordingly, hence reinforcing the need to understand students' perception of importance of aspect of CPD.

As with any concerted effort to encourage growth and development, there is a need to establish mechanisms to observe progress. In an attempt to encourage students to engage with CPD, there is a need to understand their engagement and the LP they attach to varying aspect of CPD across a disparate range of subject areas, skill areas, and activities types. Determining the LP is also critical to research that revolves around understanding the nature of CPD and engagement with CPD, as well as the interaction of CPD with other factors; For example evaluating level of engagement with CPD within an institution.

This research is important as it can enable those responsible for students' engagement with professional development to understand: 1) What students' perspectives are regarding importance of

activities, skills, and subject area. 2) How important students think varying aspects of CPD across activities, skills, and subject areas are regarding professional development. 3) To measure and track changes in students' perspective on LP. 4)To measure and track how students' level of engagement affects their perspective on importance of aspects of CPD 5) As an effective research tool to conduct further investigations into professional development of students. 6) It can also inform institutions on which areas of professional development to focus on, in order to meet student needs.

7.3 Aspects/Items of Professional Development

Although there is no universally agreed upon definition of CPD, it can be approached from several perspectives, illustrated in Fig. 1: as a process or skill, in terms of knowledge or skill content and in terms of activities engaged in by an individual [25, 27, 31, 32, 5, 4, 7, 6, 33].

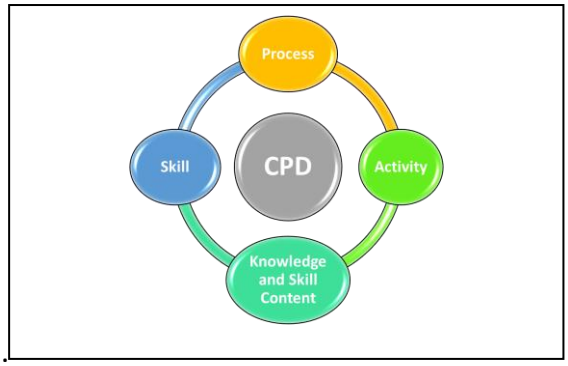


Figure 83 Perspectives/Approaches to CPD

The skill perspective shown in Figure 83 is when CPD is viewed in terms of an individual's ability to engage with auto-didacticism. 'Activity' describes a perspective of CPD where, to develop professionally, an individual must engage in a series of activities. The 'Process' approach/ perspective of CPD describes when CPD is termed as a procession of time bound activities an individual engages in to advance professionally, i.e. not solely what is engaged with but how it is carried out. 'Knowledge and Skill Content' of CPD addresses what knowledge and skills an individual needs to further acquire for professional development.

The following aspects of CPD examined in this research are the perspectives of 'Skill', 'Knowledge and Skill Content' and 'Activity'. These perspectives are considered highly suitable for this research whose focus is examining students' perspective of LP for aspects of CPD.

7.3.1 Activity

Engineering related organisations and institutes often times, view activities related to CPD in categories as shown in Figure 84. These activities form the Component items of this aspect of CPD. Some of the items are divided into three subcategories [253, 254].

7.3.2 Knowledge Content

Some engineering related organisations and institutes often view the content of knowledge in terms of subject areas as show in Figure 84 [255, 256].

7.3.3 Skill Content

Some engineering related organisations and institutes often view the content of skills in terms of skills categories as show in the Figure 84. Among the skill categories shown above, Generic Skills(GS) are of interest, given the established importance of generic skill for potential graduates [251, 257].

In the context of this research, aspects of CPD are defined as the three-main perspectives that are considered relevant to the paper namely; Category of Activities (CA), Skill Categories (SC) , and Subject Area(SA). They are considered ideal for the research and are used as the basis for the questionnaire utilised in this research. Items are the actual individual units that are engaged with in terms of CPD, which are under said Aspects. Some of the Items shown in Figure 84 contain specific terms that are defined as Sub-Aspects but are omitted due to space constraint.

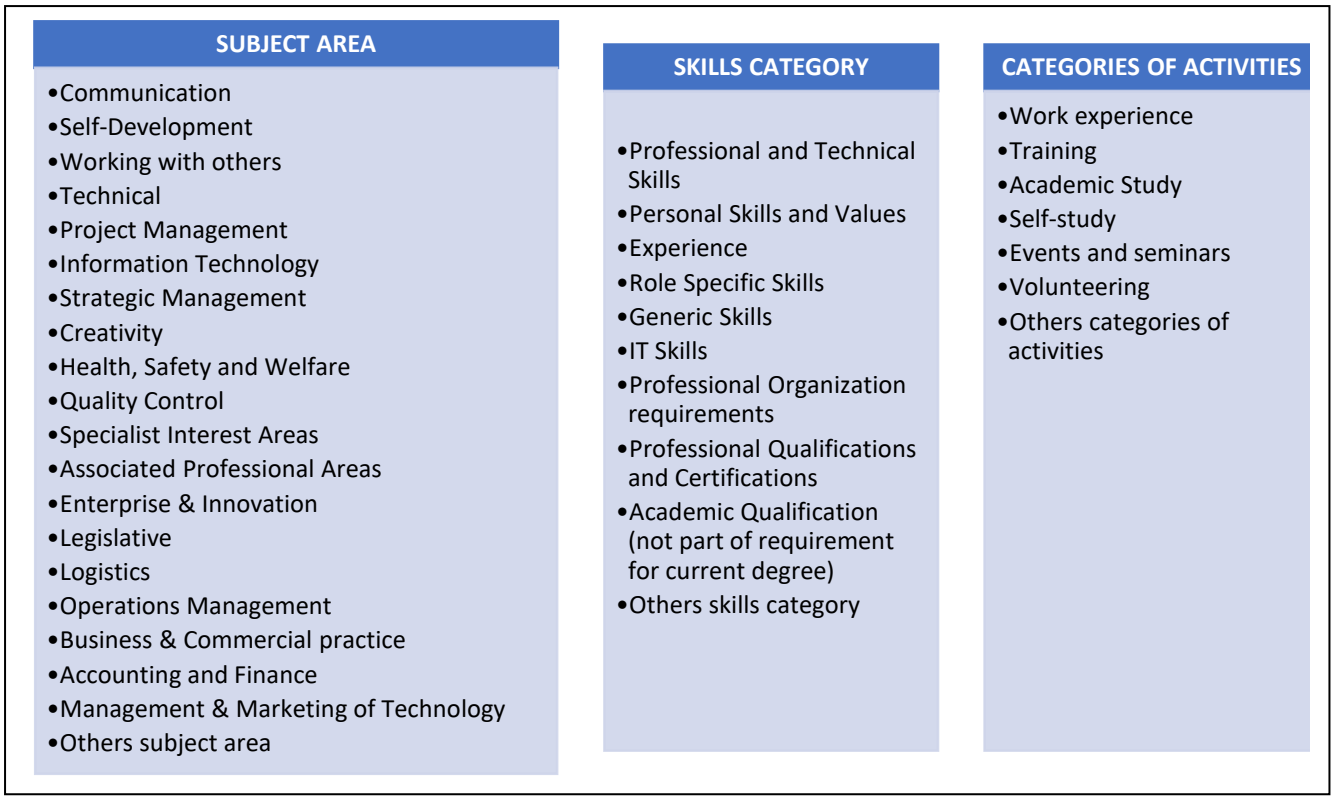


Figure 84 Aspects/Items of CPD

7.4 Research Methodology and Analysis

A Quantitative research method using online survey was utilised in exploring student's perspective on LP of aspect of CPD. This section presents the results of the mini study for this research.

Research Questions

The study attempted to answer several questions:

4. What LP do students attach to varying aspects and items of CPD?
5. Do students attach different levels of importance to different aspects of professional development ranging across said groupings?
6. Does the LP attached to aspects of CPD vary across demographic features?

The related Hypotheses are a) Individual Students attach different LP to items of CPD. b) There is a difference in the Mean LP attached to different CPD items of within a disparate range of aspects of CPD. c) Mean LP is different for different aspects of professional development ranging across said

disparate range. d) There is a difference in the mean LP attached to aspects of CPD across demographic groupings.

7.4.1 Questionnaire

The Questionnaire was developed using Items based on Aspects and Items of CPD consisting of Skill Categories, Subject Areas and Categories of activities. The Categories of Activities is the further divided into 6 Subcategories including Work experience, Training, Academic Study (not part of university degree), Volunteering, Events and Seminars, Self-Study activities, each Sub-Aspects then had their individual items. The only sub category of skills was Generic skills, and was included based on previously mentioned reasons. The questionnaire was designed to be strictly for online distribution, therefore Pick-Group-Rank type questions were used. The participants were asked to drop items in each category depending on how important they thought it was, the LP was based on a 5-point Likert scale ranging from extremely important to not important at all, with an intermediate of moderately important. Furthermore, the questionnaire collected demographic details of students, the most paramount being; gender, institution, level of study and ethnicity.

7.4.2 Study

The Level of importance study was conducted using an online survey. It was split into three major subgroups: skill area, subject area and activities. The activities subgroup is further split into seven subgroups. 36 engineering students across three universities in the north of England completed the online survey. They were asked to organise these subgroups based on the LP of the items to pprofessional development. The data collected was then analysed using SPSS and excel.

7.4.3 Approach to Analysis

The results are approached using the mean value of the respective items across all participants. This approach was used to simplify data analysis in excel, SPSS was used to examine the normality of the data. Other means of analysis such as T-tests were also utilized.

7.5 Analysis and Discussion

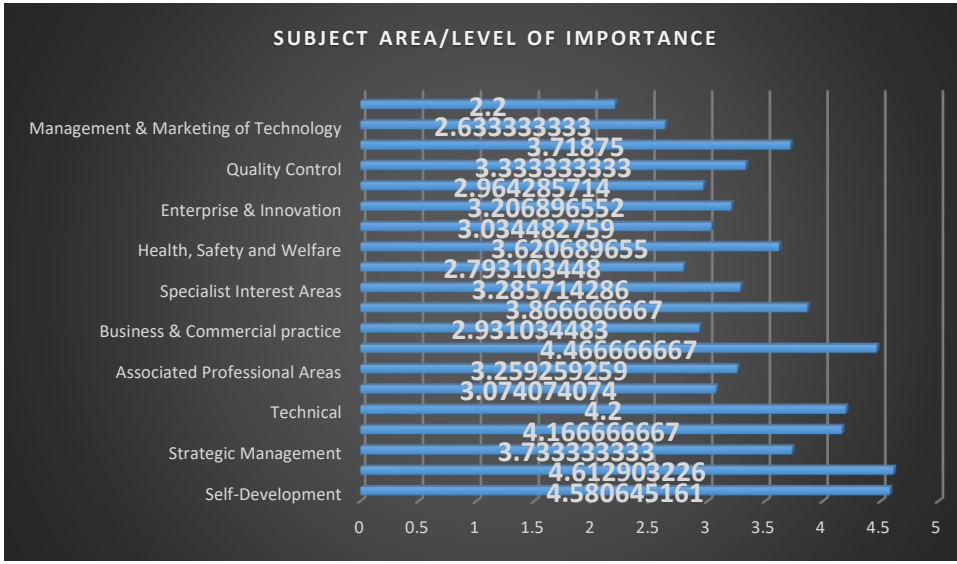
The results of this study show varying perceived LPs for varying aspects of professional development across the stated subgroups. This is supported by a high coefficient of variance see Figure 85 and the mean values for each item as displayed in Figure 86. The mean value for each item and aspect are used in chapter 8 to compute the value for the direct measure of level of engagement with CPD which is in turn used to establish the construct validity of the postulated measure for level of engagement with CPD.

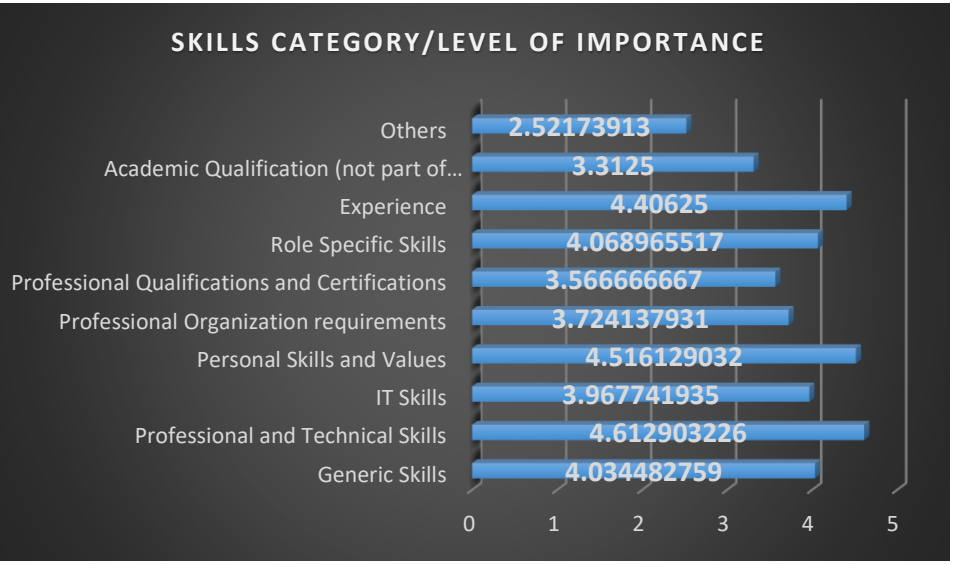
Difference in Level of Importance of Items within Aspects of CPD	SUBJECT AREA	SKILLS CATEGORY	Categories of Activities	GENERIC SKILLS AREA
Mean	3.551676	3.873152	3.781773	3.807749
Standard deviation	0.676239	0.630251	0.623479	0.896666
coefficient of variance	19%	16%	16%	24%

Figure 85 Difference in Level of Importance of Items within Aspects of CPD

7.5.1 Level of Importance within Aspects of CPD

Students attach different LP to items of CPD within and across aspect groupings. This is evident from the coefficient of variance in Figure 85. The LP ranged from 1(Not important) to 5 (Very important) with this, it is possible to identify the most or least important item within Aspect groupings.


SUBJECT AREA/LEVEL OF IMPORTANCE
Management & Marketing of Technology
Quality Control
Enterprise & Innovation
Health, Safety and Welfare
Specialist Interest Areas
Business & Commercial practice
Associated Professional Areas
Technical
Strategic Management
Self-Development
2.2
2.633333333
3.71875
3.333333333
2.964285714
3.206896552
3.034482759
3.620689655
2.793103448
3.285714286
3.866666667
2.931034483
4.466666667
3.259259259
3.074074074
4.2
4.166666667
3.733333333
4.612903226
4.580645161
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5


SKILLS CATEGORY/LEVEL OF IMPORTANCE
Others
Academic Qualification (not part of...
Experience
Role Specific Skills
Professional Qualifications and Certifications
Professional Organization requirements
Personal Skills and Values
IT Skills
Professional and Technical Skills
Generic Skills
2.52173913
3.3125
4.40625
4.068965517
3.566666667
3.724137931
4.516129032
3.967741935
4.612903226
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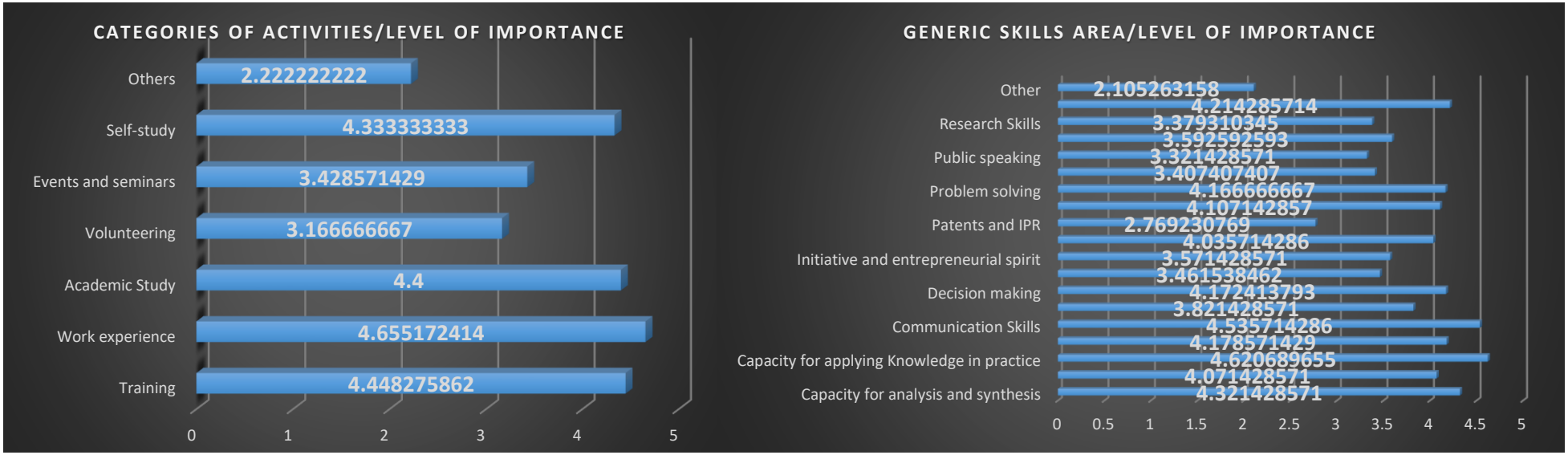


Figure 86 Level of importance of Items of CPD Across Varying Aspects

Among the defined SA items, the highest LP was attached to 'Communication' and 'Self-development' as shown in Figure 86 and Figure 87, the lowest LP was 'Management & Marketing of Technology'. The defined SC with the highest LP was the 'Professional and Technical skills' and the 'Personal Skills and Values', the lowest LP was attached to the 'Academic Qualification (not part of requirement for current degree)'; although 'Generic skills' did not rank among the highest SC it still ranked high in LP.

The defined GS areas with the highest LP are the 'Capacity for applying Knowledge in practice' and 'Communication Skills'. Among the defined CA, the highest LP was attached to 'Work Experience' and 'Training', the lowest LP was 'Volunteering'. To determine if the lists of items/aspects were comprehensive; an item for 'Others' was included in the subscales. Considering the collective data in each aspect of CPD, the 'Others' items was rated as the least important (as shown in Figure 87). Indicating that the participants do not think highly important aspect or items of CPD were missing in any category. This shows that the questionnaire was suited for the research in general. This changes a little bit when the data is considered along demographic lines (see Figure 87) as some items appear lower on the scale than the other 'Item' indicating that in future research targeting these groups, the questionnaire may need to be tailored.

7.5.2 Level of Importance with aspects of CPD taking in cognizance Demographic features

There is a total of 121 Items of CPD ranked according to their LP; the result of the ranking is summarized in Figure 87. The results of interest which are display in Figure 87 are split along the lines of Highest ranked items (highest LP), the lowest ranked items (Lowest LP) and the lowest ranked named items. For better intelligibility of the data, the lowest named items were included as the majority consisted of "Others" items.

LEVEL OF IMPORTANCE ITEMS WITHIN ASPECTS OF CPD		ITEMS WITH HIGHEST LEVEL OF IMPORTANCE WITHIN ASPECTS OF CPD				NAMED ITEMS WITH LOWEST LEVEL OF IMPORTANCE WITHIN ASPECTS OF CPD				ITEMS WITH LOWEST LEVEL OF IMPORTANCE WITHIN ASPECTS OF CPD			
		SUBJECT AREA	SKILLS CATEGORY	CATEGORIES OF ACTIVITIES	GENERIC SKILLS AREA	SUBJECT AREA	SKILLS CATEGORY	CATEGORIES OF ACTIVITIES	GENERIC SKILLS AREA	SUBJECT AREA	SKILLS CATEGORY	CATEGORIES OF ACTIVITIES	GENERIC SKILLS AREA
ALL		Communication	Professional and Technical Skills	Work experience	Capacity for applying Knowledge in practice	Management & Marketing of Technology	Academic Qualification (not part of requirement for current degree)	Volunteering	Patents and IPR	Others	Others	Others	Other
GENDER	MALE	Communication	Professional and Technical Skills	Work experience	Capacity for applying Knowledge in practice	Specialist Interest Areas	Academic Qualification (not part of requirement for current degree)	Volunteering	Patents and IPR	Others	Others	Others	Other
	FEMALE	Self-Development	Professional and Technical Skills	Work experience	Communication Skills	Management & Marketing of Technology	Academic Qualification (not part of requirement for current degree)	Volunteering	Patents and IPR	Others	Others	Others	Other
INSTITUTION	YORK	Working with others	Personal Skills and Values	Work experience	Capacity for applying Knowledge in practice	Management & Marketing of Technology	Academic Qualification (not part of requirement for current degree)	Volunteering	Patents and IPR	Others	Others	Others	Other
	SHEFFIELD	Communication	Professional and Technical Skills	Work experience	Capacity for applying Knowledge in practice	Accounting and Finance	Academic Qualification (not part of requirement for current degree)	Events and seminars	Patents and IPR	Others	Others	Others	Other
LEVEL OF STUDY	UNDERGRADUATE	Self-Development	Experience	Work experience	Capacity for applying Knowledge in practice	Management & Marketing of Technology	Academic Qualification (not part of requirement for current degree)	Volunteering	Patents and IPR	Management & Marketing of Technology	Others	Others	Other
	MASTERS	Communication	Personal Skills and Values	Work experience	Communication Skills	Logistics	Academic Qualification (not part of requirement for current degree)	Volunteering	Patents and IPR	Others	Others	Others	Other
	PHD	Communication	Professional and Technical Skills	Work experience	Capacity for applying Knowledge in practice	Management & Marketing of Technology	Academic Qualification (not part of requirement for current degree)	Volunteering	Project design and management	Management & Marketing of Technology	Others	Others	Other
ETHNICITY	BLACK	Communication	Personal Skills and Values	Training	Communication Skills	Specialist Interest Areas	Academic Qualification (not part of requirement for current degree)	Events and seminars	Patents and IPR	Specialist Interest Areas	Others	Others	Patents and IPR
	WHITE	Communication	Experience	Work experience	Capacity for applying Knowledge in practice	Management & Marketing of Technology	Academic Qualification (not part of requirement for current degree)	Volunteering	Patents and IPR	Management & Marketing of Technology	Others	Others	Other
	ASIAN	Self-Development	Personal Skills and Values	Self-study	Capacity for analysis and synthesis	Management & Marketing of Technology	Academic Qualification (not part of requirement for current degree)	Volunteering	Patents and IPR	Others	Others	Others	Other

Figure 87 Level of Importance of Items within Aspects of CPD

7.5.2.1 Highest Level of Importance

While the highest ranked item "Work Experience" appears across demographics lines in the Activities category, the same is seen for "Communication" in subject area. The most prominent skills aspects are "Professional & Technical Skills" and "Personal Skills & Value", whereas "Capacity for applying Knowledge to Practice" is the most prominent among Generic skills. This is interesting and might be a result from the nature of the field of study (engineering) the participants. It might be because they are all engineering students and future research may want to further explore this line of enquiry. Of further interest is the difference between the most important items when gender is taken into cognizance. The highest ranked item (highest LP) for males was "Communication", while for females it was "Self-development". Again, to make an inference from this, further research needs to be carried out. It is also interesting that the most important Generic Skills for males is the "Capacity for applying Knowledge in Practice" and for females it is the "Communication" item. Considering ethnicity, it is interesting that those of black ethnicity value the Generic Skill of "Communication" as the most important, while for those of White and Asian ethnicity "Capacity for applying Knowledge in Practice" is most important.

For the Skills Category, it is noteworthy that there is an effect of ethnicity on importance of items. To explain these observations, further research has to be conducted to determine the contributing factors such as cultural values especially in the context of cultural evaluation theories and tools such as Hofstede cultural dimensions. The effect of ethnicity on CA is also evident and to understand this trend further research needs to be done to see whether this is attributed to socioeconomic condition or culture. The Figure 87 also contains "Other" interesting data referred to below. The demographic features of Institutions and LS can also be examined.

7.5.2.2 Lowest Level of Importance

Among the items ranked at the lowest LP, shown in Figure 87, it is interesting that the "Other" items appear in most aspects even across demographic lines, showing that the questions covered most of the relevant items; Although this might differ for a bigger data set or when considering a different field of study. For specific demographic features such as LS and Ethnicity, it might be an indication that a more specialized questionnaire is needed or simply imply that the item is irrelevant. For those at the undergraduate level of study "Management & Marketing of Technology" being considered as the item of least important might be strictly down to their level of study which is at a point where it is focused more on the technical aspects of their degrees.

For the PHD category, the low importance of the "Management & Marketing of Technology" item may be due to specialization in their field of study. Possibly along technical lines for which Management & Marketing of Technology is a negligible item.

It is also noteworthy that for those of black ethnicity "Special Interest Areas" is the Item with the lowest LP. This might be due to a desire to obtain a diverse skill set to overcome structural issues in the job market. Again, further research would need to be carried out to support these findings.

The named items with lowest LP are included to allow further meaningful inference to be made. The "Academic Qualification (not part …)" item from the Skill Category has the lowest LP maybe due to students already engaging in an Academic Qualification and as such view it to be least important in term of what they consider vital for professional development

For the Categories of Activities aspect, "Volunteering" is named item with lowest LP in most categories. For the Subject Area aspect "Management & Marketing of Technology" appear repeatedly. For the Generic Skills Sub-Aspect "Patents and IPR" has the lowest LP in all demographic categories apart from the PHD categories. This might be because the PHD researcher are engaged in cutting edge research, as such Patents and IPR, that are more important at their level of study compared to "Project Design & Management" which they might have already acquired as part of a PhD.

In all, this study sought to present the results of the research rather than draw strong inferences as to why they are what they are; as such further research would be required for solid inference to be drawn on areas of interest of whoever would be engaged in it.

7.5.3 Level of Importance ignoring Aspects of CPD

To get a holistic view of the students' perspective of LP the data was examined ignoring the Aspect of CPD and evaluating the Item as a whole. This is done in several ways.

7.5.3.1 Ranking Level of Importance

The items of CPD are ranked according to the LP, those items high and low in LP are examined along demographic lines. Although the results are quite extensive, the focus is on the most and least important items as presented in Figure 88, with colour coded Items to enable easier identification of the associated aspects.

7.5.3.1.1 Highest Level of importance

On evaluating the data, "Learning by doing the Job and Developing Experience" item features prominently across demographic lines as the most important item. When this is examined along Gender lines there are clear differences in importance attribute to certain Items. It is interesting that

both genders view action related items as important. Reasons for the difference may be a good investigation to carryout.

When looking at the LS Categories PhD students rated the "Capacity for applying Knowledge in Practice" item as most important. This does not divert much from expectation as PhD students oftentimes use existing knowledge to develop new knowledge. The results for Undergraduates and master's categories are also in line with expectation. This can be observed within the undergraduate LS category, where "Action based Learning Focused problems……" is a more guided process and rated highly as undergraduates require a certain extent of guidance. For the Masters category the "Learning by doing the Job and Developing Experience" item has the highest LP, also aligning with the expectation that Masters Students would be at a phase of their development in which they would be desiring or attempting to bridge gaps in their knowledge while engaged with employment while simultaneously attempting to gain experience.

MOST AND LEAST IMPORTANT ITEMS OF CPD (IGNORING CPD ASPESCTS	ITEMS WITH Highest Level of importance	Items with Lowest Level of importance
ALL	Learning by doing the job and developing experience.	Other Generic Skills
MALE	Action-based learning focused on problems in industries of choice (there are various definitions of action-based learning. In this context it means a learning process involving a systematic, structured approach to the identification of problems and the search for solutions, with clear benefit to the individual member in terms of meeting the personal CPD needs identified in his or her PDP);	Other Generic Skills Area
FEMALE	Learning by doing the job and developing experience.	Others
YORK	Learning by doing the job and developing experience.	Other
SHEFFIELD	Communication	Others
UNDERGRADUATE	Action-based learning focused on problems in industries of choice	Others
MASTERS	Learning by doing the job and developing experience.	Others
PHD	Capacity for applying Knowledge in practice	Others Skills Categories
ALL	Learning by doing the job and developing experience.	Other Generic Skills
BLACK	Communication	City & Guilds
WHITE	Work experience	City & Guilds
ASIAN	Learning by doing the job and developing experience.	Others Subject Areas

LEGEND

SUBJECT AREA | SKILLS CATEGORY | GENERIC SKILLS AREA | CATEGORIES OF ACTIVITIES | TRAINING | WORK EXPERIENCE | ACADEMIC STUDY | VOLUNTEERING | EVENTS AND SEMINARS | SELF-STUDY ACTIVITIES

Figure 88 Most and Least Important Items of CPD (Ignoring CPD Aspects)

Also, of interest is the fact that when considered along the Ethnicity lines the three groupings rated different items as most important with those of Black Ethnicity rating "communication"; White

Ethnicity rating “Experience; “Asian Ethnicity rating “Learning by doing the Job and Developing Experience”.

7.5.3.1.2 Lowest Level of Importance

For the lowest rated items, the “Other” items where ranked as least important (see Table III for details). What stands out the most is the fact that those of White and Black ethnicity rated the “City & Guilds” item as lowest in importance.

7.5.3.2 Number and Percentage of Items High and Low in Importance.

Number of items rated as low and high along demographic lines is also considered to give some insight to volume of items considered as important and promotes further understanding of the trend within the data. This can be used for varying purposes; from examining the approach to encourage engagement with CPD for certain demographic categories, to analysing the relationship between the extent to which individual’s perspective of items of CPD are important and performance indexes such as Academic grades, Job performance of fresh undergraduates. It can also be used to guide policy development by institutions and governments. The Figure 89 shows numbers and percentages of items of CPD labelled as high/low in level of importance; the percentages are relative to the total number of items (121). The largest number considered as high in LP was viewed when this data was considered along Ethnicity lines. The Black Ethnicity category reflects the highest number of items at count of 33 items, (27%). The lowest number of highly important items was observed among those of White-Ethnicity and of Male-Gender with a count of 9 items, which is 7 % of all items.

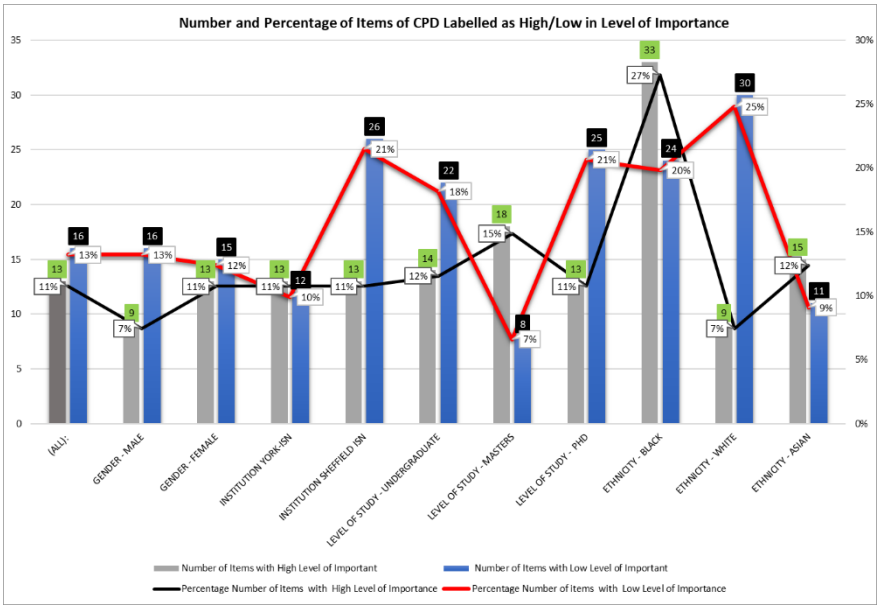


Figure 89 Number and Percentage of Items of CPD Labelled as High/Low in Level of Importance

On the other hand, when exploring items rated as Low in LP, the largest number occurred with White-Ethnicity category with a count of 30(25%). It is interesting that the largest number of items high in LP and low in LP is in the ethnicity category, showing that there is significant difference in perspective of LP of items of CPD considering ethnicity. This is further confirmed by the T-test shown in Table IV. This is also shown in the Figure 90 and Figure 91 Fig. 5 that displays the variations of the mean around the Singular mean (Collective Value)

7.5.4 Trend's in the data: Variation of mean of categories around Collective mean or aspect means

In considering the difference in the results, several approaches were used. This was particularly essential due to the limitation presented by the small data set, and the complex nature of the concept being examined. Figure 90 and Figure 91 show the variations of the mean of the categories around the mean of the collective data and the mean of individual aspects respectively across demographic features. Exploring the plots shown in Figure 90 and Figure 91, noticeable variations in mean values are seen across the different categories.

7.5.4.1 Variation about Collective Mean

Figure 90 shows that there is little variation across the gender. This assertion is supported by the fact that when a t-Test was carried out, the p-Value confirmed that no significant difference occurred (See Figure 92 for details).

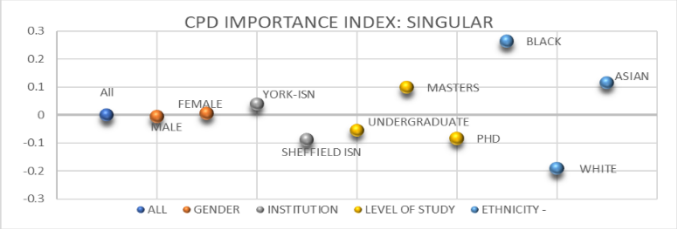


Figure 90 Variation in CPD Importance Index: Singular

There is some difference when considering the Institution and LS Categories. The highest variations seen in the Ethnicity category between those of Black Ethnicity and White Ethnicity, again this is supported by the result of the t-Test conducted with a P-value indicating significant difference (See Figure 92 for details).

7.5.4.2 Variation about means of aspects

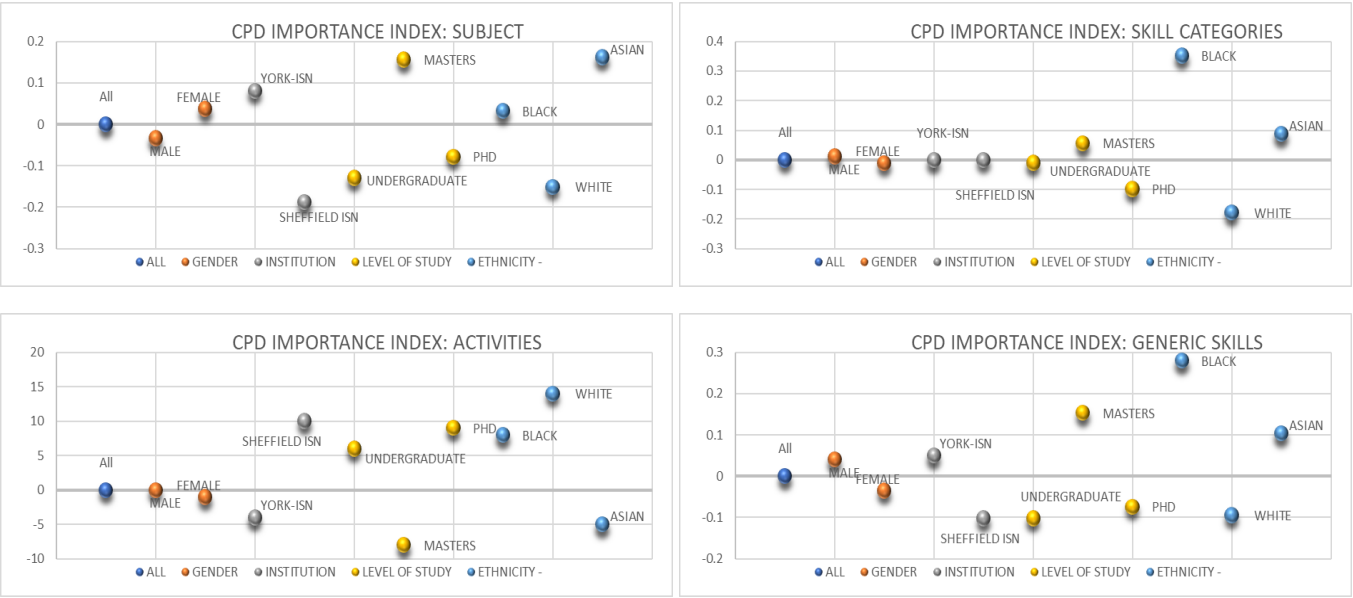


Figure 91 variation in CPD Importance Index: Subject Area; Skill Categories; Category of Activities; Generic Skills

Variation about the mean of the different aspects is shown in Figure 91. Considering the SC Aspect, it is seen that the largest difference occurs in the Ethnicity Category (Black-White. When the CA Aspect is considered, it is seen that the largest differences occur in the LS category (PhD – Masters) and the (undergraduate -Masters) categories. Differences are also seen in the Ethnicity categories (White-Asian). This is also supported by t-Test results. When the Generic Skills Sub-aspect plot is considered, notable difference is observed in the LS category (Master-PhD) and Ethnicity category (Black-White).

7.5.5 Trend in the Data: t-Test Results

t-Test is carried out to examine the difference in the mean, this is done fully taking into cognisance the fact that the sample size is small. The t-Test was carried out with elements across the aspects of CPD and demographic features. The Figure 92 shows results from the t-Tests which are in line with inferences from various other methods used.

Trends in the data	Pair	Types of Tests	P(T<=t) one-tail	P(T<=t) two-tail
Aspect of CPD	Subject Area/Skills Categories	t-Test: Paired Two Sample for Means	4.18222E-05	8.36444E-05
	Skills Categories/ Categories of Activities	t-Test: Paired Two Sample for Means	0.023711198	0.047422395
Demographic features	ETHNICITY – BLACK/ETHNICITY - WHITE	t-Test: Two-Sample Assuming Unequal Variances	0.011677679	0.023355358
	ETHNICITY – ASIAN/ETHNICITY - WHITE	t-Test: Two-Sample Assuming Unequal Variances	0.00510645	0.010212901
	LEVEL OF STUDY – UNDERGRADUATE/LEVEL OF STUDY - MASTERS	t-Test: Two-Sample Assuming Unequal Variances	0.066673772	0.133347544
	LEVEL OF STUDY – MASTERS/LEVEL OF STUDY - PHD	t-Test: Two-Sample Assuming Unequal Variances	0.027162791	0.054325582

Figure 92 Trends in the Data: t-Test Results

In all, the questions were adequately answered, and the hypothesis confirmed as best can be done with a pilot study. The varying LP attached to different items and aspects of CPD was found. It was confirmed that students attach different levels of importance to the different items and aspect of CPD and tis varied across the different demographic lines.

All the study confirmed that mean LP is different for different aspects of professional development ranging across said disparate range.

7.6 Recommendations and Further Work

The result of the Level of Importance study is used in determining the value of the direct measure of Level of engagement with CPD as detailed in Chapter 8, evaluating students' level of engagement with CPD and developing additional tools for said evaluation. Apart from this, there is a wide range of plausible applications and opportunities for further research based on the results obtained. Research could be conducted to determine the factors that affect students' perspective of LP to different aspects of professional development. In addition, research can also be done across fields of studies in universities, and can be followed up by a comparison of results obtained. Of particular interest is a comparison of the LP students attach to different aspects of engagement with CPD to industries, academic institutions or professional institution's views of the importance of said aspect; thereby, acting as a tool that can aid in developing or tracking the process of bridging the skills gap. The beneficiaries of the research could range from students, to universities, the industry and policy makers. Students can benefit from being able to track their perception of LP and identify areas that need improvement. Universities can benefit from being able to track alignment of the university's perception of LP to that of students' or/and industry. Policy makers can potentially benefit from having a basis for designing effective policies, interventions, and tracking the effect of said interventions.

Industries can also benefit in similar ways. Other recommendations are made in the analysis section of this paper upon encounter.

7.7 Section Summary

This This section presents the study's result into students' perception of LP of Items and Aspects of CPD. The varying aspect of CPD is presented, thereby justifying selecting said aspects/item. The Chapter elucidates the methodology used, giving a brief description of the questionnaire, target population (sample) and the distribution mechanism.

The Chapter shows that students attach different levels of importance to different aspects and items of CPD. The LP is shown to vary depending on demographic features and the specific aspects in question. The study results will help universities, industry, and policy makers gain a better understanding of students' perception of CPD.

LIMITATION

The research presented in this Chapter is a limited study that is intended to carry out a preliminary examination of the key concept of students' perspective on LP of Items/ Aspects of CPD to generate required values for use in further analysis and at the same time, tests proposed research methodology and analysis approaches. Although preliminary findings were encouraging, the general constraints that result from a limited data set impeded further inference and lead to generalisation from the result. In addition, the study is subject to several limitations commonly associated with the nature of self-reported questionnaires.

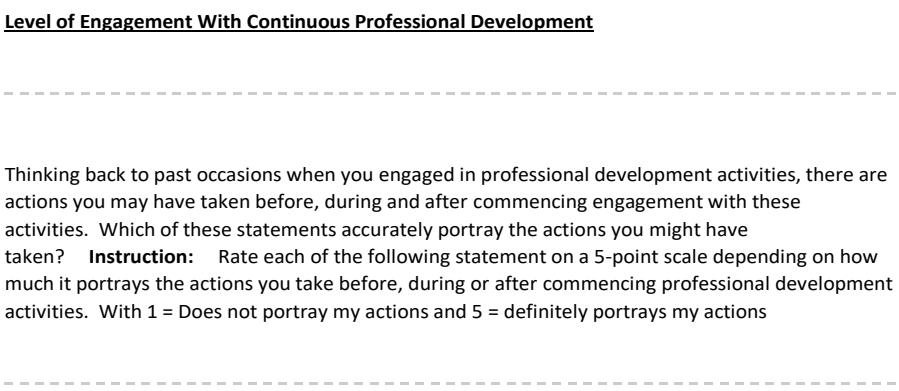
Chapter Eight

8 Establishing Measure for Level of Engagement with CPD

Establishing a measure for Level of engagement with CPD is one of the key research aims of the study, and is paramount to further analysis required in the study. Establishing the said measure also helps in answering the research question in relations to the measurability of level of engagement with CPD. This chapter presents the approach taken in developing the measure including creating the required questionnaire, establishing the validity & reliability, exploring the interaction of items and components of CPD, computation of variables representative of the value of engagement with CPD for respective subscales (Values of Components LECPD) and the full scale (LECPD Value).

8.1 Postulated Level of Engagement with Continuous Professional Development questionnaire/scale

A questionnaire was developed to measure the level of engagement with CPD, it comprised of 29 items divided into 5 subscales. The 5 subscales comprise of three subscales representative of; the plan, action and result component of CPD respectively, and the two other subscales are representative of the two aspects of the reflection component. The two aspects of the reflection component are: one aspect denoting the extent of reflection on aspects of the professional development cycle (Reflection I) and the other denoting approach or process of reflection (Reflection II). These are illustrated in the figure below. Details of the formation of items of the questionnaire and theoretical underpinning are presented in measurement of engagement with CPD component of Chapter 2.3. The subscales and corresponding items are presented below. The Figure 93 shows the opening statement of the questionnaire.



Level of Engagement With Continuous Professional Development

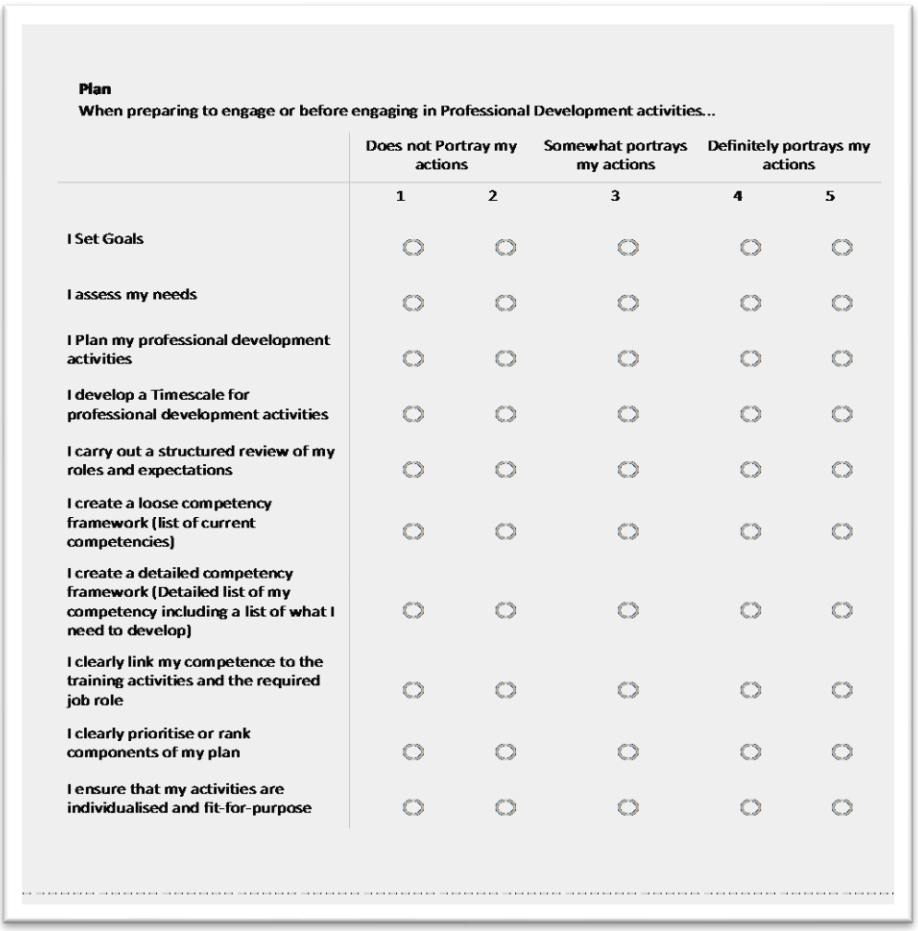
Thinking back to past occasions when you engaged in professional development activities, there are actions you may have taken before, during and after commencing engagement with these activities. Which of these statements accurately portray the actions you might have taken? **Instruction:** Rate each of the following statement on a 5-point scale depending on how much it portrays the actions you take before, during or after commencing professional development activities. With 1 = Does not portray my actions and 5 = definitely portrays my actions

Figure 93 LECPD Questionnaire opening question/statement

The questions of the CPD Scale inquire on the extent to which the individual's actions while engaged with CPD is portrayed by a set of items as shown in the extract above (Figure 93). The Items are then rated on 5-point Likert scale.

8.1.1 Plan Subscale

To measure the planning component of a student's engagement with CPD, a revised form of the planning scale by IFA is utilized. The IFA planning scale was developed based on an evaluation of the CPD measurement techniques of professional organizations across the UK, Australia, Canada and Ireland [32]. Plan Subscale evaluates the extent to which the participants engage in the planning process by looking at how much each of the items of the scale portray the participants actions when preparing to or before engaging in professional development activity. The plan aspect of the questionnaire consists of the items illustrated in the Figure 94



Plan

When preparing to engage or before engaging in Professional Development activities...

	Does not Portray my actions		Somewhat portrays my actions	Definitely portrays my actions	
	1	2	3	4	5
I Set Goals	○	○	○	○	○
I assess my needs	○	○	○	○	○
I Plan my professional development activities	○	○	○	○	○
I develop a Timescale for professional development activities	○	○	○	○	○
I carry out a structured review of my roles and expectations	○	○	○	○	○
I create a loose competency framework (list of current competencies)	○	○	○	○	○
I create a detailed competency framework (Detailed list of my competency including a list of what I need to develop)	○	○	○	○	○
I clearly link my competence to the training activities and the required job role	○	○	○	○	○
I clearly prioritise or rank components of my plan	○	○	○	○	○
I ensure that my activities are individualised and fit-for-purpose	○	○	○	○	○

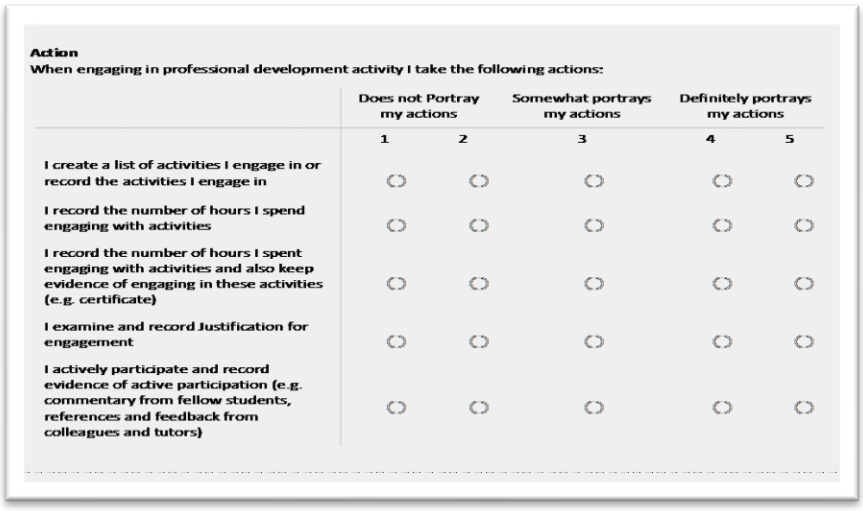
Figure 94 Evaluation of Planning/Plan Subscale Items

Adapted from [32]

As shown in Figure 94, the plan subscale comprises of 10 items, each item on a 5 point Likert scale ranging from 'Do not portray my actions' (1) to 'definitely portrays my action' (5). The scale is used to evaluate and score the ability of the student to create a plan that includes a set of goals and objectives the student wishes to achieve, an objective assessment of needs based on the set goals and objectives, and a timescale or a plan of activities to participate in to achieve these goals and satisfy their assessed needs. The scale also evaluates if the plan includes a structured review of the students current and future roles and expectations and level of depth of list or framework of the learner's competency and ability including skills and knowledge. It also considers if any planning tools were utilised and if prioritization of the components of the plan was carried out. The final item of the scale then considers if the plan is fit for purpose and tailored to students' needs [32, 38].

8.1.2 Action Subscale

The evaluation of action in the context of most approaches to CPD Engagement-measurement and determination of the professional development value often revolves around evidence of participation in CPD activity. Action Subscale evaluates the extent to which the participants engage in a range of actionable activities by looking at how much each of the items of the scale portray the participants actions while actually engaging in professional development activity. The action aspect of the questionnaire comprises of the items illustrated in the *Figure 95*



Action
When engaging in professional development activity I take the following actions:

	Does not Portray my actions		Somewhat portrays my actions		Definitely portrays my actions
	1	2	3	4	5
I create a list of activities I engage in or record the activities I engage in	○	○	○	○	○
I record the number of hours I spend engaging with activities	○	○	○	○	○
I record the number of hours I spent engaging with activities and also keep evidence of engaging in these activities (e.g. certificate)	○	○	○	○	○
I examine and record Justification for engagement	○	○	○	○	○
I actively participate and record evidence of active participation (e.g. commentary from fellow students, references and feedback from colleagues and tutors)	○	○	○	○	○

Figure 95 Evaluation of Action

Adapted from [32]

As shown in *Figure 95*, the action subscale comprises 5 items, each item on a 5 point Likert scale ranging from 'Do not portray my actions' (1) to 'Definitely portrays my action' (5). The elements

evaluate the ability of the participant to portray each of these elements when actually engaging in CPD activity. This component evaluates the extent to which the students participates in CPD activities and by virtue of that the plausible impact of the said engagement. The measurement of the action takes into account the presence of a list of activities engaged in, the records of the hours and evidence of attending activities, justification for choice of activities engaged in and evidence of active participation.

The disadvantage of this approach to measuring action is that participation does not often reflect level of engagement. As an individual can have detailed participation record and not have fully participated in activities [32, 38].

8.1.3 Result Subscale

The evaluation of result in the context of most approaches to CPD Engagement- measurement and determination of the professional development value, often revolves around the result of assessed CPD activity. The exact form of assessment depends on the specific nature and objective of the CPD activity. Since the assessment of results is context specific, it would include an analysis of the result based on the standard assessment of the specific activity and the goal and objective set by the learner before participation in the activity.

Effective measures of evaluation of results, often need to be based on the specific CPD activity and should comprise of objective and subjective techniques. The assessment of results involves more than an evaluation of knowledge or skills developed. It also involves a consideration of impact [32]. The assessment of result is categorised into knowledge, performance, behaviour, and practical effect of knowledge gained. The assessment methods could be in the form of knowledge tests, multiple assessment techniques, peer review, self-assessment, client feedback etc.

Result Subscale evaluates the results and impact of engagement in professional development activity. It achieves this by examining the extent to which the statements in the questionnaire portray the result of said engagement. The result aspect of the questionnaire comprises the items illustrated in the *Figure 96*.

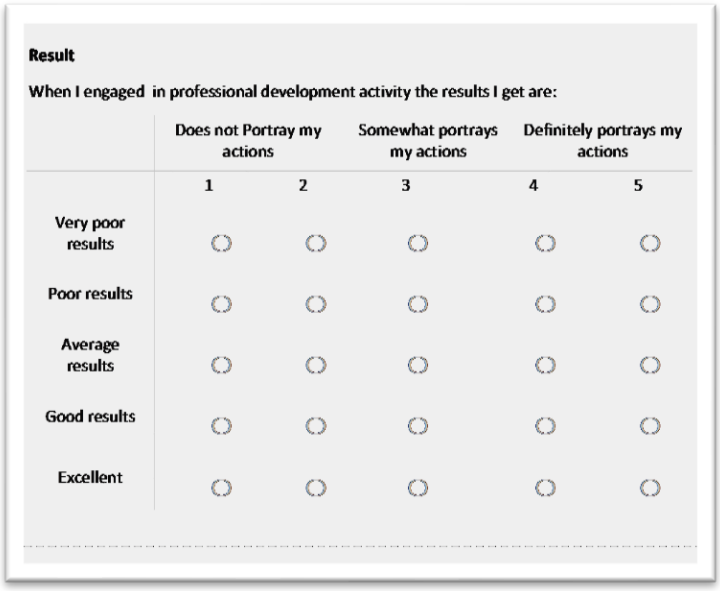


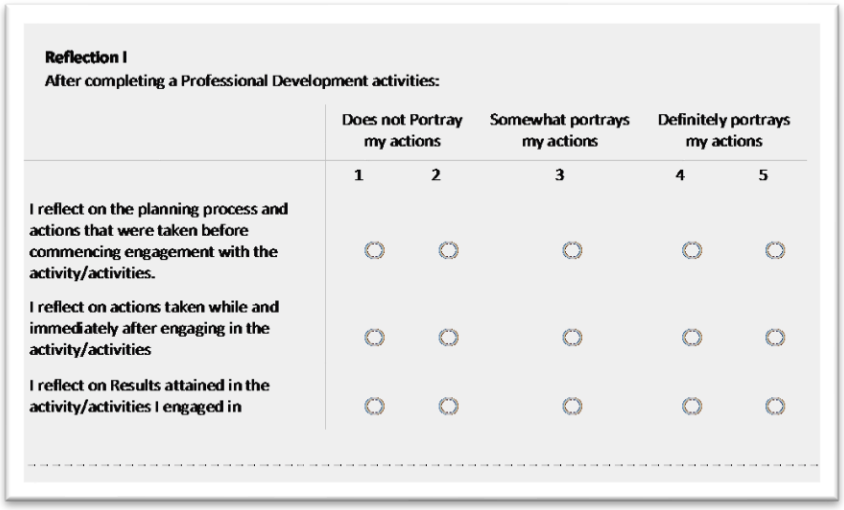
Figure 96 Evaluation of result

As shown in *Figure 96* the Result subscale comprises 5 items each item on a 5 point Likert scale ranging from 'Do not portray my actions' (1) to 'Definitely portrays my action' (5). The wordings of the items are intentionally broad because of the extensive range of activities being engaged with and the diversity of modes of assessment of the results of said activities.

8.1.4 Reflection Subscale

The evaluation of the reflection component of the Professional Development Value (PDV) often revolves around evidence and examination of the participants reflection on the other 3 components of the CPD cycle. The approach or process of reflection adopted by an individual is subjective and dependent both on the nature of the individual and the CPD activity. The reflection subscale comprise two category of items and comprise of items as illustrated in *Figure 97* and Figure 98, the scale are labelled 'Reflection I' and 'Reflection II' respectively. As illustrated in *Figure 97* and Figure 98, the Reflection subscales comprises of 5 items each item on a 5 point Likert scale ranging from 'Do not portray my actions' (1) to 'Definitely portrays my action' (5). The separation of this subscales and the orthogonal interrelationship therein are confirmed using factor analysis results of which are presented in Chapter 8.3.

One Subscale labelled as 'Reflection I' looks at the extent to which the individual reflects on different components of the CPD Cycle and the items are as illustrated in the *Figure 97*



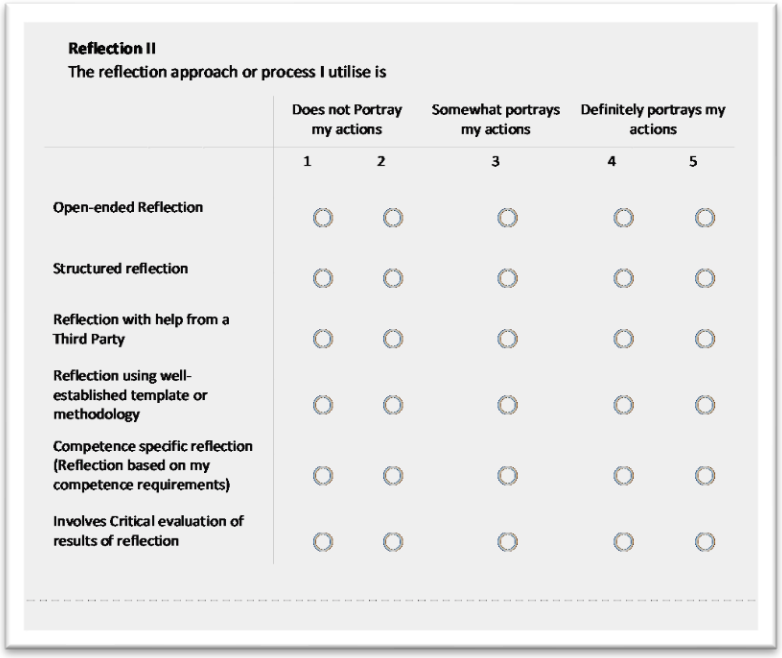
Reflection I
After completing a Professional Development activities:

	Does not Portray my actions		Somewhat portrays my actions	Definitely portrays my actions	
	1	2	3	4	5
I reflect on the planning process and actions that were taken before commencing engagement with the activity/activities.	○	○	○	○	○
I reflect on actions taken while and immediately after engaging in the activity/activities	○	○	○	○	○
I reflect on Results attained in the activity/activities I engaged in	○	○	○	○	○

Figure 97 Evaluation of Reflection Part I

Adapted from [32]

The second subscale labelled as 'Reflection II' looks at the individuals approach to reflection, the items are as illustrated in the Figure 98.



Reflection II
The reflection approach or process I utilise is

	Does not Portray my actions		Somewhat portrays my actions	Definitely portrays my actions	
	1	2	3	4	5
Open-ended Reflection	○	○	○	○	○
Structured reflection	○	○	○	○	○
Reflection with help from a Third Party	○	○	○	○	○
Reflection using well-established template or methodology	○	○	○	○	○
Competence specific reflection (Reflection based on my competence requirements)	○	○	○	○	○
Involves Critical evaluation of results of reflection	○	○	○	○	○

Figure 98 Evaluation of Reflection Part II

The elements evaluate the range of ability and approach of the student towards reflection. It examines the range of the reflection in terms of the spread of reflection activities over the Plan, Action and

Results component of the CPD Cycle as laid out in Chapter 2. This comprises of the ability to first carry out open reflection followed by a more structured review. The reflection component assesses how holistic the student's reflection process is. As such it evaluates if the learner's reflection process involves enhancing approaches such as reflection with the aid of third parties and using well established templates. The evaluation of the reflection component also involves examining if the students approach to reflection is fit for purpose, if the student carries out reflection in the context of competence, and also critically evaluates their reflection process [32, 38].

8.1.5 Overall level of engagement

In order to establish an overall value for LECPD using the developed questionnaire, a number of approaches are taken as detailed in Section 8.3.2. The approaches focus on use of second order combination of the value of the different subscales, and the best method of combination is selected by a comparison of the output of this method to the value derived using the direct measure of engagement with CPD. The values for the subscales are themselves arrived at through the use of factor analysis to develop a representative value for the subscales.

8.2 Validity

8.2.1 Reliability of Developed LECPD Questionnaire

According to Koo et al. (2016) Reliability is "the extent to which measurement can be replicated" [258]. In examining the reliability of the LECPD Scale, an adaptation of the approach used in the establishing reliability and validity of self-assessed questionnaires by a number of researchers namely: Komagamine, et al. (2014), Henry, et al.(1999) and Reimers, et al. (2012) and others [259, 260, 261]. To this effect, reliability of the LECPD scale and its 5 subscales were determined by examining the internal consistency using the Cronbach's Alpha (deemed acceptable above 0.6) and Inter Items statistics (Corrected Item-Total Correlation, Squared Multiple Correlation and Cronbach's Alpha if Item Deleted), Test-retest reliability is assessed using Intraclass Correlation Coefficient test.

Question items of the LECPD Scale

Subscale	Reference	Questionnaire Items
Plan	Q96_1	I Set Goals
	Q96_2	I assess my needs
	Q96_3	I Plan my professional development activities
	Q96_4	I develop a Timescale for professional development activities
	Q96_5	I carry out a structured review of my roles and expectations

	Q96_6	I create a loose competency framework (list of current competency)
	Q96_7	I create a detailed competency framework (Detailed list of my competency including a list of what I need to develop)
	Q96_8	I clearly link my competence to the training activities and the required job role
	Q96_9	I clearly prioritise or rank components of my plan
	Q96_10	I ensure that my activities are individualised and fit-for-purpose
Action	Q97_1	I create a list of activities I engage in or record the activities I engage in
	Q97_2	I record the number of hours I spend engaging with activities
	Q97_3	I record the number of hours I spent engaging with activities and also keep evidence of engaging in these activities (e.g. certificate)
	Q97_4	I examine and record Justification for engagement
	Q97_5	Actions for PD activity - I actively participate and record evidence of active participation (e.g. commentary from fellow students, references and feedback from colleagues and tutors)
Result	Q98_1	Very poor results
	Q98_2	Poor results
	Q98_3	Average results
	Q98_4	Good results
	Q98_5	Excellent
Reflection I	Q100_1	I reflect on the planning process and actions that were taken before commencing engagement with the activity/activities.
	Q100_2	I reflect on actions taken while and immediately after engaging in the activity/activities
	Q100_3	I reflect on Results attained in the activity/activities I engaged in
Reflection II	Q101_1	Open-ended Reflection
	Q101_2	Structured reflection
	Q101_3	Reflection with help from a Third Party
	Q101_4	Reflection using well-established template or methodology
	Q101_5	Competence specific reflection (Reflection based on my competence requirements)
	Q101_6	Involves Critical evaluation of results of reflection

Figure 99 Question items of the LECPD Scale

A level of Cronbach's Alpha above 0.6 is deemed acceptable, between 0.60–0.69 it is considered marginally reliable, between 0.70–0.79 it is considered reliable, between 0.80–0.90 it is considered highly reliable, at a level greater than 0.90 it is considered extremely reliable. A level of average inter class correlation above 0.3 is consider as acceptable, estimates between 0.30-0.50 are considered as marginally reliable, estimates between 0.50-0.75 is considered reliable , and estimates above 0.75 are considered highly reliable [218, 261]

The LECPD Scale comprised of 29 items as shown in the Figure 99. The value of Cronbach Alpha (α =0.933) showed the LECPD scale has an excellent level of Internal Consistency, the subscales have a lower Alpha than the full scale but all the scales have acceptable levels of alpha ranging from 0.701 to

0.910 as shown in the Figure 100 . It should be however noted that the questionnaires with fewer items often have lower levels of Cronbach Alpha. The level of average inter-item correlation of the LECPD scale and all the subscales are considered acceptable (>0.3), with values ranging from 0.641 to 0.303.

Cronbach's α and average inter-item correlation coefficients		
	Coefficients	Average inter-item correlation coefficient
Summary Score (LECPD Scale)	0.933	0.329
Plan	0.91	0.504
Action	0.877	0.584
Result	0.701	0.303
Reflection I	0.841	0.641
Reflection II	0.842	0.473

Figure 100 Cronbach's α and average inter-item correlation Coefficient for LECPD Scale and Sub Scales

Most items on the LECPD scale appeared worthy of inclusion on considering Inter Items statistics (Corrected Item-Total Correlation, Squared Multiple Correlation and Cronbach's Alpha if Item Deleted) as shown in Figure 101. Although some consideration was given to removing some items in the result subscale due to low level of Item-Total Correlation (Q98_1, 0.215; Q98_2,0.216; Q98_3, 0.094), this was decided against. A decision was made to keep the items in on the basis of: 1) theoretical consideration of the effects of results on engagement with CPD, 2) the acceptable level of Squared Multiple correlation, (Q98_1, 0.674; Q98_2,0.691; Q98_3, 0.39). 3) The items showed reasonable level of correlation when the item-total correlation based solely on the result subscale was considered (Based on Subscales: (Q98_1, 0.631; Q98_2,0.674; Q98_3, 0.466). 4) This was further reinforced by the fact that there was no substantial increase in the value of the alpha on deletion of said items.

		Based on Summary Score (LECPD Scale)			Based on Subscales		
Subscale		Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Plan	Q96_1	0.503	0.618	0.931	0.601	0.484	0.905
	Q96_2	0.505	0.598	0.931	0.581	0.526	0.906
	Q96_3	0.625	0.674	0.93	0.69	0.551	0.9
	Q96_4	0.665	0.732	0.929	0.737	0.623	0.897
	Q96_5	0.631	0.688	0.93	0.73	0.594	0.898
	Q96_6	0.599	0.464	0.93	0.621	0.445	0.905
	Q96_7	0.724	0.674	0.928	0.722	0.575	0.899
	Q96_8	0.742	0.736	0.928	0.741	0.622	0.897
	Q96_9	0.637	0.604	0.93	0.69	0.529	0.9
	Q96_10	0.611	0.64	0.93	0.637	0.471	0.903

Action	Q97_1	0.564	0.55	0.93	0.546	0.331	0.886
	Q97_2	0.619	0.645	0.93	0.755	0.578	0.839
	Q97_3	0.625	0.674	0.93	0.777	0.617	0.834
	Q97_4	0.657	0.671	0.929	0.755	0.594	0.839
	Q97_5	0.688	0.694	0.929	0.707	0.543	0.851
Result	Q98_1	0.215	0.674	0.935	0.631	0.663	0.565
	Q98_2	0.216	0.691	0.935	0.674	0.706	0.541
	Q98_3	0.094	0.39	0.936	0.466	0.333	0.649
	Q98_4	0.438	0.399	0.932	0.316	0.253	0.702
	Q98_5	0.475	0.452	0.932	0.218	0.23	0.736
Reflection I	Q100_1	0.584	0.58	0.93	0.651	0.436	0.833
	Q100_2	0.58	0.639	0.93	0.767	0.595	0.722
	Q100_3	0.576	0.64	0.93	0.703	0.53	0.782
Reflection II	Q101_1	0.505	0.436	0.931	0.511	0.29	0.837
	Q101_2	0.621	0.535	0.93	0.667	0.471	0.807
	Q101_3	0.459	0.431	0.932	0.541	0.331	0.831
	Q101_4	0.626	0.587	0.93	0.664	0.48	0.807
	Q101_5	0.653	0.613	0.929	0.729	0.563	0.795
	Q101_6	0.638	0.588	0.929	0.622	0.48	0.816

Figure 101 Inter-items statistics for LECPD Scales and Subscales

For the purpose of this research, the average measure value of Intraclass Coefficient is the value that is of relevance. The Intraclass Correlation Coefficient (ICC) of the summary score was 0.915 and the ICCs of the six subscales ranged from 0.583 to 0.915 as shown in Figure 102. The value of the ICCs shows that overall, there are high levels of agreement within class, further illustrating the high reliability of the questionnaire. This is despite the lower value of ICC in certain subscales although still within the range of reliability. The ICCs for the results Subscale is lower than that of the other Subscales, as with the Item-total correlation this might again be due to the nature of the construct of result being explored and the required vague wording of the items in the Result subscale. The Result subscale needs to be capable of measuring the performance in a large variety of activities, subject areas and skills areas. The items were by effect designed to be wide enough to capture the range. Given that this is a self assessed questionnaire, the ICC carried out to an extent represents the Inter-rater reliability of the questionnaire in question [218, 261].

Scales	Intraclass Correlation Coefficient	95%, Confidence Interval		Sig
Summary Score (LECPD Scale	0.915	0.898	0.929	0.000
Plan	0.906	0.890	0.920	0.000
Action	0.871	0.849	0.891	0.000
Result	0.583	0.509	0.649	0.000

Reflection I	0.838	0.798	0.870	0.000
Reflection II	0.838	0.804	0.868	0.000

Figure 102 Interclass Correlation Coefficient of the LECPD Scales and Sub Scales

Inter-rater Reliability

Inter-rater reliability reflects the extent to which there is agreement between Raters. This is done using a scale to measure a group of subjects. In the context of a deployed self-assessment questionnaire, the subject of the study in question are also raters who utilise the scale to rate themselves. In some situations, it is not ideal to utilise non-expert raters in inter-rater reliability studies. However in cases where constructs such as the engagement with development is being examined in the manner that it is being done in this study, the individual can be considered to be experts in there their own development [258, 262, 263, 264].

In order to examine reliability, there is a need to understand the Model, Type and Definition of the inter-rater reliability being considered on the basis of the particular circumstance. There are models for selection that depict different rating circumstances, which are based on varying conventions such as the McGraw and Wong (1996) convention or the Shrout and Fleiss Convention. On the basis of the McGraw and Wong(1996) convention, circumstance can be depicted in a number of ways ranging from a One-way Random-effects-Model to a Two-way Mixed-effects-model [258, 262].

In establishing inter-rater reliability, the inter-class correlation coefficients is found to be a more desirable measure depicting the degree of correlation and agreement between measures. Nevertheless, in order to get the correct value of ICC, the correct form of ICC for the particular dataset and circumstance needs to be utilised. The effect model, type and definition of the dataset and circumstance of utilisation of the LECPD scale where determined based on Koo and Li (2016)'s recommendation in order to guide the selection of ICC form [258].

In the case of this study, the circumstance reflects a One-way Random-Effect Model. A model in which each subject is rated by a different rater selected from a population of rates. Since each randomly selected individual assesses/ rates themselves, it can be interpreted as a circumstance in which each subject is rated by a different rater. Given that the assessment is based on large number of self-assessing raters. The mean value of ratings is used as a basis for assessment, hence the 'Type' is a multiple raters/measurements type, as such the average measure value of ICC is the value that indicates the level of reliability. The definition of agreement is not applicable in this circumstance. This is because each subject is rated by a different rater. As such, it is inconsequential if the definition is on the basis of absolute agreement, or consistency between rater. This is usually the case for One-Way

Random-Effects Model. As such the form of ICC for random effects multiple rater dataset or circumstance is utilised in line with McGraw and Wong (1996 convention) [258, 262, 263].

In order to carry out this analysis, the data was rearranged in line with illustrations by Graziano & Raulin (2013) in such a way that the individual's (participants turned raters) assessment of items of the LECPD scale and subscales was converted into variables by transposing the data with Unique ID codes representing the Variable name of each rater, this is illustrated in the Figure 103 [263].

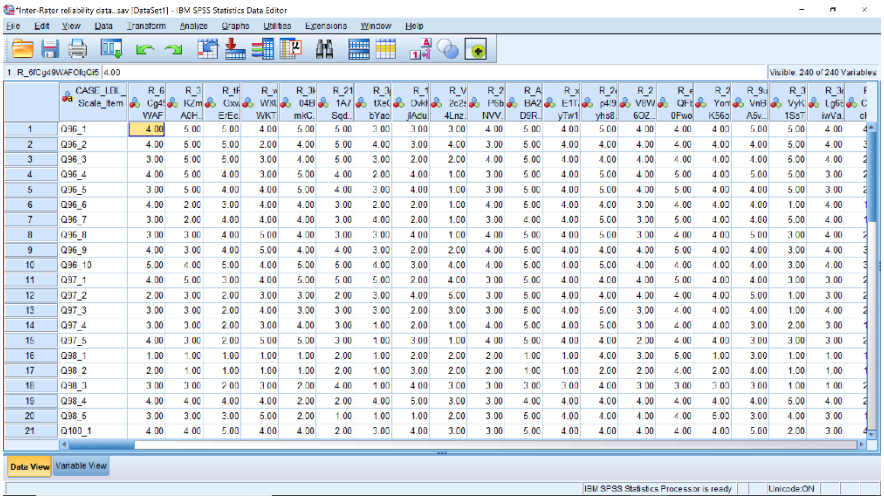


Figure 103 Transposed variables for establishing Inter-rater reliability

On carrying out the ICC analysis, as stated above the average measure value of Intraclass Coefficient is the value that is of relevance. The Intraclass Correlation Coefficient (ICC) of the summary score was 0.979 and the ICCs of the six subscales ranged from 0.773 to 0.993 as shown in Figure 104. The value of the ICCs shows that; overall, there is a high level of agreement within class, further illustrating the high reliability of the questionnaire.

INTER RATER RELIABILITY				
Scales	Intraclass Correlation Coefficient	95% Confidence Interval		Sig
Summary Score	0.979	0.966	0.988	0.000
Plan	0.930	0.852	0.979	0.000
Action	0.907	0.739	0.989	0.000
Result	0.993	0.982	0.999	0.000
Reflection I	0.779	0.177	0.994	0.000
Reflection II	0.773	0.415	0.962	0.000

Figure 104 Inter-Class Correlation Coefficients for Inter-rater reliability

8.2.2 Cross Cultural Validity of preferred method

The results of Factor analysis can be used to examine the equivalence of test/Instruments across divergent population samples, using one of several guidelines and approaches. One such approach which is used in this research is examining similarities of number of factors, factor patterns, explained variance and factor loadings. If they are found to be similar enough or reasonably equivalent, this indicates that the instrument is measuring the same construct across the population. This approach is common among cross-cultural researchers, and is in line with the approach used by Byrne et al. in assessing equivalency of variance of instrument used to measure achievement motivation across varying sample groups [145].

Preceding carrying out the factor analysis, the KMO and Bartlett's Test was carried out to ensure that the data was adequate to carry out the factor analysis. The result in the Figure 105 confirms the adequacy of the data.

KMO and Bartlett's Test

		Nigeria	Uk
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.830	.678
Bartlett's Test of Sphericity	Approx. Chi-Square	526.899	124.195
	Df	21	21
	Sig.	.000	.000

Figure 105 Result of Test of adequacy of data for Factor analysis of LECPD variable based of split population along cultural lines

The result of the factor analysis is presented in Figure 106 and Figure 107. As shown in Figure 106 , it can be seen that the number of relevant factors and the percentage of variance explained are very similar.

Total Variance Explained

	Rotation Sums of Squared Loadings					
	Nigeria			UK		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.512	50.165	50.165	3.552	50.738	50.738
2	1.151	16.443	66.608	1.197	17.102	67.840

Figure 106 Result of Factor analysis of LECPD variable based of split population along cultural lines: Total Variance Explained (Rotation sums)

Figure 107 shows that the number of variables that load on this factor, factor patterns and their factor loadings are very similar. To this effect, it can be seen that the number of factors, explained variance, factor patterns and factor loadings across the population samples are similar enough to come to the conclusion that there is equivalence of test or instruments for measuring LECPD across sample populations (cultures; U.K and Nigeria).

Rotated Component Matrix

	Nigeria Component		United Kingdom Component	
	1	2	1	2
Reflection_F1_Index=Approach_or_Process_of_Reflection_Index	.759		.739	
Reflection_F2_Index=Extent_of_Reflection_on_Aspects_of_the_PD_Cycle_Index	.743		.732	
Result_F1		.950		.939
Result_F2	.627		.642	
Action_F1_Index=Actions_for_CPD_Activities	.760		.759	
Plan_F1=Extent_of_Overarching_Planning	.885		.836	
Plan_F2=Extent_of_Indepth_Planning	.793		.886	

Figure 107 Result of Factor analysis of LECPD variable based of split population along cultural lines: Rotated Component Matrix

8.2.3 Construct Validity

A Crude form of Construct validity of the questionnaire was established by comparing the results of the LECPD measure with an operationalised version of the existing approach to measure engagement with CPD. Details of how the value of LECPD are arrived at are presented in section 8.3.2. The manner in which the existing approach to measure engagement with CPD otherwise named 'Direct Measure of engagement with CPD (Collective CPD Value)' is operationalised was expanded upon in Section 8.2.3.1.

8.2.3.1 Direct measure of Level of engagement with CPD

Current measurement of engagement with CPD by most professional organisations involves ticking off activities, skills area or subject area that the individual has participated in and allocating points for

said participation [4, 121, 32, 5, 4, 265, 266, 267, 268, 269]. This holds true for engineering organisations that often measure their engagement with CPD by examining individual's participation in activities, skills area and subject areas. To operationalize the existing method for it to serve as a direct measure of level of engagement with CPD in the context of this research, a questionnaire is developed. The questionnaire reflects the participants' interaction with the list of activities, skills area and subject area. The list of activities, skills area and subject area are gleaned from engineering institutions CPD policy documents [268, 4, 270, 271, 269]. A face validity approach is taken in order to establish validity of the questionnaire; this is done in view of the near ubiquitous nature of the participation-based approach to examining engagement with CPD [218]. The questionnaire is presented in the appendix.

The direct measurement questionnaire looks at the extent to which individuals participate, the desire to participate and the level of importance attached to items in a list of varying CPD activities, skill areas and subject areas. The overall resultant of the values of the different sections of the direct measure questionnaire (as listed), gives the value of direct measure of engagement with CPD. The direct measurement questionnaire looks at parameters for the extent to which individuals participate, the desire to participate, and the level of importance attached to articles in a list of varying aspects of CPD. The aspects of CPD are the respective Activities, Skill areas and Subject areas of CPD. Respective items of the direct measurement questionnaire are created on the basis of these parameters for varying articles of the respective aspects of CPD. Overall, the resultant implication of this gives the direct measure of engagement with CPD.

8.2.3.1.1 Computing the Value of Direct Measure of CPD

To establish a variable representative of the collective value (resultant) of engagement with CPD measured using the direct measure, a variable is computed on the basis of a combination of the above-mentioned variables for 'how often' the individual participates weighted by associated perceived 'level of importance' for the item of CPD in question and the 'Desire to participate' weighted by associated perceived 'level of importance' of the item of CPD.

In order to derive a representative value of a certain aspect of CPD: 1) the representative value for each item of or article of an aspect of CPD for 'the extent of participation' (how often) and the 'Desire to improve' parameters of said item are weighted by the level of importance parameter of the said item or article of an aspect of CPD as illustrated in *Equation 24* and *Equation 25*.

''Weighted value of extent of participation in an Item of an Aspect of CPD' = 'Value of extent of participation in an Item of an Aspect of CPD' × 'Level of Importance an Item of an Aspect of CPD.

Equation 24 Weighted value of extent of participation for individual article of aspect of CPD

'Weighted value of Desire to Improve an Item of an Aspect of CPD' = 'Value of Desire to Improve an Item of an Aspect of CPD' × 'Level of Importance an Item of an Aspect of CPD.

Equation 25 Weighted value of level of Desire for individual article of aspect of CPD

2)The value of 'extent of participation' and 'desire to improve' for each aspect of CPD was calculated. To do this, the respective weighted 'extent of participation' (how often) and 'Desire to improve' values for items of each aspect of CPD were combined by calculating their respective means. This is illustrated *Equation 26* and *Equation 27*

' Weighted Value of desire to improve an aspect of CPD' = 'Mean of weighted value of 'Desire to Improve' for all Items of an Aspect of CPD'

Equation 26 Value of desire to improve an aspect of CPD

' Weighted Value of extent of participation in an aspect of CPD' = 'Mean 'Weighted value of 'extent of participation' in all Items of an aspect of CPD'

Equation 27 Value of how often an item of CPD is carried out'

3) The value of engagement with each aspect of CPD was then calculated by combining the values of the 'extent of participation' and 'desire to improve' parameters for each aspect of CPD as shown below.

'Value of engagement with Aspects of CPD' = Square Root ('Weighted value of extent of participation in an aspect of CPD' * 'Weighted value of desire to improve an aspect of CPD').

Equation 28 Value of engagement with an aspect of CPD

4) The collective value of direct measure of engagement with CPD was then calculated by finding the meaning of value of engagement for all aspects of CPD.

'Direct value of Level of engagement with CPD'(Collective CPD Value) = Mean of Value of engagement with all Area Aspects of CPD.

Equation 29 'Direct value of Level of engagement with CPD'

For this study the direct approach to measuring level of engagement with CPD was labelled 'Collective CPD Value'. Its respective aspects labelled 'Mean CPD Activities' denoting the CPD value of activities engaged in; 'Mean CPD Subject' denoting the CPD value of subject areas engaged with; 'Mean CPD Skills' area denoting the CPD value of skills areas engaged with. 'Mean CPD Generic skills' although a component of CPD skills is mentioned on its own since Generic skill category stands out as an important category of skill across all forms of engineering.

It can be seen from the Figure 108 that there is a significant level of correlation between the LECPD variable Labelled as "LECPD Combined" and the "Collective CPD value" (r=531), the level of correlation is even higher for the activity component labelled "Mean CPD Activities" with (r=655). This result indicating that the LECPD scale whose value is labelled as "LECPD Combined" and 'LECPD Less the effect of poor results' measure the intended construct of level of engagement with CPD.

		Collective_ CPD_Value	MEAN__CPD_ Activities.	MEAN_CPD_S ubject	MEAN_C PD_Skills	MEAN_CPD_G eneric_Skills
LECPD Combined factors Indexed 0 to 5	Pearson Correlation	.531**	.655**	.161*	.320**	.393**
	Sig. (2-tailed)	.000	.000	.014	.000	.000
	N	238	236	232	231	229
LECPD Less the effect of poor	Pearson Correlation	.536**	.649**	.168*	.331**	.400**
	Sig. (2-tailed)	.000	.000	.010	.000	.000

results (Factor Analysis) Indexed 0 to 5	N	238	236	232	231	229
Effect of poor results on LECPD (Factor Analysis) Indexed 0 to 5	Pearson Correlation	.103	.336**	-.064	-.045	.009
	Sig. (2-tailed)	.055	.000	.239	.412	.866
	N	345	340	338	336	334

Figure 108 Correlation of LECPD scale and direct measure of engagement with CPD

8.3 Factoria Analysis and Computation of variables/value for Postulated method for measuring and computing level of engagement with CPD

In order for further analysis to be carried out and also to establish how the items of the varying scale and subscales interacted together the variables and in turn representative value of the LECPD and the different dimensions/components representative of the LECPD scale and subscales are computed.

8.3.1 Variables representing individual Dimensions of LECPD

8.3.1.1 First order variables

First order variables of LECPD are calculated by carrying out factor analysis for each subscale. Factor analysis of items of each subscale is carried out separately to establish the value of the subscale the resulting variables are directly representative of value of the subscales denoting the different dimensions/components of LECPD. The variables that represent the values of the First-order dimensions/components of LECPD are computed as follows:

8.3.1.1.1 Plan Dimension of LECPD

In order to confirm that the variable derived from the Plan Subscale used to measure the plan component of the CPD can be combined and that it conforms with the expected model Factoria analysis (Principal component Analysis) was carried out. This helped to confirm that the proposed tool for measuring the extent of planning is measuring what it is intended to measure, and that the proposed separation of variables is actually in line with the underlying structure of interaction of said variables. Also, to show that all variables can be reduced to a distinct variable as proposed in the initial design of the questionnaire.

Q96_1	**Planning PD activities**	**I Set Goals**
Q96_2	Planning PD activities	I assess my needs
Q96_3	Planning PD activities	I Plan my professional development activities
Q96_4	Planning PD activities	I develop a Timescale for professional development activities
Q96_5	Planning PD activities	I carry out a structured review of my roles and expectations
Q96_6	Planning PD activities	I create a loose competency framework (list of current competency)

Q96_7	Planning PD activities	I create a detailed competency framework (Detailed list of my competency including a list of what I need to develop)
Q96_8	Planning PD activities	I clearly link my competence to the training activities and the required job role
Q96_9	Planning PD activities	I clearly prioritise or rank components of my plan
Q96_10	Planning PD activities	I ensure that my activities are individualised and fit-for-purpose

Figure 109 Plan Subscale Items and respective labels for Factor analysis

Figure 109 contains the Planning variables that were included in the initial LECPD component of the questionnaire and the labels that is used to denote them going forward. The Factoria analysis that is carried out also showed how the variables can/should be combined and the underlying interaction of items within the subscale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.906
Bartlett's Test of Sphericity	Approx. Chi-Square	1893.492
	Df	45
	Sig.	.000

Figure 110 Plan Subscale Factor analysis: KMO and Bartlett's Test

The results of the KMO and Bartlett's Test shown in the Figure 110 indicate that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, a principal component analysis with varimax rotation and Kaiser Normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regard to the 10 variables used, orthogonal rotation of the variables yielded 2 factors, accounting for 38.429 and 27.477 per cent of the total variance respectively, a total of 65.906 per cent of the total variance explained as shown in Figure 111.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.560	55.598	55.598	5.560	55.598	55.598	3.843	38.429	38.429
2	1.031	10.308	65.906	1.031	10.308	65.906	2.748	27.477	65.906

3	.683	6.828	72.734						
4	.583	5.827	78.561						
5	.498	4.984	83.545						
6	.418	4.179	87.724						
7	.400	4.000	91.724						
8	.315	3.148	94.872						
9	.262	2.620	97.492						
10	.251	2.508	100.000						

Figure 111 Plan Subscale Factor analysis: Total Variance Explained

The scree plot in Figure 112 supports the conclusion about the number of factors.

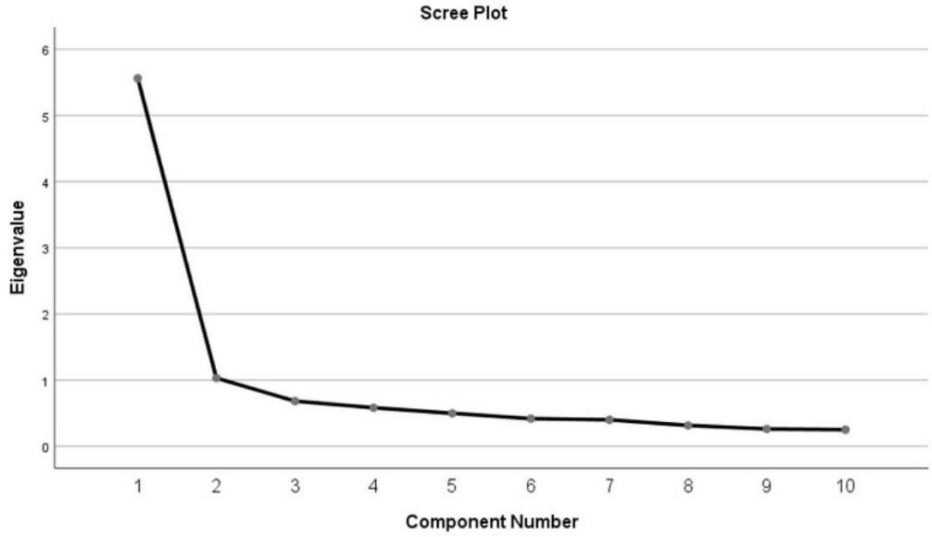


Figure 112 Plan Subscale Factor analysis: Scree Plot

The factor loadings for the variables are presented in Figure 113 :

Rotated Component Matrix[a]		
	Component	
	1	2
Planning PD activities - I Set Goals	.261	.773
Planning PD activities- I assess my needs	.155	.874
Planning PD activities- I Plan my professional development activities	.411	.709
Planning PD activities - I develop a Timescale for professional development activities	.552	.597
Planning PD activities - I carry out a structured review of my roles and expectations	.645	.463
Planning PD activities - I create a loose competency framework (list of current competency)	.714	.211

Planning PD activities - I create a detailed competency framework (Detailed list of my competency including a list of what I need to develop)	.786	.267
Planning PD activities - I clearly link my competence to the training activities and the required job role	.829	.235
Planning PD activities - I clearly prioritise or rank components of my plan	.745	.275
Planning PD activities - I ensure that my activities are individualised and fit-for-purpose	.700	.256

Figure 113 Plan Subscale Factor analysis: Factor loadings

Figure 113 shows the factor loadings of the varying items. To enhance the interpretability of the factors, only variables with factor loadings > 0.630 (factor 1), > 0.580(factor 2) were selected for inclusion in their respective factors. The factors are named, respectively: 'Extent of In-depth Planning ' (Factor 1): 'Extent of Overarching Planning' (Factor 2).

The six variables Q96_5, Q96_6, Q96_7, Q96_8, Q96_9, Q96_10 that load on Factor 1 (as shown in Figure 113) reflect the way or approach in which the subjects engage with in-depth components of the planning process such as systematic evaluation of competence or extent to which planning is fit for purpose as such factor 1 is labelled 'Extent of In-depth Planning'. While the 4 variables Q96_1, Q96_2, Q96_3, Q96_4 that load on Factor 2 (as shown in Figure 113) reflect the extent to which subjects engage in across-the-board components of the planning aspect of the continuous professional development cycle such as generally setting goals or assessing needs, as such the Factor 2 is labelled as 'Extent of Overarching Planning'. The results of the factor analysis can be interpreted as being in line with theoretical expectations although it is highly informative that the variables load on two factors.

It illustrates the relative orthogonal relationship between factors examining the extent to which individuals engage with In-depth Planning of CPD activities and Overarching Planning of CPD activities, showing that they are independent of each other. As such an individual might engage with In-depth Planning effectively yet not effectively engage in Overarching Planning and vice versa; not to say that an individual can't engage with both effectively.

Figure 114 illustrates how the different variables of reflection contribute to the total level of reflection done. It can be seen that variable Q96_1 to Q96_4 cluster together while the variables Q96_5 to q96_9 also cluster together.

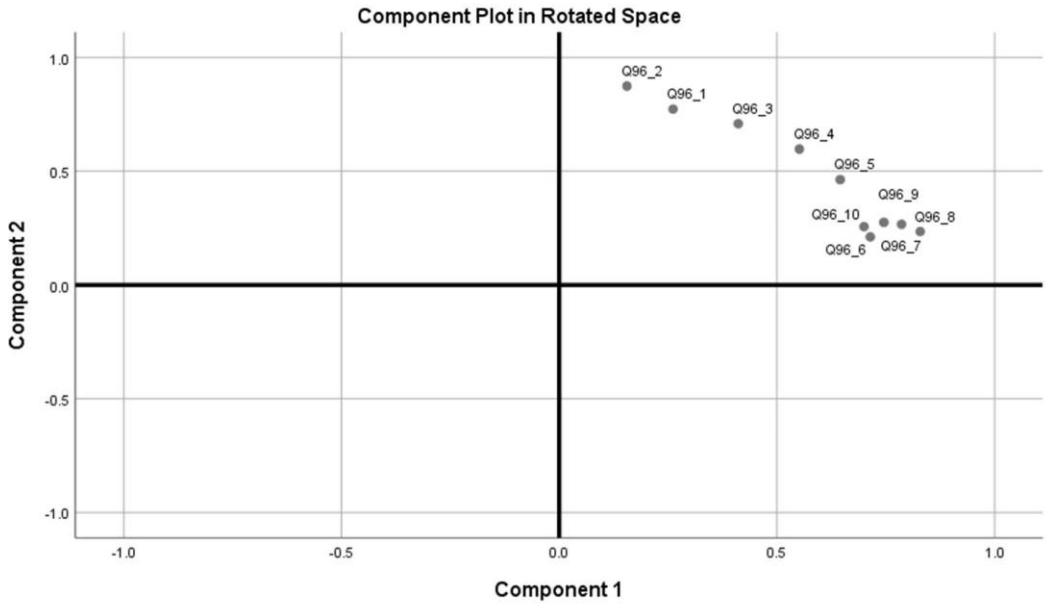


Figure 114 Plan subscale Factor Analysis: Illustration of loading of the First-order variables on resulting orthogonal factors or components

The value of the variables would be calculated as follows; the values are computed as the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified version of the equation were inputted as SPSS Syntax. The variables representative of the 'Extent of In-depth Planning '(Factor 1) and 'Extent of Overarching Planning' (Factor 2) are computed as shown in Equation 30 and Equation 31 respectively.

'Extent of In-depth Planning '(Factor 1):
Extent of In-depth Planning(Plan_F1) = Q96_5*0.645+Q96_6*0.714+Q96_7*0.786 + Q96_8 * 0.829 + Q96_9*0.745+ Q96_10*0.700

In order to maintain the scale of 0 to 5

Plan_F1_Index=(Q96_5*0.645+Q96_6*0.714+Q96_7*0.786+Q96_8* 0.829+Q96_9*0.745+ Q96_10*0.700)/(0.645+0.714+0.786+0.829+0.745+0.700)

Equation 30 'Extent of In-depth Planning '(Factor 1)

'Extent of Overarching Planning'(Factor 2).
Extent of Overarching Planning(Plan_F2)=Q96_1*0.773+Q96_2*0.874+Q96_3*0.709+Q96_4*0.597

In order to maintain the scale of 0 to 5

Plan_F2_Index=(Q96_1*0.773+Q96_2*0.874+Q96_3*0.709+Q96_4*0.597)/(0.773+0.874+0.709+0.597)

Equation 31 'Extent of Overarching Planning'(Factor 2).

A variable representative of the combined value of Plan component (Plan_F1F2) of CPD is computed by combing the two orthogonal variables 'Extent of In-depth Planning' and 'Extent of Overarching Planning' by finding their resultant, as they are orthogonal variables and act as right angles to one another as illustrated in Figure 114 . The variables are combined as would two variables acting at right angles to one another would be combined using Pythagoras theorem as illustrated in Equation 32

Combined Value of Plan component
Combined Value of Plan component (Plan_F1F2) = SQRT(Plan_F1**2+Plan_F2**2)

In order to maintain a scale of 0 to 5

Plan_F1 Max=4.419*5=22.095
Plan_F2 Max=2.953*5=14.765

Plan_F1F2 Max= SQRT(22.095^2+14.765^2) = 26.574

Plan_F1F2_Index Max= 26.574/5.3148

Plan_F1F2_Index= Plan_F1F2/5.3148

Equation 32 Combined Value of Plan component

8.3.1.1.2 Action Dimension of LECPD

To confirm that the values of the items from the action subscale can be combined, and to establish that the pattern of interaction of the variables conforms in the postulated manner, factor analysis (Principal Component Analysis) was carried out. This helps confirm that the proposed tool for measuring action is measuring what it intends to measure, and that the proposed separation of variable is in line with the underlying structure of interaction of said variables. Also, to show that all variables can be reduced to a distinct variable as proposed in the initial design of the questionnaire.

Q97_1	Actions for PD activity	I create a list of activities I engage in or record the activities I engage in
Q97_2	Actions for PD activity	I record the number of hours I spend engaging with activities
Q97_3	Actions for PD activity	I record the number of hours I spent engaging with activities and also keep evidence of engaging in these activities (e.g. certificate)
Q97_4	Actions for PD activity	I examine and record Justification for engagement
Q97_5	Actions for PD activity	I actively participate and record evidence of active participation (e.g. commentary from fellow students, references and feedback from colleagues and tutors)

Figure 115 Action Subscale Items and respective labels for Factor analysis

Figure 115 contains the Action variables/Items that were included in the initial Action subscale of the LECPD component of the questionnaire and the labels that would be used to denote them going forward. The Factor analysis that is carried out also showed how the variables can/should be combined, and the underlying interaction of items within the subscale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.862
Bartlett's Test of Sphericity	Approx. Chi-Square	886.764
	Df	10
	Sig.	.000

Figure 116 Action Subscale Factor analysis: KMO and Bartlett's Test

The results of the KMO and Bartlett's Test shown in the Figure 116 indicates that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, principal component analysis with varimax rotation and Kaiser normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regard to the 5 variables used, orthogonal rotation of the variables yielded 1 factors, accounting for 67.141 per cent of the total variance respectively, a total of 67.141 per cent of the total variance explained as shown in Figure 117.

Total Variance Explained		
Component	Initial Eigenvalues	Extraction Sums of Squared Loadings

	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.357	67.141	67.141	3.357	67.141	67.141
2	.671	13.413	80.554			
3	.366	7.324	87.878			
4	.312	6.230	94.108			
5	.295	5.892	100.000			

Figure 117 Action Subscale Factor analysis: Total Variance Explained

The scree plot as shown in Figure 118 supports as shown the conclusion about the number of factors

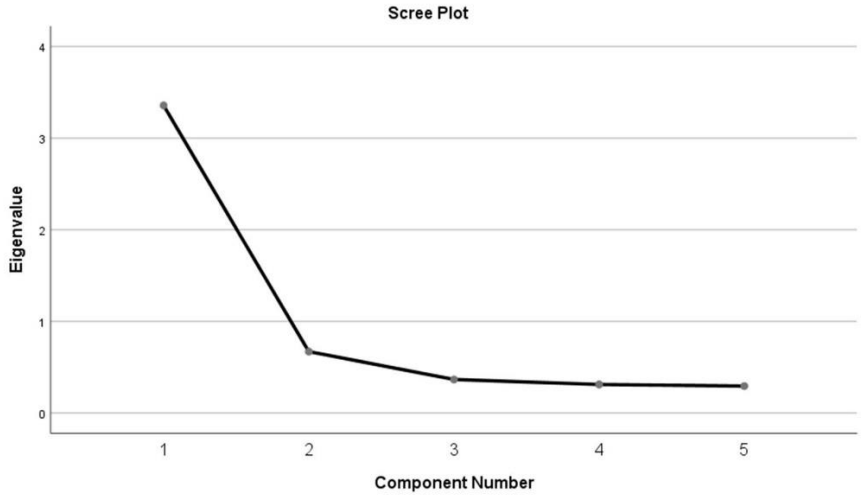


Figure 118 Action Subscale Factoria Analysis: Scree Plot

The factor loadings for the variables/items of the action subscale are presented in Figure 119

Component Matrix[a]	
	Component

	1
Actions for PD activity - I create a list of activities I engage in or record the activities I engage in	.680
Actions for PD activity- I record the number of hours I spend engaging with activities	.854
Actions for PD activity - I record the number of hours I spent engaging with activities and also keep evidence of engaging in these activities (e.g. certificate)	.871
Actions for PD activity - I examine and record Justification for engagement	.856
Actions for PD activity - I actively participate and record evidence of active participation (e.g. commentary from fellow students, references and feedback from colleagues and tutors)	.822

Figure 119 Action Subscale Factor Analysis: Factor loadings

To enhance the interpretability of the factors, only variables with factor loadings > 0.670 (factor 1) were selected for inclusion in their respective factors in so doing including all the variables as shown in Figure 119. The 5 variables Q97_1, Q97_2, Q97_3, Q97_4, Q97_5, that load on Factor 1 (as shown in Figure 119) reflect the Extent of Actions taken when engaging with CPD activities as such factor 1 is labelled 'Level of Actions for CPD Activities'. The results of the factor analysis are as expected, as it falls in line with theoretical expectation. It illustrates that all the variables measuring the level of action engaged in- combine to form a single variable. The value of the variables would be calculated as shown below. The values are calculated as the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. The computation of the variables was carried out using SPSS; modified versions of the equations were inputted as SPSS Syntax. The variables representative of Level of Actions for CPD Activities'(Action_F1) are computed as shown Equation 33.

'Level of Actions for CPD Activities' (Factor 1):
Level of Actions for CPD Activities'(Action_F1) =Q97_1*0.680+Q97_2*0.854+Q97_3*0.871 +Q97_4*0.856+Q97_5*0.822

In order to maintain the scale of 0 to 5

Action_F1_Index=(Q97_1*0.680+Q97_2*0.854+Q97_3*0.871+Q97_4*0.856+Q97_5*0.822)/(0.6 80+0.854+0.871+0.856+0.822)

Equation 33 Level of Actions for CPD Activities'(Action_F1)

8.3.1.1.3 Results Dimension of LECPD

To confirm that the values of the items from the Results subscale can be combined and to establish that the pattern of interaction of the variables conforms in the postulated manner factor analysis (Principal Component Analysis) was carried out. This helped in confirming that the proposed tool for measuring action is measuring what it is intended to measure and that the proposed separation of variable is in line with the underlying structure of interaction of said variables. Also, to show that all variables can be reduced to a to distinct variables as proposed in the initial design of the questionnaire.

98_1	Result of PD activity	Very poor results
98_2	Result of PD activity	Poor results
98_3	Result of PD activity	Average results
98_4	Result of PD activity	Good results
98_5	Result of PD activity	Excellent

Figure 120 Results Subscale Items and respective labels for Factor analysis

Figure 120 contains the Result variables/items that were included in the initially LECPD component of the questionnaire and the labels that would be used to denote them going forward. The Factor analysis that is carried out also showed how the variables can/should be combined and the underlying interaction of items within the subscale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.597
Bartlett's Test of Sphericity	Approx. Chi-Square	600.103
	Df	10
	Sig.	.000

Figure 121 Results Subscale Factoria Analysis: KMO and Bartlett's Test

All assumptions for conducting Factor Analysis were met, the results of the KMO and Bartlett's Test shown in the Figure 121 indicates that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, a principal component analysis with varimax rotation and Kaiser normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regard to the 5 variables used, orthogonal rotation of the variables yielded 2 factors, accounting for 44.187 and 29.121 per cent of the total variance respectively, a total of 73.308 per cent of the total variance explained as shown in Figure 122.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.332	46.638	46.638	2.332	46.638	46.638	2.209	44.187	44.187
2	1.334	26.670	73.308	1.334	26.670	73.308	1.456	29.121	73.308
3	.709	14.179	87.487						
4	.450	8.999	96.486						
5	.176	3.514	100.000						

Figure 122 Results Subscale Factoria Analysis: Total Variance Explained

The scree plot shown in Figure 123 supports the conclusion about the number of factors

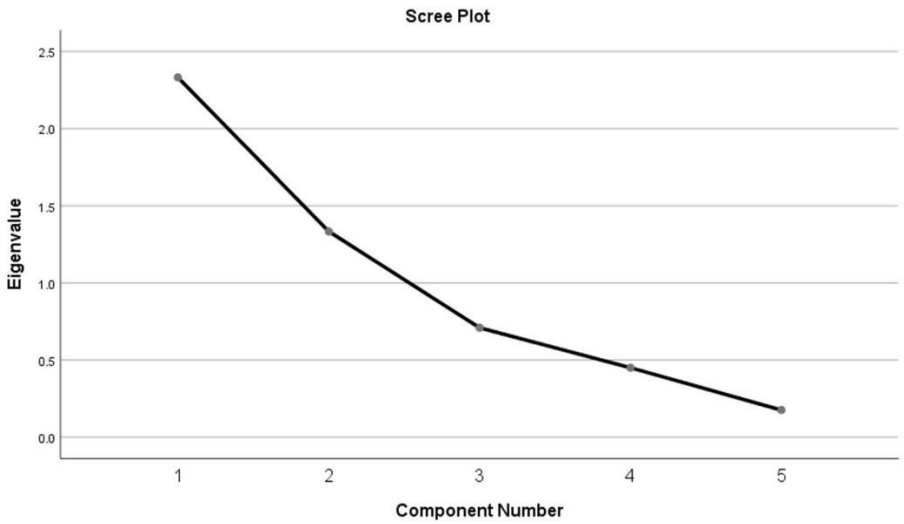


Figure 123 Results Subscale Factoria Analysis: Scree Plot

The factor loadings for the variables are presented in Figure 124:

Rotated Component Matrix[a]		
	Component	
	1	2
Result of PD activity - Very poor results	.884	.088

Result of PD activity - Poor results	.926	.074
Result of PD activity. - Average results	.741	.067
Result of PD activity - Good results	.142	.835
Result of PD activity. – Excellent	.015	.861

Figure 124 Results Subscale Factoria Analysis: Factor Loadings

To enhance the interpretability of the factors, only variables with factor loadings as > 0.74(factor 1), > 0.83 (factor 2) were selected for inclusion in their respective factors as shown in Figure 124.

The three variables Q98_1, Q98_2, Q98_3, that load on Factor 1 as shown in Figure 124reflect Average to very poor results of the CPD activity engaged in as such factor 1 is labelled 'Average to poor Result'. While the 2 variables Q98_4, Q98_5 that load on the factor 2 (as shown in Figure 124) reflect Good to Excellent results of professional development activity engaged in, as such the factor 2 is labelled as 'Good to Excellent results' . The results of the factor analysis is as expected, as it falls in line with theoretical expectation, although it is very interesting that the variables for Good and Excellent coalesced on a separate factor(latent variable) form the variables for Average, poor and very poor results in line with the results. It illustrates the relative orthogonal relationship between the factors representing Good to Excellent results of engagement with Professional development activity and the factors representing Average to poor results of engagement with professional development activity, shows that they are independent of each other.

Figure 125 illustrates how the different variables of reflection contribute to the total level of reflection done. It can be seen that variables Q98_1, Q98_2, Q98_3 cluster together while the variables Q98_4, Q98_5 cluster together.

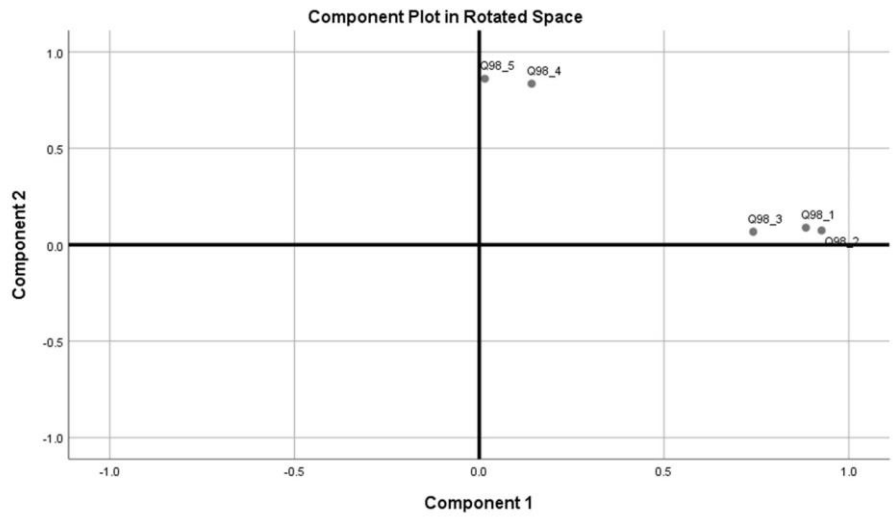


Figure 125 Result subscale Factor Analysis: Illustration of loading of the First-order variables on resulting orthogonal factors or components

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified versions of the equations were inputted as SPSS Syntax. The variables representative of the 'Average to Poor Results' (Factor 1) and 'Good to Excellent results' (Factor 2) are computed as shown in Equation 34 and Equation 35 respectively.

'Average to Poor Results' (Factor 1):
Average to Poor Results(Result_F1)=Q98_1*0.844+ Q98_2*0.710 + Q98_3*0.741

In order to maintain the scale of 0 to 5

Result_F1_Index=(Q98_1*0.844+ Q98_2*0.710 + Q98_3*0.741)/(0.844+0.710+0.741)

Equation 34 'Average to Poor Results' (Factor 1)

'Good to Excellent results' (Factor 2).
Good to Excellent results (Result_F2)=Q98_4*0.835+Q98_5*0.861

In order to maintain the scale of 0 to 5

Result_F2_Index=(Q98_4*0.835+Q98_5*0.861)/(0.835+0.861)

Equation 35 'Good to Excellent results' (Factor 2)

A variable representative of the combined value of Result component (Result_F1F2) of CPD is computed by combining the two orthogonal variables the 'Average to Poor Results' (Factor 1) and 'Good to Excellent results' (Factor 2) by finding their resultant. As they are orthogonal variable and act as right angles to one another as illustrated in Figure 125 the variables are combined as would two variables acting at right angles to one another would be combined using Pythagoras theorem as illustrated in Equation 36

Combined value of Results Component.
Combined Value of Results Component(Result_F1F2)=SQRT(Result_F1^2 + Result_F2^2)

In order to maintain scale of 0 to 5
Result_F1 Max=2.295*5 = 11.475
Result_F2 Max=1.696*5 = 8.48
Result_F1F2 Max =SQRT(Result_F1_Max^2 + Result_F2_Max^2)
= 14.268
Result_F1F2_Index Max= 14.268/2.8536
Result_F1F2_Index= Result_F1F2/2.8536

Equation 36 Combined value of Results Component

8.3.1.1.4 Reflection Dimension of LECPD

To confirm that the values of the items from the Reflection subscale can be combined and to establish that the pattern of interaction of the variables conforms in the postulated manner factor analysis (Principal Component Analysis) was carried out. This helped in confirming that the proposed tool for measuring action is measuring what it is intended to measure and that the proposed separation of variable is in line with the underlying structure of interaction of said variables. Also, to show that all variables can be reduced to a distinct variable as proposed in the initial design of the questionnaire.

Q100_1	Reflection I on PD activities	- I reflect on the planning process and actions that were taken before commencing engagement with the activity/activities.
Q100_2	Reflection I on PD activities	Reflection I on PD activities - I reflect on actions taken while and immediately after engaging in the activity/activities
Q100_3	Reflection I on PD activities	Reflection I on PD activities - I reflect on Results attained in the activity/activities I engaged in
Q101_1	Reflection II approach or process-	Open-ended Reflection
Q101_2	Reflection II approach or process-	Reflection II approach or process - Structured reflection
Q101_3	Reflection II approach or process-	Reflection II approach or process - Reflection with help from a Third Party
Q101_4	Reflection II approach or process-	Reflection II approach or process - Reflection using well-established template or methodology
Q101_5	Reflection II approach or process-	Reflection II approach or process - Competence specific reflection (Reflection based on my competence requirements)
Q101_6	Reflection II approach or process-	Reflection II approach or process - Involves Critical evaluation of results of reflection

Figure 126 Reflection Subscale Items and respective labels for Factor analysis

Figure 126 contains the reflection variables that were included in the initial LECPD component of the questionnaire. These variables were divided into 'reflection on the professional development activities' and the 'approach or process of reflection'. The Factor analysis that is carried out also showed how the variables can/should be combined and the underlying interaction of items within the subscale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.877
Bartlett's Test of Sphericity	Approx. Chi-Square	1007.898
	Df	36
	Sig.	.000

Figure 127 Reflection Subscale Factor analysis: KMO and Bartlett's Test

The results of the KMO and Bartlett's Test shown in the Figure 127 indicate that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, principal

component analysis with varimax rotation and Kaiser normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regard to the 9 variables used, orthogonal rotation of the variables yielded 2 factors, accounting for 32.371 and 32.124 per cent of the total variance respectively, a total of 64.495 per cent of the total variance explained as shown in Figure 128.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.668	51.866	51.866	4.668	51.866	51.866	2.913	32.371	32.371
2	1.137	12.628	64.495	1.137	12.628	64.495	2.891	32.124	64.495
3	.786	8.728	73.223						
4	.624	6.929	80.152						
5	.467	5.186	85.337						
6	.400	4.439	89.776						
7	.364	4.047	93.823						
8	.305	3.383	97.206						
9	.251	2.794	100.000						

Figure 128 Reflection Subscale Factor analysis: Total Variance Explained

The scree plot as shown in Figure 129 supports the conclusion about the number of factors

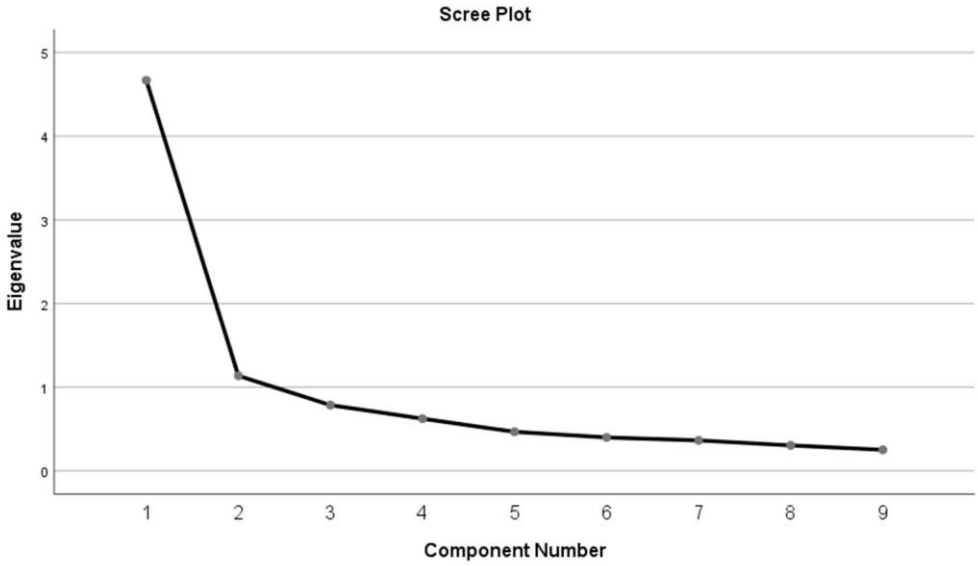


Figure 129 Reflection Subscale Factor analysis: Scree Plot

The factor loadings for the variables are presented in Figure 130:

Rotated Component Matrix[a]			
		Component	
		1	2
Q100_1	I reflect on the planning process and actions that were taken before commencing engagement with the activity/activities.	.307	.736
Q100_2	I reflect on actions taken while and immediately after engaging in the activity/activities	.182	.871
Q100_3	I reflect on Results attained in the activity/activities I engaged in	.175	.871
Q101_1	Open-ended Reflection	.421	.518
Q101_2	Structured reflection	.710	.338
Q101_3	Reflection with help from a Third Party	.698	.176
Q101_4	Reflection using well-established template or methodology	.859	.102
Q101_5	Competence specific reflection (Reflection based on my competence requirements)	.734	.368
Q101_6	Involves Critical evaluation of results of reflection	.557	.523

Figure 130 Reflection Subscale Factor analysis: Factor loadings

To enhance the interpretability of the factors, only variables with factor loadings > 0.420 (factor 1), > 0.74 (factor 2) were selected for inclusion in their respective factors as shown in Figure 130. The six variables Q101_1, Q101_2, Q101_3, Q101_4, Q101_5, Q101_6 that load on Factor 1 (as shown in Figure 130) reflect the way or approach in which the subjects engage with reflection process as such

factor 1 is labelled 'approach or process of reflection'. While the 3 variables Q100_1, Q100_2, Q100_3 that load on factor 2 (as shown in Figure 130) reflect the extent to which subjects reflected on other aspects of professional development cycle as such the factor 2 is labelled as 'Extent of reflection on aspect of the professional development cycle' .

'Approach or process of reflection' (Factor 1) and 'Extent of reflection on aspect of the professional development cycle' (Factor 2) are analogous to examining the nature of reflective learning carried out by the subject and the depth quality of reflective learning. The variable associated with quality of depth of reflection evaluates the extent to which the subject engaged with varying methods of deepening reflection during the Reflection phase of the CPD cycle such as: use of a critical other; using approaches to enable subject to stand back and avoid emotional distortion such as structures reflection; engage with Second-order Reflection - Reflecting on or evaluating results of reflection done i.e. reflecting on reflection (Moon, 2004).

Examining the factor loadings, inform us of how the variables and in turn activities that make up the variables contribute to the overall reflection factor. The factor loading is interesting when arranged in ascending order (as shown Figure 131) it becomes obvious that those variables that have the highest factor loadings are the variables that are expected to be more important to overall reflection. This make a lot of sense, as it would be expected that reflection with a well-established template or methodology would contribute the most to the overall value of reflection and it would also be expected that open-ended reflection would contribute least to the overall value of reflection.

	Rotated Component Matrix[a]	
		Component
		1
Q101_1	Open-ended Reflection	.421
Q101_6	Involves Critical evaluation of results of reflection	.557
Q101_3	Reflection with help from a Third Party	.698
Q101_2	Structured reflection	.710
Q101_5	Competence specific reflection (Reflection based on my competence requirements)	.734
Q101_4	Reflection using well-established template or methodology	.859

Figure 131 Reflection Subscale Factor analysis: Factor loadings in ascending order

The results of the factor analysis is as expected, as it falls in line with theoretical expectation, this also justifies the separation of these variables in the questionnaire with the sets of variables forming two separate Likert scales as opposed to Likert items forming parts of the same Likert scale. Figure 132

illustrates the relative orthogonal relationship between reflection examining the extent to which individuals engage with different aspects of the CPD cycle and the individual CPD approach; this shows that they are independent of each other. As such an individual might have an effective approach or process of reflecting on engagement with CPD yet not reflect on all the process

Figure 132 illustrates how the different variables of reflection contribute to the total level of reflection done. It can be seen that variable Q100 cluster together while the variables Q101 cluster together.

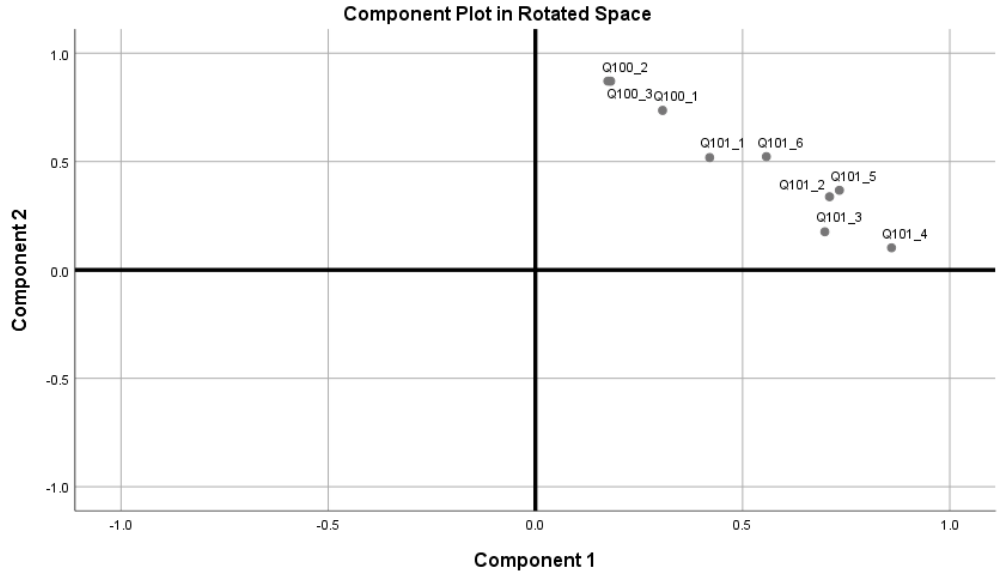


Figure 132 Reflection subscale Factor Analysis: Illustration of loading of the First-order variables on resulting orthogonal factors or components

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified versions of the equations were inputted as SPSS Syntax. The variables representative of the 'Approach or process of reflection' (Factor 1) and 'Extent of reflection on aspect of the professional development cycle' (Factor 2) are computed as shown in Equation 37 and Equation 38 respectively.

'Approach or process of reflection' (Factor 1):
Approach or Process of Reflection (Reflection_F1) =Q101_1*0.421+ Q101_2*0.710 + Q101_3*0.698 +Q101_4*0.859+Q101_5*0.734+Q101_6*0.557

In order to maintain the scale of 0 to 5

Reflection_F1_Index=(Reflection_1)/(0.421+0.710+0.698+0.859+0.734+0.557)

Equation 37 'Approach or process of reflection' (Factor 1)

'Extent of reflection on aspect of the professional development cycle' (Factor 2).
Extent of reflection on aspect of the professional development cycle(Reflection_F2)=Q100_1*0.736+Q100_2*0.871+Q100_3*0.871
In order to maintain the scale of 0 to 5
Reflection_F2_Index=(Q100_1*0.736+Q100_2*0.871+Q100_3*0.871)/(0.736+0.871+0.871).

Equation 38 'Extent of reflection on aspect of the professional development cycle' (Factor 2)

A variable representative of the combined value of Reflection component (Reflection_F1F2) of CPD is computed by combing the two orthogonal variables the 'Approach or process of reflection' (Factor 1) and 'Extent of reflection on aspect of the professional development cycle' (Factor 2) by finding their resultant. As they are orthogonal variables and act as right angles to one another as illustrated in Figure 132 the variables are combined as would two variables acting at right angles to one another would be combined using Pythagoras theorem as illustrated in Equation 39.

Combined value of Reflection Component.
Combined value of Reflection (Reflection_F1F2) = SQRT (Reflection_F1^2 + Reflection_F2^2)

In order to maintain the scale of 0 to 5

Reflection_F1 Max= 19.895
Reflection_F2 Max= 12.390
Reflection_F1F2 Max= SQRT (Reflection_F1_Max^2 + Reflection_F2_Max^2)= 23.438
Reflection_F1F2_Index Max = 23.438/4.6876
Reflection_F1F2_Index = Reflection_F1F2 / 4.6876

Equation 39 Combined value of Reflection Component

8.3.1.2 Second Order variables

Second order variables of LECPD are calculated by carrying out factor analysis of the first-order variables that are directly representative of the value of the subscales denoting the different dimensions/components of LECPD. The variables 'LECPD less Effect of Failure' and 'Effect of Failure' that represent the values of the Second-order dimensions/components of LECPD are computed as shown below. To confirm that the values of the items from the LECPD can be combined and to establish the pattern of interaction of the variables conforms in the postulated manner factor analysis (Principal Component Analysis) was carried out. This helped in confirming that the proposed tool for measuring action is measuring what it is intended to measure and that the proposed separation of

variable is in line with the underlying structure of interaction of said variables. Also, to show that all variables can be reduced to distinct variable as proposed in the initial design of the questionnaire.

Reflection_F1_Index	Approach or Process of Reflection
Reflection_F2_Index	Extent of reflection on aspect of the professional development cycle
Result_F1_Index	Average to Poor Results
Result_F2_Index	Good to Excellent results
Action_F1_Index	Level of Actions for CPD Activities
Plan_F1_Index	Extent of In-depth Planning
Plan_F2_Index	Extent of Overarching Planning

Figure 133 LECPD Subscale Items and respective labels for Factor analysis

Figure 133 contains the First-order variables that were representative of the initial LECPD aspects of the questionnaire and where used in the second-order factor analysis. The Factor analysis that is carried out also showed how the variables can/should be combined and the underlying interaction of items within the subscale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.831
Bartlett's Test of Sphericity	Approx. Chi-Square	658.616
	Df	21
	Sig.	.000

Figure 134 LECPD Scale Factor analysis: KMO and Bartlett's Test

The result of the KMO and Bartlett's Test shown in the Figure 134 indicates that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, principal component analysis with varimax rotation and Kaiser Normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regard to the 7 variables used, orthogonal rotation of the variables yielded 2 factors, accounting for 50.565 and 16.189 per cent of the total variance respectively, a total of 66.754 per cent of the total variance explained as shown in Figure 135.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %

1	3.578	51.109	51.109	3.578	51.109	51.109	3.540	50.565	50.565
2	1.095	15.645	66.754	1.095	15.645	66.754	1.133	16.189	66.754
3	.694	9.921	76.675						
4	.594	8.482	85.156						
5	.467	6.677	91.833						
6	.325	4.643	96.476						
7	.247	3.524	100.000						

Figure 135 LECPD Subscale Factor analysis: Total Variance Explained

The scree plot as shown in Figure 136 supports the conclusion about the number of factors.

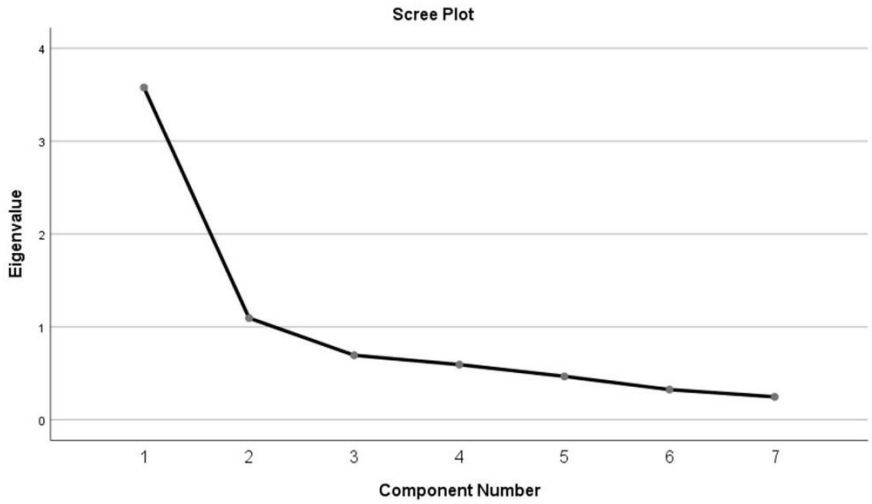


Figure 136 LECPD Subscale Factor analysis: Scree Plot

The factor loadings for the variables are presented in Figure 137 :

Rotated Component Matrix[a]		
	Component	
	1	2
Reflection_F1_Index	.768	.337
Reflection_F2_Index	.747	.012

Result_F1_Index	.032	.956
Result_F2_Index	.640	.062
Action_F1_Index	.760	.217
Plan_F1_Index	.878	-.015
Plan_F2_Index	.796	-.232

Figure 137 LECPD Subscale Factor analysis: Factor loadings

To enhance the interpretability of the factors, only variables with factor loadings > 0.630 (factor 1), > 0.940(factor 2) were selected for inclusion in their respective factors as shown in Figure 137. The six variables Reflection_F1_Index, Reflection_F2_Index, Result_F2_Index, Action_F1_Index, Plan_F1_Index, Plan_F2_Index that load on Factor 1 (as shown in Figure 137) reflect all components of measuring the level of engagement of CPD apart from the variable for 'average to poor results' as such factor 1 is labelled 'Level of engagement With CPD Less the effect of poor results' (LECPD_F1) . While the variables Result_F1_Index that load on factor 2 (as shown in Figure 137) reflect the effect of average to poor result on the Level of engagement with CPD as such the factor 2 is labelled as 'Effect of poor results on level of engage with CPD' (LECPD_F2). The results of the factor analysis can be interpreted as being in line with theoretical expectations although it is highly informative that the variables load on two factors. This illustrates the relative orthogonal relationship between factors evaluating level of engagement with CPD less the effect of "average to poor result' and the factor examining the Effect of average to poor results on level of engage with CPD , shows that they are independent of each other. It is important to further explore the implication of this; as it would need to be investigated if this means that effect of average to poor result should be considered as not contributing to the level of engagement with CPD or contributes in such a way that resultant of the factor it loads on (Factor2) and the other factor (Factor 1) gives the level of engagement with CPD. The factor loading shows that in-depth planning is the highest contribution to level of engagement with CPD less effect of 'Average to Poor' result, while the lowest contributor is Good to Excellent results.

Figure 138 illustrates how the different variables of LECPD contribute to the total level of LECPD . It can be seen that variable Reflection_F1_Index, Reflection_F2_Index, Result_F2_Index, Action_F1_Index, Plan_F1_Index, Plan_F2_Index cluster together while the variable Result_F1_Index stands apart.

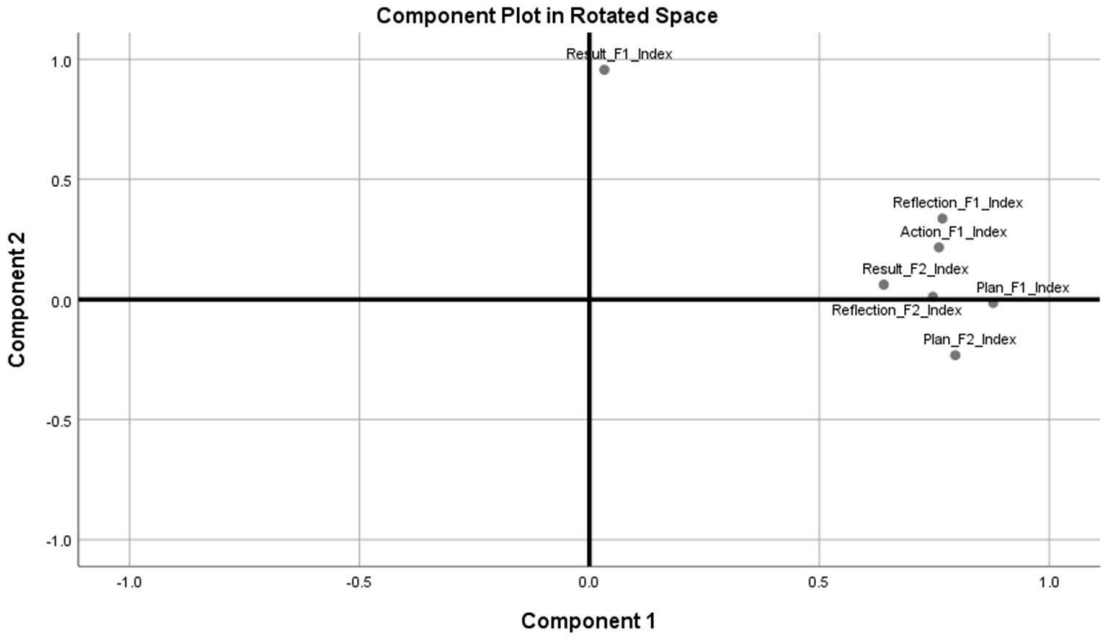


Figure 138 Illustration of loading of the First-order variables on resulting orthogonal factors or components

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified versions of the equations were inputted as SPSS Syntax. The variables representative of the 'Level of engagement With CPD Less the effect of poor results'(Factor 1) and 'Effect of poor results on level of engage with CPD' (Factor 2) are computed as shown in Equation 40 and Equation 38 respectively

'Level of engagement With CPD Less the effect of poor results'(Factor 1):
Level of engagement With CPD Less the effect of poor results(LECPD_F1) =Reflection_F1_Index*0.768 +Reflection_F2_Index*0.747+Result_F2_Index*0.640+Action_F1_Index*0.760+Plan_F1_Index*0.878 +Plan_F2_Index*0.796

In order to maintain the scale of 0 to 5

LECPD_F1_Index =(Reflection_F1_Index*0.768+Reflection_F2_Index*0.747+Result_F2_Index*0.640 +Action_F1_Index*0.760+Plan_F1_Index*0.878+Plan_F2_Index*0.796)/(0.768+0.747+0.640+0.760+0.87 8+0.796)

Equation 40 'Level of engagement With CPD Less the effect of poor results'(Factor 1)

'Effect of poor results on level of engage with CPD' (Factor 2)
'Effect of poor results on level of engage with CPD' (LECPD_F2) =Result_F1_Index*0.956

In order to maintain the scale of 0 to 5

LECPD_F2_Index=(Result_F1_Index*0.956)/0.956

Equation 41 'Effect of poor results on level of engage with CPD' (Factor 2)

8.3.2 Variable representing Overall Level of Engagement with CPD

8.3.2.1 LECPD based on factorial analysis (Third order variables)

A third order variable representative of the value of CPD is computed by combing the two orthogonal Second-order variables by finding their resultant. As these are orthogonal variables and act as right angles to one another as illustrated in Figure 138 the Second order variables are combined as two variables acting at right angles to one another would be combined using Pythagoras theorem as illustrated in Equation 42

Level of engagement With CPD with the effect of poor results (LECPD_F1.F2) =
SQRT (LECPD_F1**2 + LECPD_F**2)

In order to maintain the scale of 0 to 5
LECPD_F1 Max=4.589*5 = 22.945
LECPD_F2 Max=0.956*5 = 4.78
LECPD_F1F2 Max= SQRT(22.945^2+4.78^2) = 23.438

LECPD_F1F2_Index Max=23.438/4.6876
LECPD_F1F2_Index = LECPD_F1F2/4.6876

Equation 42 Level of engagement With CPD with the effect of poor results

8.3.2.2 LECPD calculated using hypothesized weightings

Another method of computing an overall value for LECPD was by hypothesizing perceived weighting of contribution of the different components (First-order variable of LECPD) to the overall level of engagement with CPD and then subjecting said hypothesized value to scrutiny by experts in CPD engagement. The Figure 139 contains the value of weightings based on the perceived importance/contribution of the component towards overall level of engagement with CPD hypothesized by the researcher.

Component	Initial hypothesized Weighting by researcher
Planning	5
Action	2
Result	5
Reflection	5

Figure 139 Hypothesized weighting of contribution of component/dimensions of CPD to overall value

As part of the interview process, experts were presented with the assumed weighting for the component of level of engagement with CPD. Each component was assigned a weighting between 1 to 7 (in line with a 7 point Likert scale). Figure 140 shows the varying weightings based on the perceived importance/contribution of the component towards overall level of engagement with CPD by the participants in the interviews.

S/N	Planning	Action	Result	Reflection
1	5	5	5	5
2	6	3	1	7
3	5	3	4	5
4	5	2		5
5	5	2	5	5
6	5	2	5	5
7	5	2	5	5
8	5	2	5	5
9	5	2	5	5
10	5	2	5	5
11	5	2	5	5
12	5	2	5	5
13	5	2	5	5
14	5	2	5	5
15	5	2	5	5
16	5	2	5	5
17	5	2	5	5

18	5	2	5	5
19	5	2	5	5
20	5	2	5	5
21	5	2	5	5
22	5	2	5	5
23	5	2	5	5
Mean	5.043478	2.217391	4.772727	5.086957

Figure 140 Weightings given by the participants in the interviews

To derive the overall value of level of engagement with CPD the mean weighting is multiplied by the values of each component as shown in Equation 43

Level of engagement With CPD Computed based on hypnotised weightings (LECPD_W) =Reflection_F1F2_Index*5.086957 +Result_F1F2_Index*4.772727 +Action_F1_Index*2.217391 +Plan_F1F2_Index*5.043478

In order to maintain the scale of 0 to 5

LECPD_W_Index = (Reflection_F1F2_Index*5.086957+Result_F1F2_Index*4.772727+ Action_F1_Index*2.217391 + Plan_F1F2_Index*5.043478)/(5.086957+4.772727+2.217391+5.043478)

Equation 43 Level of engagement With CPD Computed based on hypnotised weightings

8.3.3 Comparing approaches and selecting preferred to method of computation of LECPD

In order to determine which of the varying methods of combining the variables for LECPD is most suitable T-test for paired samples was carried out. Variables representing the values of LECPD combined using different approaches are compared to the variable representative of 'direct measure of level engagement with CPD (Collective_CPD_Value)' . The variable of LECPD value that are compared are 1) Level of engagement with CPD computed based on hypothesized weightings (LECPD_W_Index) , 2) Level of engagement with CPD less the effect of poor results(LECPD_F1_Index) , 3) Level of engagement with CPD with the effect of poor results (LECPD_F1.F2)/ LECPD combined

The results of the t-test show that there is a significant difference in all pairs as shown in Figure 141 .

Paired Samples Test									
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	'Collective_CPD_Value' – 'LECPD calculated using hypothesized weight Indexed 0 to 5'	-.28618	.55288	.03584	-.35678	-.21558	-7.985	237	.000
Pair 2	'Collective_CPD_Value' – 'LECPD Combined factors Indexed 0 to 5'	-.46262	.56186	.03642	-.53437	-.39087	-12.702	237	.000
Pair 3	Collective_CPD_Value - LECPD Less the effect of poor results (Factor Analysis) Indexed 0 to 5	-.49960	.57198	.03708	-.57264	-.42656	-13.475	237	.000

Figure 141 Comparison of approaches to LECPD variable computation: Paired samples Test

Figure 142 shows the results of the T-test, it is quite interesting and noteworthy that all methods of combination provide a mean value that is higher than the mean from the relatively direct measure of engagement with CPD labelled 'Collective_CPD_Value'. This is in line with expectation as LECPD measures takes into cognisance the additional factor of reflection. It is also of interest that the mean value of the LECPD without considering the effect of poor results is greater than the mean value of LECPD with the effect of poor results considered. This shows that the effect of 'Average to poor results' on LECPD is negative, this is in line with expectation and quite intuitive. Further T-tests are carried out to examine the significance of this difference and is discussed below.

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Collective_CPD_Value	3.0259	238	.40568	.02630
	LECPD calculated using hypothesized weight Indexed 0 to 5	3.3121	238	.61861	.04010
Pair 2	Collective_CPD_Value	3.0259	238	.40568	.02630
	LECPD Combined factors Indexed 0 to 5	3.4885	238	.65978	.04277
Pair 3	Collective_CPD_Value	3.0259	238	.40568	.02630
	LECPD Less the effect of poor results (Factor Analysis) Indexed 0 to 5	3.5255	238	.67547	.04378

Figure 142 Comparison of approaches to LECPD variable computation: Paired samples statistics

In selecting which of the variables was most suitable, the level of correlation of each of the pairs (as shown in Figure 143) i.e. the correlation of each of the methods of combining LECPD, with the Collective_CPD_value, and theoretical under pinning's are considered. As shown in the Figure 143 pair 2 and pair 3 have the highest level of correlation but with only a minimal amount of difference in their correlation coefficient. As a result of this, further comparison of the LECPD variables in these pair was carried out.

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Collective_CPD_Value & LECPD calculated using hypothesized weight Indexed 0 to 5	238	.481	.000
Pair 2	Collective_CPD_Value & LECPD Combined factors Indexed 0 to 5	238	.531	.000
Pair 3	Collective_CPD_Value & LECPD Less the effect of poor results (Factor Analysis) Indexed 0 to 5	238	.536	.000

Figure 143 Comparison of approaches to LECPD variable computation: Paired samples correlations

A T-test comparing the variables ‘LECPD Combined Factors' and 'LECPD Less the effect of poor results' was carried out, the result of which shows that there is are significant differences ($p>0.05$) in their means as shown in the Figure 144.

Paired Samples Test									
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	LECPD Combined factors Indexed 0 to 5 - LECPD Less the effect of poor results (Factor Analysis) Indexed 0 to 5	-.03690	.03380	.00219	-.04121	-.03259	-16.878	238	.000

Figure 144 Comparison of approaches to LECPD variable with/without effect of failure: Paired samples correlations

It can also be seen from Figure 145 that the mean 'LECPD Combined Factors' which is the LECPD with the effect of poor results is less than the 'LECPD Less the effect of poor results', this show that the mean effect of 'Average to Poor' results is a negative one. This is in-line with what would be expected, as failure would tend to have a negative effect on level of engagement with CPD.

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	LECPD Combined factors Indexed 0 to 5	3.4883	239	.65840	.04259
	LECPD Less the effect of poor results	3.5252	239	.67407	.04360

Figure 145 Comparison of approaches to LECPD variable with/without effect of failure: Paired samples Statistics

The variable in pair 2 is selected given the minimal difference in Correlation and the fact that the variable in Pair 2 (labelled LECPD combined factors) is more in line with theoretical underpinnings (as stated above) and takes into consideration the effect of the failure (average to poor results). Thus, the variable LECPD combined factors would be representative value of LECPD used in further analysis and in the rest of the paper.

8.4 Chapter Summary

This Chapter shows that the postulated measure for the Level of engagement with CPD was established to enable further analysis and provide an affirmative answer to the research question regarding the measurability of the Level of engagement with CPD. The postulated instrument

/measure of Level of engagement with CPD is designed based on the CPD cycle, and this Chapter shows how the questionnaire items were created for the varying subscales and the full scale. The questionnaire's validity and reliability/ the postulated measure for the Level of engagement with CPD is established using a range of techniques presented in the Chapter. To establish the external/construct validity, a direct measure of engagement with CPD is operationalised, and this takes measurements that are compared with that of the postulated measure of Level of engagement with CPD. In addition, the results of factor analysis and inferred implications for the interaction between items and subscales are presented. Also presented is how the variables representative of the values of subscales and the full scale (component and overall) of the measure of Level of engagement with CPD are computed. To this effect, first-order, second-order and a singular Third-order variable representative of the component and resultant value of postulated Level of engagement with CPD is also computed to enable further analysis.

Chapter Nine

9 Computing Variables for Motivation in the context of CPD LECPD.

To enable in-depth evaluation of the relationship between level of engagement with CPD and motivation towards engagement with CPD and by effect attempt to answer key research questions and hypothesis, variables representative of different dimensions and components of motivation towards engagement with CPD are computed. The process of computing the variables representative of value of the said components and dimensions also allows for exploration and understanding the interaction between varying dimensions of motivation in the context of CPD. The variables are computed using the result of factor analysis, which not only sheds light on how the variables can be computed but also the underlying trend of interaction within the dimensions of motivation. A non-refined method using weighted sums of factor loadings above a cut-off point is used in computing the variables from the result of factor analysis [234]. Variables are computed for the Achievement motivation, Self-determined motivation, and Time perspective (Future Time Perspective, Zimbardo Time Perspective and Multidimensional future Time Perspective) dimensions of motivation. Pearson correlation would be used to establish the nature of the relationship between the said dimensions of motivation and CPD. In so doing, engaging with one of the key objective of this research which is to: determine the level of motivation in the specific context of CPD through computation of variables representative of underlying interaction specific to the sample population.

9.1 Computation of AM variables

To understand the relationship between LECPD and Achievement motivation, for further analysis to be carried out and to establish how the items of Achievement motivation in the context of CPD interact together, the variables and in turn representative value of Achievement motivation and the different dimensions/components representative of the Achievement motivation scale and emerging subscales are computed. To confirm that the values of the items from the Achievement Motivation Inventory can be combined and to establish the pattern of interaction of the variables in the factor analysis (Principal Component Analysis) was carried out. Also, to show if and how all variables can be reduced to a distinct variable as postulated in the conceptual framework section of this research.

9.1.1 Variables representing Dimensions AM

9.1.1.1 First Order variables

First order variables of Achievement Motivation are calculated by carrying out factor analysis to identify the emerging subscales which are representative of the dimension of achievement motivation. The variable representative of the emerging Achievement motivation subscales and their corresponding values are then computed using the results of the factorial analysis. The variables that represent the values of the First-order dimensions/components of Achievement Motivation are computed as follows

Label	Item
Q102_1	I feel I am a lazy person
Q102_2	Days often go by without me having done a thing
Q102_3	I like reading the biography of great people in order to learn how they overcome hurdles and achieved great things in life
Q102_4	I plan ahead what subjects to study during my free time
Q102_5	When I come to know that somebody like me, have achieved something great, I am motivated to do the same thing in a better way.
Q102_6	Most people who know me say that I am hard working and ambitious.
Q102_7	I go on postponing what I should be studying today.
Q102_8	I take a lot of time to get started on the task of studying
Q102_9	Most evenings I kick back and relax rather than prepare for the next day's University work
Q102_10	Sometimes, I forget to do preparatory work/homework.
Q102_11	I never leave a task/assignment unfinished
Q102_12	I enjoy working with people who perform/Score at an equivalent or lower level, rather than with those who are smarter and more hardworking than me.
Q102_13	I dislike failing in my University examinations due to unpreparedness.
Q102_14	I always work very hard to be among the best students in my Department.
Q102_15	I find myself just taking life as it comes without planning.
Q102_16	I aim at reaching the highest level in my profession or Education.
Q102_17	As I progress further, I want to do something which others have not done.
Q102_18	I am basically a competitive person and I compete just for the sake of competing.
Q102_19	I believe that success in life has less to do with hard work and more to do with luck and being in the right place at the right time.
Q102_20	I enjoy reading all kinds of books including those that are not part of our University syllabus.
Q102_21	I shall be satisfied with an above average performance, even though it may not be my best.
Q102_22	I prefer to use my time for doing something else rather than trying to perfect something that I have already completed.
Q102_23	I enjoy spending most of my time alone concentrating on my University work.

Q102_24	I always try to stand out from the rest of my team/colleagues in one way or the other.
Q102_25	I will go ahead with my plans only if I am sure that other people will approve of it.
Q102_26	I get restless and annoyed when I feel I am wasting time.
Q102_27	It is not a good idea to be always above others in achievement, because that may make them feel bad about themselves.
Q102_28	I like to be the best student in my class/department.
Q102_29	I enjoy finishing my University assignments/Projects even when they are difficult and time-consuming.
Q102_30	I enjoy making friends with the most intelligent student in my class/department so as to keep up my standards of performance.
Q102_31	I like when people say in front of others that I am doing well in University
Q102_32	I would like to deal with difficult situations, so that the blame or praise for its results come to me alone.

Figure 146: Achievement Motivation Items and Respective labels for factor analysis.

Figure 146 contains the Achievement motivation variables/items that were included in the achievement motivation inventory/questionnaire and the labels that would be used to denote them going forward. The Factoria Analysis that is carried, out also showed how the variables can/should be combined and the underlying interaction of items within the scale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.890
Bartlett's Test of Sphericity	Approx. Chi-Square	4096.956
	Df	496
	Sig.	.000

Figure 147 Achievement Motivation scale Factor analysis: KMO and Bartlett's Test

The results of the KMO and Bartlett's Test shown in the Figure 147 indicates that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, a principal component analysis with varimax rotation and Kaiser normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regard to the 32 variables used, orthogonal rotation of the variables yielded 7 factors, accounting for 15.756, 11.226, 9.703, 5.938, 5.905, 5.002, 4.638 per cent of the total variance respectively, a total of 58.167 per cent of the total variance explained as shown in Figure 148.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.610	23.780	23.780	7.610	23.780	23.780	5.042	15.756	15.756
2	4.626	14.456	38.236	4.626	14.456	38.236	3.592	11.226	26.981
3	1.694	5.293	43.529	1.694	5.293	43.529	3.105	9.703	36.685
4	1.405	4.391	47.920	1.405	4.391	47.920	1.900	5.938	42.623
5	1.177	3.679	51.599	1.177	3.679	51.599	1.890	5.905	48.528
6	1.099	3.434	55.033	1.099	3.434	55.033	1.600	5.002	53.529
7	1.003	3.134	58.167	1.003	3.134	58.167	1.484	4.638	58.167
8	.930	2.907	61.074						
9	.887	2.773	63.846						
10	.822	2.570	66.416						
11	.780	2.438	68.854						
12	.741	2.315	71.169						
13	.725	2.266	73.436						
14	.699	2.184	75.620						
15	.685	2.140	77.760						
16	.619	1.933	79.693						
17	.585	1.828	81.521						
18	.553	1.727	83.248						
19	.516	1.613	84.861						
20	.493	1.540	86.401						
21	.480	1.499	87.900						
22	.456	1.425	89.325						
23	.444	1.388	90.713						
24	.401	1.252	91.964						
25	.385	1.205	93.169						
26	.370	1.156	94.325						
27	.352	1.100	95.425						
28	.333	1.042	96.467						
29	.329	1.027	97.494						
30	.301	.939	98.433						
31	.259	.810	99.243						
32	.242	.757	100.000						

Figure 148 Achievement Motivation scale Factor analysis: Total Variance Explained

The scree plot as shown in Figure 149 supports the conclusion about the number of factors.

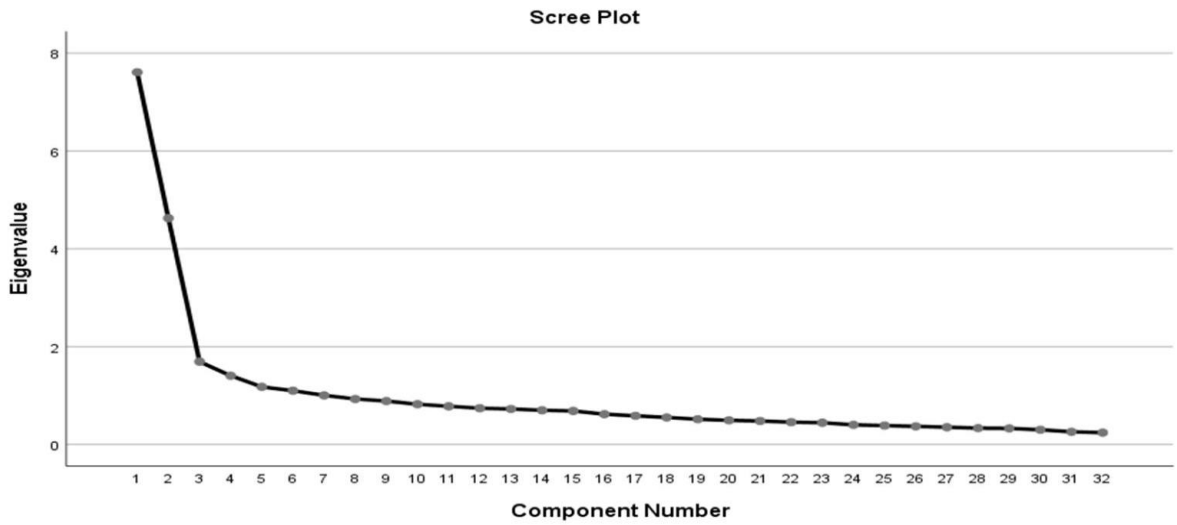


Figure 149 Achievement Motivation scale Factor analysis: Scree Plot

The factor loadings for the variables are presented in Figure 150.

Rotated Component Matrix							
	Component						
	1	2	3	4	5	6	7
Q102_1	.769	.038	-.062	.035	.062	.151	-.086
Q102_2	.787	.089	-.049	-.053	-.035	-.073	.141
Q102_3	-.121	-.046	.188	.212	.457	.516	-.127
Q102_4	.148	-.098	.318	.111	.250	.526	.150
Q102_5	-.046	.100	.214	.228	.712	.182	.052
Q102_6	.030	-.203	.257	-.081	.692	.078	.172
Q102_7	.800	.112	.048	-.132	-.101	-.010	-.082
Q102_8	.719	.161	-.002	-.051	-.055	-.086	-.060
Q102_9	.733	.285	.038	-.098	.077	.008	-.023
Q102_10	.713	.236	.128	-.134	-.203	-.127	.007
Q102_11	.026	-.478	.036	-.019	.022	.195	.506
Q102_12	.353	.621	-.059	-.171	-.028	-.118	-.049
Q102_13	-.039	.187	.200	-.116	.073	.023	.734
Q102_14	.140	-.248	.680	.056	.227	.029	.044
Q102_15	.608	.461	-.020	-.051	.102	.026	.048
Q102_16	-.078	.007	.708	.027	.127	.102	.031

Q102_17	.025	.273	.519	.080	.366	.129	.139
Q102_18	.315	.447	-.096	-.366	-.334	.169	.008
Q102_19	.409	.632	-.066	-.087	-.001	.074	.031
Q102_20	-.129	-.013	.155	.078	.089	.605	.237
Q102_21	.427	.545	.122	.091	.128	-.351	.027
Q102_22	.541	.339	.072	-.073	.134	-.337	.081
Q102_23	-.038	-.566	.292	.152	.252	-.098	.116
Q102_24	-.046	-.289	.480	.257	.095	.193	.136
Q102_25	.297	.565	-.069	-.338	.125	-.130	.056
Q102_26	-.021	-.041	.016	.359	.108	.157	.614
Q102_27	.335	.723	.002	.000	-.062	-.047	.137
Q102_28	-.014	-.017	.752	.220	.192	-.054	-.075
Q102_29	.067	-.031	.651	.136	-.176	.300	.181
Q102_30	.057	-.061	.375	.574	.040	-.052	.131
Q102_31	-.179	-.093	.175	.717	.066	.150	.008
Q102_32	-.252	-.271	.107	.523	.133	.198	-.030

Figure 150 Achievement Motivation scale Factor analysis: Factor loadings

To enhance the interpretability of the factors, only variables with factor loadings > 0.540 (factor 1), > 0.440(factor 2), >0.470 (factor 3), >0.520 (factor 4), >0.690 (factor 5), >0.510 (Factor 6), >0.500(Factor 7) as shown in Figure 150 were selected for inclusion in their respective factors.

The 8 variables Q102_1, Q102_2, Q102_7, Q102_8, Q102_9, Q102_10, Q102_15, Q102_22 that loaded on Factor 1 as shown in Figure 150 are representative of desire to avoid engagement with task or an absence of desire to engage with task, as such Factor 1 is labelled as 'Avoidance of Task'. While variables Q102_12, Q102_18, Q102_19, Q102_21, Q102_23, Q102_25, Q102_27 that load on Factor 2 as shown in Figure 150 are representative of a desire for approval and engagement in competitive behaviour for the sake of competition as such Factor 2 is labelled 'Affinity for Approval and Competitiveness'. The variables Q102_14, Q102_16, Q102_17, Q102_24, Q102_28, Q102_29 that load on Factor 3 as shown in the Figure 150 is representative of a draw towards success and challenge, reflective an affinity for/desire to engage with challenging circumstances with a potential to success

or an affinity for success resulting from challenging circumstances as such Factor 3 is labelled as ‘Success and Challenge Approaching’. On the other hand the variables Q102_30, Q102_31, Q102_32 that load on Factor 4 as shown in Figure 150 denotes a desire for recognition irrespective of outcome or success as such Factor 4 is labelled ‘Affinity for Recognition’. The variables Q102_5, Q102_6 that load on Factor 5 as shown in Figure 150 is indicative of a desire to be challenged or lack of avoidance of challenge especially when the veracity of the challenge is affirmed by others. As such Factor 5 is labelled, ‘Affinity for Challenge’. The variables Q102_3, Q102_4 that load on Factor 6 as shown in Figure 150 reflect an element of achievement motivation focused on a desire to plan or adequate preparation as such Factor 6 is labelled as ‘Affinity for Planning’. The variables Q102_11, Q102_13, Q102_26 that load on Factor 7 Figure 150 are indicative of an extent of intolerance for failure, with concerted effort to prevent failure through hard work, as such the Factor 7 was labelled ‘Dislike of Failure'. The factors are named, respectively: 'Avoidance of Task' (Factor 1): 'Affinity for approval and competitiveness' (Factor 2); 'Success and challenge approaching' (Factor 3); 'Affinity for Recognition' (Factor 4); 'Affinity of challenge' (Factor 5); 'Affinity for Planning' (Factor 6); ‘Dislike of Failure' (Factor 7).

Figure 151 illustrates how the variables of achievement motivation cluster, in so doing showing how the different variables of Achievement motivation contribute to the total level of achievement motivation.

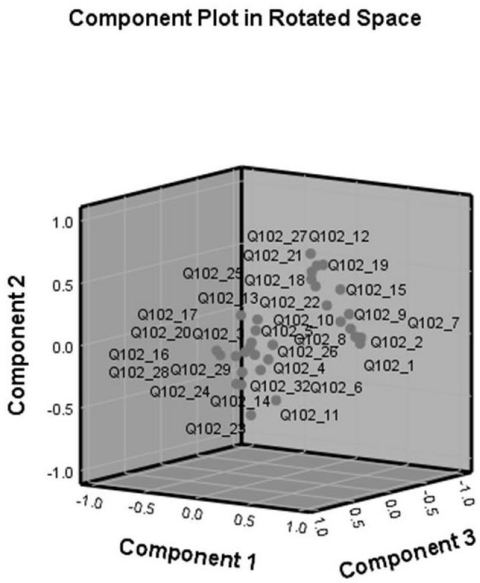


Figure 151 Achievement Motivation Scale: Illustration of how variables of items of Achievement Motivation cluster

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified versions of the equations were inputted as SPSS Syntax. The variables representative of the 'Avoidance of Task' (Factor 1), 'Affinity for approval and competitiveness' (Factor 2), 'Success and challenge approaching' (Factor 3), 'Affinity for Recognition' (Factor 4), 'Affinity of challenge' (Factor 5), 'Affinity for Planning' (Factor 6) and 'Dislike of Failure' (Factor 7) are computed as shown in Equation 44, Equation 45, Equation 46, Equation 47, Equation 48, Equation 49 and Equation 50 respectively.

'Avoidance of Task'(Factor 1)

Avoidance of Task(AM_F1)

=Q102_1*0.769+Q102_2*0.787+Q102_7*0.800+Q102_8*0.719+

Q102_9*0.733+Q102_10*0.713+Q102_15*0.608+Q102_22*0.541

In order to maintain scale of 0 to 5

Equation 44 'Avoidance of Task'(Factor 1)

'Affinity for approval and competitiveness' (Factor 2)

'Affinity for approval and competitiveness'(AM_F2) =Q102_12*0.621+Q102_18*0.447+

Q102_19*0.632 +Q102_21*0.545-Q102_23*0.566+Q102_25*0.565+Q102_27*0.723

In order to maintain scale of 0 to 5

AM_F2_Index=(AM_F2)/(0.621+0.447+0.632+0.545-0.566+0.565+0.723)

Equation 45 'Affinity for approval and competitiveness' (Factor 2)

'Success and challenge approaching'(Factor 3)

'Success and challenge approaching'(AM_F3) =Q102_14*0.680+Q102_16*0.708

+Q102_17*0.519+Q102_24*0.480+Q102_28*0.752+Q102_29*0.651

In order to maintain scale of 0 to 5

AM_F3_Index=AM_F3/(0.680+0.708+0.519+0.480+0.752+0.651)

Equation 46 'Success and challenge approaching'(Factor 3)

'Affinity for Recognition'(Factor 4)

'Affinity for Recognition'(AM_F4)

=Q102_30*0.574+Q102_31*0.717+Q102_32*0.523

In order to maintain scale of 0 to 5

Equation 47 'Affinity for Recognition'(Factor 4)

'Affinity of Challenge'(Factor 5)

'Affinity of Challenge'(AM_F5)

=Q102_5*0.712+Q102_6*0.692

In order to maintain scale of 0 to 5

Equation 48 'Affinity of Challenge'(Factor 5)

'Affinity for Planning'(Factor 6)

'Affinity for Planning'(AM_F6)

=Q102_3*0.516+Q102_4*0.526+Q102_20*0.605

In order to maintain scale of 0 to 5

Equation 49 'Affinity for Planning'(Factor 6)

'Dislike/Avoidance of Failure'(Factor 7)

'Dislike/Avoidance of Failure'(AM_F7)

=Q102_11*0.506+Q102_13*0.734+Q102_26*0.614

In order to maintain scale of 0 to 5

Equation 50 'Dislike/Avoidance of Failure'(Factor 7)

9.1.1.2 Second Order Variable

Second order variables of Achievement Motivation were calculated by carrying out factor analysis of the first-order variables that are directly representative of value of the emergent subscales denoting the different dimensions/components of Achievement Motivation. The variables 'laissez-faire and approbation' and 'Concerted Effort' that represent the values of the Second-order dimensions/components of Achievement motivation are computed as shown below. To confirm that the values of the items from the Achievement Motivation can be combined and to establish the pattern of interaction of the variables conforms in the postulated manner, factor analysis (Principal Component Analysis) was carried out. Also, to show that all variables can be reduced to distinct variables.

AM_F1_Index	AM - Avoidance of Task Index
AM_F2_Index	AM - Affinity for approval and competitiveness Index
AM_F3_Index	AM - Success and challenge approaching Index
AM_F4_Index	AM - Affinity for Recognition Index
AM_F5_Index	AM - Affinity of Challenge Index
AM_F6_Index	AM - Affinity for Planning Index
AM_F7_Index	AM - Dislike/Avoidance of Failure Index

Figure 152 Achievement Motivation scale First-order variables and labels for Factor analysis

Figure 152 contains the First-order variables that were representative of the emergent subscales of Achievement Motivation and where used in the second-order factor analysis. The Factoria Analysis that is carried out also showed how the variables can/should be combined and the underlying interaction of items within the subscale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.728
Bartlett's Test of Sphericity	Approx. Chi-Square	595.877
	Df	21
	Sig.	.000

Figure 153 AM scale Second-order Factor analysis: KMO and Bartlett's Test

The result of the KMO and Bartlett's Test shown in the Figure 134 indicates that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, principal component analysis with varimax rotation and Kaiser normalisation were conducted. Factors with

Eigen values equal to or greater than 1.00 were extracted. With regard to the 7 variables used, orthogonal rotation of the variables yielded 2 factors, accounting for 34.271 and 26.466 per cent of the total variance respectively, a total of 60.736 per cent of the total variance explained as shown in Figure 154.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.742	39.171	39.171	2.742	39.171	39.171	2.399	34.271	34.271
2	1.510	21.565	60.736	1.510	21.565	60.736	1.853	26.466	60.736
3	.803	11.477	72.214						
4	.631	9.008	81.222						
5	.542	7.737	88.958						
6	.449	6.419	95.378						
7	.324	4.622	100.000						

Figure 154 AM Subscale Second-order Factor analysis: Total Variance Explained

The scree plot as shown in Figure 136 supports the conclusion about the number of factors.

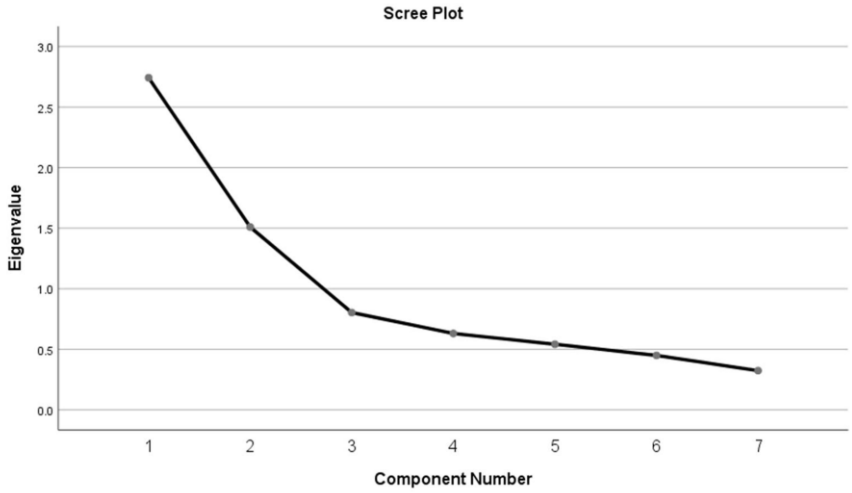


Figure 155 AM Second-order Factor analysis: Scree Plot

The factor loadings for the variables are presented in Figure 156

Rotated Component Matrix		
	Component	
	1	2
AM - Avoidance of Task Index	.037	.898
AM - Affinity for approval and competitiveness Index	-.146	.883
AM - Success and challenge approaching Index	.801	-.038
AM - Affinity for Recognition Index	.560	-.486
AM - Affinity of Challenge Index	.746	-.012
AM - Affinity for Planning Index	.741	-.161
AM - Dislike/Avoidance of Failure Index	.561	-.045

Figure 156 AM Second-Order Factorial Analysis

To enhance the interpretability of the factors, only variables with factor loadings > 0.559 (factor 1), > 0.880(factor 2) were selected for inclusion in their respective factors as shown in Figure 156. The 7 variables AM_F3_Index, AM_F4_Index, AM_F5_Index, AM_F6_Index, AM_F7_Index that load on Factor 1 (as shown in Figure 156) are indicative of components of achievement motivation that reflect a concerted effort (through planning) to avoid failure, take up challenge and/to gain recognition as such factor 1 is labelled 'Achievement motivation in the context concerted effort'. While the variables AM_F1_Index, AM_F2_Index that load on factor 2 (as shown in Figure 156) are indicative of components of achievement motivation that reflect a laissez-faire attitude towards work and approbation lust (desire for praise irrespective of veracity of effort or possible at the expense of Success) as such the factor 2 is labelled as 'Achievement motivation in the context of laissez-faire and approbation'. The results of the factor analysis can be interpreted as being is in line with theoretical expectations although it is highly informative that the variables load on two factors. These illustrate the relative orthogonal relationship between factors evaluating 'Achievement motivation in the context of concerted effort' and the factor examining 'Achievement motivation in the context of

laissez-faire' attitude towards work and approbation lust, show that they are independent of each other. It is important to further explore the implication of this.

Figure 157 illustrates how the different variables of AM contribute to the total level of AM. Variables AM_F3_Index, AM_F4_Index, AM_F5_Index, AM_F6_Index, AM_F7_Index cluster together while the variables AM_F1_Index, AM_F2_Index cluster together.

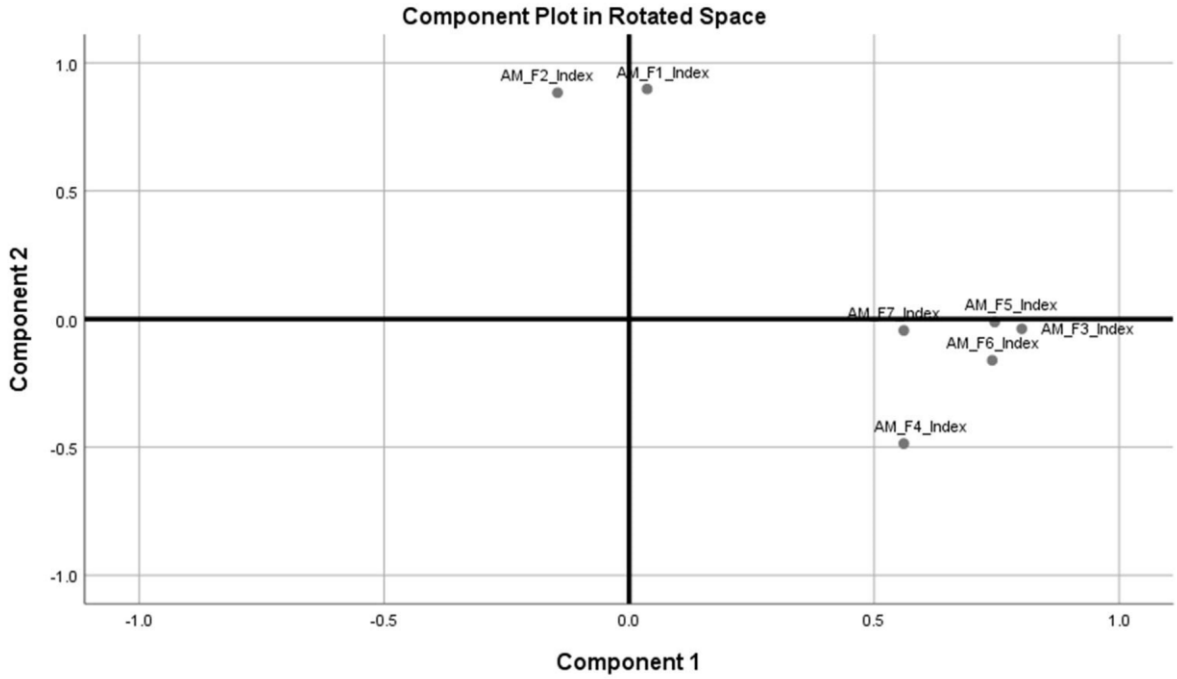


Figure 157 AM: Illustration of loading of the First-order variables on resulting orthogonal factors or components

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified version of the equations was inputted as SPSS Syntax. The variables representative of 'Achievement motivation in the context of concerted effort' (Factor 1) and the 'Achievement motivation in the context of laissez-faire and approbation'(Factor 2) are computed as shown in Equation 40 and Equation 52 respectively

'Achievement motivation in the context concerted effort' AMSUB_F1
'Achievement motivation in the context concerted effort' (AMSUB_F1)= AM_F3_Index*0.801+ AM_F4_Index*0.560+AM_F5_Index*0.746+AM_F6_Index*0.741+AM_F7_Index*0.561

In order to maintain the scale of 0 to 5

(AMSUB_F1_Index) = AMSUB_F1/ (0.801+0.560+0.746+0.741+0.561)

Equation 51 'Achievement motivation in the context concerted effort' (Factor 1)

'Achievement motivation in the context of laissez-faire and approbation' (Factor 2)
'Achievement motivation in the context of laissez-faire and approbation' (AMSUB_F2) =AM_F1_Index*898 +AM_F2_Index*0.833

In order to maintain the scale of 0 to 5

(AMSUB_F2_Index) =AMSUB_F2/ (0.898+0.833)

Equation 52 'Achievement motivation in the context of laissez-faire and approbation' (Factor 2)

9.1.2 Variable representing Overall Level of AM

9.1.2.1 Level of AM base on Second-order factor analysis (Third order variable)

A third order variable representative of the value of Achievement Motivation is computed by combing the two orthogonal Second-order variables by finding their resultant. As the second order variables 'Achievement motivation in the context concerted effort' (Factor 1) and the ' Achievement motivation in the context of laissez-faire and approbation'(Factor 2) are orthogonal variables and act at right angles to one another as illustrated in Figure 157 the Second order variables are combined as two variables acting at right angles to one another would be combined using Pythagoras theorem as illustrated in Equation 42.

''Achievement Motivation based on factor analysis'

Overall Level of Achievement Motivation (AMSUB_F1F2) =SQRT(MSUB_F1**2+AMSUB_F1**2)

In order to maintain the scale of 0 to 5

AMSUB_F1 Max= (0.801+0.560+0.746+0.741+0.561) *5=3.409*5= 17.045

AMSUB_F2 Max= (0.898+0.833) *5=1.731*5=8.655

AMSUB_F1F2 Max= SQRT (17.045^2+8.655^2) =19.117

AMSUB_F1F2_Index Max=19.117/3.823

AMSUB_F1F2_Index = AMSUB_F1F2/3.823

Equation 53 Level of Achievement Motivation based on factor analysis

9.1.2.2 Level of AM motivation: Mean value

An approach to finding the value of achievement motivation with was to find the mean of all the items in the Achievement motivation inventory [209]. An alternative value of AM was computed on this basis as shown in Equation 54.

Level of Achievement Motivation

Level of Achievement Motivation Via Mean: Achievement Motivation=MEAN(Q102_1:Q102_32)

Equation 54 Level of Achievement Motivation Via Mean

9.1.3 Comparing approaches and selecting preferred to method of computation of AM

In order to determine which method of computing the value of Achievement Motivation that is best fit for the purpose of this study (a study geared towards determining factors that influence and predict level engagement with LECPD), correlation was carried out between the variables generated from both methods and the variable representative of the postulated LECPD (LECPD combined). 'Level of Achievement Motivation Via Mean', 'Achievement Motivation based on factor analysis - Index' and 'LECPD Combined' factors Indexed 0 to 5'. All the correlation result was significant as shown in Figure

158 AM Computation Method Selection: Correlation Analysis, however the Achievement Motivation based on factor analysis Index was chosen as it gave the highest level of correlation (0.396).

Correlations

		Level of Achievement Motivation Via Mean	LECPD Combined factors Indexed 0 to 5	Achievement Motivation based on factor analysis Index
Level of Achievement Motivation Via Mean	Pearson Correlation	1	.227**	.762**
	Sig. (2-tailed)		.000	.000
	N	335	233	335
LECPD Combined factors Indexed 0 to 5	Pearson Correlation	.227**	1	.396**
	Sig. (2-tailed)	.000		.000
	N	233	239	233
Achievement Motivation based on factor analysis Index	Pearson Correlation	.762**	.396**	1
	Sig. (2-tailed)	.000	.000	
	N	335	233	335

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 158 AM Computation Method Selection: Correlation Analysis

9.2 Self-Determined motivation

For further analysis to be carried out, and to establish how the items of the Self Determined motivation in the context of CPD interact together, the variables and in turn representative values of the Self determined motivation and the different dimensions/components representative of the Academic motivation scale and emerging subscales are computed. To confirm that the values of the items from the Academic Motivation scale can be combined and to establish the pattern of interaction of the variables in the factor analysis (Principal Component Analysis) was carried out. Also, to show if and how all variables can be reduced to a distinct variable as postulated in the conceptual framework section of this research. Nevertheless, factor analysis should always be considered as a tool for estimating the relationship or interaction of variables, and as such theoretical implications and methods of evaluation that have been developed from literature needs to be considered for fitness in computing values of the variables or evaluation of the said relationship [234]. In the case of self-determined motivation, a number of approaches where used as more than one method of evaluating the relationship and computing a value as gleamed from the literature seem to be relevant. To make an informed decision on which of the approaches is best fit for purpose, the results of each of the approaches are compared in a later section (Section 9.1.3 Comparing approaches and selecting preferred to method of computation of AM)

The variables were computed using several approaches and the result variables derived using the varying computation methods compared, to select the most suitable method. The approaches used for the computation are: 1) Computation of value of dimensions using approach recommend in literature and combination of said dimensions using approach based on dynamics between dimensions/subscale gleamed from literature [272, 66, 157, 164, 163]. 2) Computation of value of dimensions using approach recommend in literature and combination of said dimensions using approach based on the dynamics between dimensions/subscales gleamed from the results of factor analysis. 3) Computation of value of respective dimensions using an approach based on the dynamics between items of respective dimensions/subscales gleamed from the results of factor analysis, then combining the dimensions based on the dynamics between dimensions/subscales gleamed from the results of a second order factorial analysis.

9.2.1 Variables representing Dimensions SDM

Figure 159 contains the Achievement motivation variables/items that were included in the Academic Motivation scale the tool for measuring Self Determined motivation utilised in this study. The items

are used in computing the Variables representative of the different dimensions and the labels that would be used to denote them going forward.

Label	Item
Q103_1	Because with only a high-school degree, I would not find a high-paying job later on.
Q103_2	Because I experience pleasure and satisfaction while learning new things.
Q103_3	Because I think that a University education will help me better prepare for the career, I have chosen.
Q103_4	For the intense feelings, I experience when I am communicating my own ideas to others.
Q103_5	Honestly, I don't know; I really feel that I am wasting my time in school.
Q103_6	For the pleasure, I experience while surpassing myself in my studies.
Q103_7	To prove to myself that I am capable of completing my University degree.
Q103_8	In order to obtain a more prestigious job later on.
Q103_9	For the pleasure, I experience when I discover new things never seen before.
Q103_10	Because eventually, it will enable me to enter the job market in a field that I like.
Q103_11	For the pleasure that I experience when I read interesting authors.
Q103_12	I once had good reasons for going to University; however, now I wonder whether I should continue.
Q103_13	For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.
Q103_14	Because of the fact that when I succeed in University, I feel important.
Q103_15	Because I want to have "the good life" later on.
Q103_16	For the pleasure that I experience in broadening my knowledge about subjects which appeal to me.
Q103_17	Because this will help me make a better choice regarding my career orientation.
Q103_18	Self-Determined Motivation. - For the pleasure that I experience when I feel completely absorbed by what certain authors have written.
Q103_19	I can't see why I go to University and frankly, I couldn't care less.
Q103_20	For the satisfaction, I feel when I am in the process of accomplishing difficult academic activities.
Q103_21	To show myself that I am an intelligent person.
Q103_22	In order to have a better salary later on.
Q103_23	Because my studies allow me to continue to learn about many things that interest me.
Q103_24	Because I believe that a few additional years of education will improve my competence as a worker.
Q103_25	For the "high" feeling that I experience while reading about various interesting subjects.
Q103_26	I don't know; I can't understand what I am doing in school.

Q103_27	Because University allows me to experience a personal satisfaction in my quest for excellence in my studies.
Q103_28	Because I want to show myself that I can succeed in my studies

Figure 159 Self Determined Motivation Items and Respective labels

9.2.1.1 First Order Variables

9.2.1.1.1 Approach I: Using approach recommend in literature.

The Academic Motivation scale by Vallerand et al. (1992) was used in measuring Self determined motivation. The values of the individual dimensions of Self Determined motivation are computed based on recommendation in the literature for the Academic Motivation Scale [163]. The variables are computed for the respective dimensions as shown in Equation 55, Equation 56, Equation 57, Equation 58, Equation 59 and Equation 60

To_Experience_Stimulation_IM=MEAN (Q103_25, Q103_18, Q103_11, Q103_4).

In order to move to a scale 0 to 5

To_Experience_Stimulation_IM_Index=To_Experience_Stimulation_IM/1.4.

Equation 55 Intrinsic Motivation to Experience Stimulation

Towards_Accomplishment_IM=MEAN (Q103_27, Q103_20, Q103_13, Q103_6).

In order to move to a scale 0 to 5

Towards_Accomplishment_IM_Index=Towards_Accomplishment_IM/1.4

Equation 56 Intrinsic Motivation to Towards Accomplishment

To_Know_IM=MEAN (Q103_23, Q103_16, Q103_9, Q103_2).

In order to move to a scale 0 to 5

To_Know_IM_Index=To_Know_IM/1.4.

Equation 57 Intrinsic Motivation to Know

Identified_EM=MEAN (Q103_24, Q103_17, Q103_10, Q103_3).

In order to move to a scale 0 to 5

Identified_EM_Index=Identified_EM/1.4.

Equation 58 Identified Extrinsic Motivation

Introjected_EM=MEAN (Q103_28, Q103_21, Q103_14,Q103_7).

In order to move to a scale 0 to 5

Introjected_EM_Index=Introjected_EM_Index/1.4.

Equation 59 Introjected Extrinsic Motivation

External_Regulation_EM=MEAN (Q103_22, Q103_15, Q103_8,Q103_1).

In order to move to a scale 0 to 5

External_Regulation_EM_Index=External_Regulation_EM/1.4.

Equation 60 External Regulation Extrinsic Motivation

Amotivation=MEAN (Q103_26, Q103_19,Q103_12,Q103_5).

In order to move to a scale 0 to 5

Amotivation_Index=Amotivation/1.4.

Equation 61 Amotivation

9.2.1.1.2 Approach II: Using an approach-based factor analysis

First order variables of Self Determined Motivation are calculated by carrying out factor analysis to identify the emerging subscales which are representative of the dimension of Self Determined motivation. The variable representative of the emerging Self Determined motivation subscales and their corresponding values are computed using the results of the factorial analysis. The variables that represent the values of the first-order dimensions/components of Self Determined Motivation are computed as shown below. The Factor analysis that was carried out also showed how the variables can/should be combined and the underlying interaction of items within the scale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.922
Bartlett's Test of Sphericity	Approx. Chi-Square	5644.358
	Df	378
	Sig.	.000

Figure 160 Self Determined Motivation Factor Analysis-Approach II: KMO and Bartlett's Test

The result of the KMO and Bartlett's Test shown in the Figure 160 indicates that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, a principal component analysis with varimax rotation and Kaiser normalisation were conducted. Factors with

Eigen values equal to or greater than 1.00 were extracted. With regard to the 28 variables used, orthogonal rotation of the variables yielded 4 factors, accounting for 23.975, 14.240, 14.033, 9.941 per cent of the total variance respectively, a total of 62.190 per cent of the total variance explained as shown in Figure 161.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.882	35.292	35.292	9.882	35.292	35.292	6.713	23.975	23.975
2	3.977	14.204	49.496	3.977	14.204	49.496	3.987	14.240	38.215
3	2.293	8.190	57.686	2.293	8.190	57.686	3.929	14.033	52.248
4	1.261	4.504	62.190	1.261	4.504	62.190	2.784	9.941	62.190
5	.971	3.468	65.658						
6	.851	3.038	68.696						
7	.758	2.708	71.404						
8	.692	2.471	73.875						
9	.668	2.384	76.259						
10	.597	2.133	78.392						
11	.523	1.868	80.260						
12	.508	1.815	82.075						
13	.472	1.686	83.761						
14	.455	1.626	85.387						
15	.431	1.540	86.927						
16	.406	1.449	88.376						
17	.385	1.376	89.752						
18	.373	1.333	91.085						
19	.355	1.270	92.354						
20	.317	1.133	93.488						
21	.314	1.121	94.609						
22	.295	1.053	95.662						

23	.273	.976	96.639
24	.264	.943	97.581
25	.223	.795	98.376
26	.180	.642	99.019
27	.164	.587	99.605
28	.111	.395	100.000

Figure 161 Self Determined Motivation Factor analysis- Approach II: Total Variance Explained

The scree plot as shown in Figure 162 supports the conclusion about the number of factors.

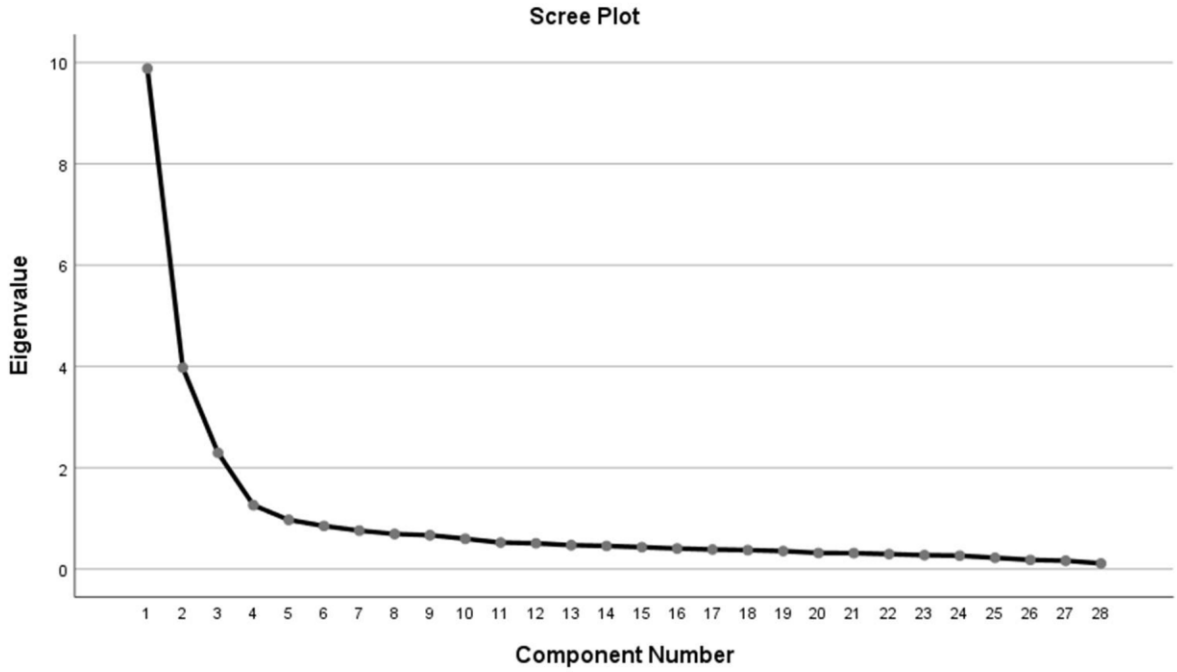


Figure 162 Self Determined Motivation Factor analysis- Approach II: Scree Plot

The factor loadings for the variables are presented in Figure 163.

Rotated Component Matrix				
	Component			
	1	2	3	4

Q103_1	.014	.691	.231	-.043
Q103_2	.692	.163	-.085	-.352
Q103_3	.484	.442	-.284	-.392
Q103_4	.607	.120	.202	-.002
Q103_5	-.015	.019	.915	.062
Q103_6	.580	.186	.243	.181
Q103_7	.263	.309	.289	.534
Q103_8	.149	.750	.032	.313
Q103_9	.673	.170	-.041	.034
Q103_10	.265	.738	-.024	-.025
Q103_11	.628	.125	.236	.257
Q103_12	.010	.073	.842	.136
Q103_13	.652	.130	.177	.330
Q103_14	.399	.376	.230	.515
Q103_15	.249	.649	-.005	.314
Q103_16	.738	.064	-.105	.073
Q103_17	.576	.373	-.141	.110
Q103_18	.673	.129	.345	.195
Q103_19	.091	.073	.893	.190
Q103_20	.680	.217	.047	.355
Q103_21	.209	.374	.274	.681
Q103_22	.103	.792	.126	.344
Q103_23	.726	.092	-.155	.090
Q103_24	.404	.569	.001	.173
Q103_25	.696	.200	.117	.265
Q103_26	.083	.069	.889	.176
Q103_27	.696	.093	.010	.365

Q103_28	.344	.203	.215	.673

Figure 163 Self Determined Motivation Factor analysis - Approach II: Factor loadings

To enhance the interpretability of the factors, only variables with factor loadings > 0.480 (factor 1), > 0.560(factor 2), >0.840 (factor 3), >0.510(factor 4) as shown in Figure 163 were selected for inclusion in their respective factors.

The 14 variables Q103_2, Q103_3, Q103_4, Q103_6, Q103_9, Q103_11, Q103_13, Q103_16, Q103_17, Q103_18, Q103_20, Q103_23, Q103_25, Q103_27 that loaded on Factor 1 as shown in Figure 163 are representative of Intrinsic motivation to know, to accomplish and to experience stimulation coupled with Identified extrinsic motivation the most internalised and hence most autonomous form of extrinsic motivation, as such Factor 1 is labelled as 'Self-determined motivation resulting from intrinsic motivation and highly internalised extrinsic motivation'. While 6 variables Q103_1, Q103_8, Q103_10, Q103_15, Q103_22, Q103_24 that load on Factor 2 as shown in Figure 163 are representative of external regulation extrinsic regulation motivation coupled with instrumental aspect of identified motivation as such Factor 2 is labelled 'Self-determined Motivation resulting from identified and external regulated perception of instrumentality'. The four variables Q103_5, Q103_12, Q103_19, Q103_26 that load on Factor 3 as shown in the Figure 163, are representative of amotivation, a conceptual lack of motivation, or refers to the instruments measuring no motivation, in so doing the level of amotivation is representative of the extent to which the instruments is capable of measuring the level of motivation of the subject as such Factor 3 is labelled as 'Extent of amotivation' . On the other hand the four variables Q103_7, Q103_14, Q103_21, Q103_28 that load on Factor 4 as shown in Figure 163 denotes a partially internalised form of extrinsic motivation, which results from the introjection of internalised instrumentality from external source as such Factor 4 is labelled 'Motivation resulting from introjection from external source'.

Figure 164 illustrates how the variables of Self Determined motivation cluster, showing how the different variables of Self Determined motivation contribute to the total level of Self Determined motivation.

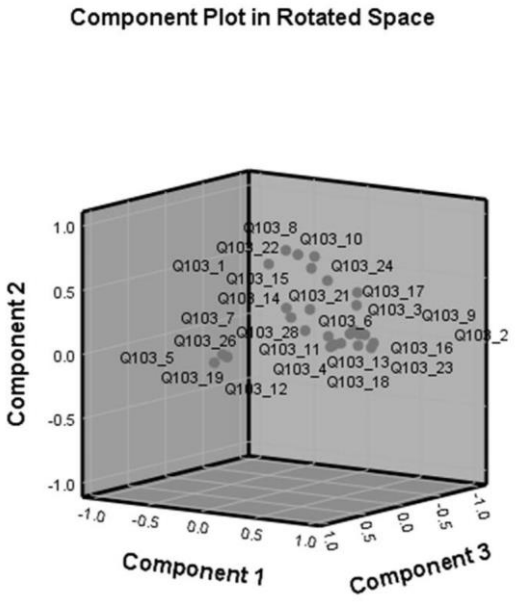


Figure 164 Approach II: Illustration of how variables of items of Self Determined Motivation cluster

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified versions of the equation were inputted as SPSS Syntax. The variables representative of the 'Self-determined motivation resulting from intrinsic motivation and highly internalised extrinsic motivation' (Factor 1), 'Self-determined Motivation resulting from identified and external regulated perception of instrumentality' (Factor 2), 'Extent of amotivation' (Factor 3), ' Motivation resulting from introjection from external source' (Factor 4) are computed as shown in Equation 62, Equation 63, Equation 64 and Equation 65 respectively

'Self-determined motivation resulting from intrinsic motivation and highly internalised extrinsic motivation'(Factor 1)

'Self-determined motivation resulting from intrinsic motivation and highly internalised extrinsic motivation'
(SDMBASE_F1)=Q103_2*0.692+Q103_3*0.484+Q103_4*0.607+Q103_6*0.580+Q103_9*0.673+Q103_11*0.628+Q103_13*0.652+Q103_16*0.738+Q103_17*0.576+Q103_18*0.673+Q103_20*0.680+Q103_23*0.726+Q103_25*0.696+Q103_27*0.696.

In order to maintain the scale of 0 to 7

(SDMBASE_F1_INDEX)
=(SDMBASE_F1)/(0.692+0.484+0.607+0.58+0.673+0.628+0.652+0.738+0.576+0.673+0.680+0.726+0.696+0.696).

Equation 62 'Self-determined motivation resulting from intrinsic motivation and highly internalised extrinsic motivation'(Factor 1)

'Self-determined Motivation resulting from identified and external regulated perception of instrumentality' (Factor 2)
(SDMBASE_F2)
=Q103_1*0.691+Q103_8*0.75+Q103_10*0.738+Q103_15*0.649+Q103_22*0.792+Q103_24*0.569.

In order to maintain the scale of 0 to 7

(SDMBASE_F2_Index) =(SDMBASE_F2)/ (0.691+0.750+0.738+0.649+0.792+0.569)

In order to move to a scale 0 to 5

Equation 63 'Self-determined Motivation resulting from identified and external regulated perception of instrumentality' (Factor 2)

' Extent of amotivation' (Factor 3)
SDMBASE_F3 = Q103_5*0.915+Q103_12*0.842+Q103_19*0.893+Q103_26*0.889

In order to maintain the scale of 0 to 7

SDMBASE_F3_Index = (SDMBASE_F3)/ (0.915+0.842+0.893+0.889)

In order to move to a scale 0 to 5

Equation 64 ' Extent of amotivation' (Factor 3)

' Motivation resulting from introjection from external source ' (Factor 4)
(SDMBASE_F4)
=Q103_7*0.534+Q103_14*0.515+Q103_21*0.681+Q103_28*0.673

In order to maintain the scale of 0 to 7

SDMBASE_F4_Index =(SDMBASE_F4)/ (0.534+0.515+0.681+0.673)

Equation 65 ' Motivation resulting from introjection from external source '(Factor 4)

9.2.1.2 Second Order Variable

Second order variables of Self Determined Motivation are calculated by 1) carrying out a first order factor analysis of the variables computed using Approach I as done in section 9.2.1.1.1 2) carrying out factor analysis of the first-order variables that are directly representative of value of the emergent subscales denoting the different dimensions/components of Self determined motivation computed using Approach II as shown in section 9.2.1.1.2.

9.2.1.2.1 Based on First-order factor analysis of Approach I variables

The results of factor analysis carried out on the variable computed using approach I is shown below. Factor analysis enabled latent variables representative of the factor to be computed and for the interaction between the dimensions of Self determined motivation based on approach I to be understood. The result of the KMO and Bartlett's Test shown in the Figure 165 indicates that factor analysis can be carried out.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.772
Bartlett's Test of Sphericity	Approx. Chi-Square	1278.032
	Df	21
	Sig.	.000

Figure 165 Self Determine Motivation Factor Analysis- Approach I: KMO and Bartlett's Test

To obtain conceptually similar and significant clusters of issues of the variables, a principal component analysis with varimax rotation and Kaiser normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regard to the 7 variables used, orthogonal rotation of the variables yielded 2 factors, accounting for 45.890 and 26.250 per cent of the total variance respectively, a total of 72.140 per cent of the total variance explained as shown in Figure 166.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.787	54.098	54.098	3.787	54.098	54.098	3.212	45.890	45.890
2	1.263	18.042	72.140	1.263	18.042	72.140	1.838	26.250	72.140
3	.858	12.258	84.398						
4	.400	5.718	90.116						
5	.306	4.372	94.488						
6	.206	2.943	97.432						
7	.180	2.568	100.000						

Figure 166 Self Determine Motivation Factor analysis - Approach I: Total Variance Experienced

The scree plot as shown in Figure 167 supports the conclusion about the number of factors

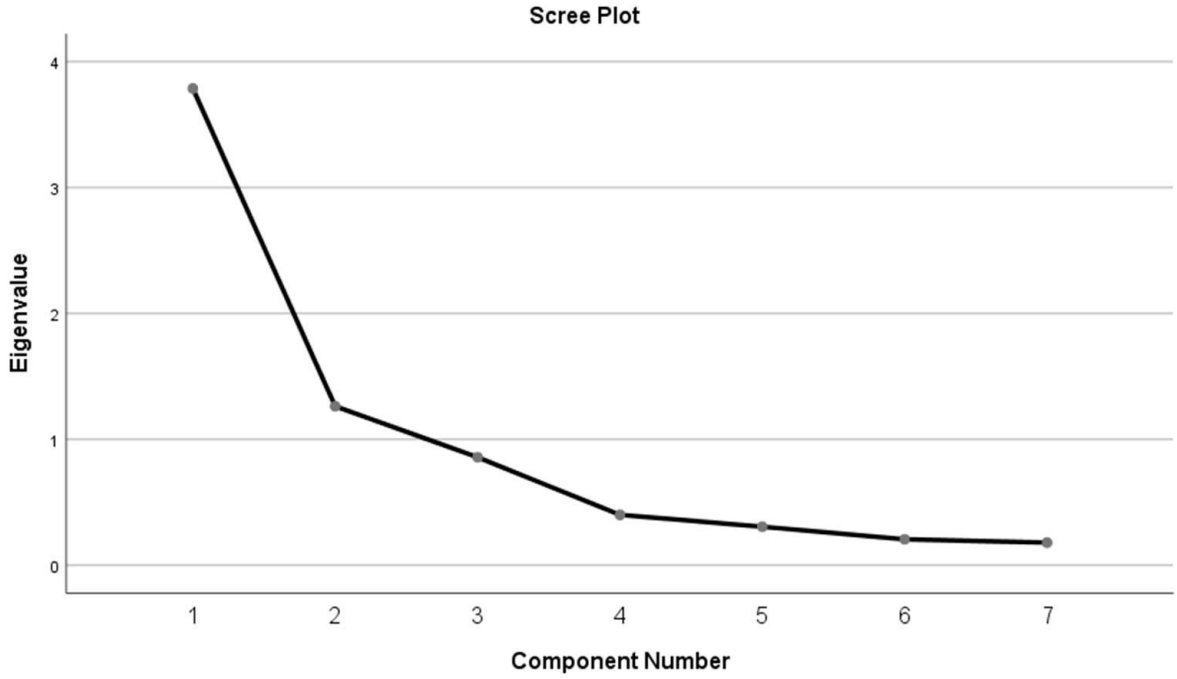


Figure 167 Self Determine Motivation Factor analysis - Approach I: Scree Plot

The factor loadings for the variables are presented in Figure 168:

Rotated Component Matrix	
	Component

	1	2
Identified_EM	.844	.012
Introjected_EM	.514	.709
External_Regulation_EM	.553	.442
Amotivation	-.112	.904
To_Experience_Stimulation_IM	.738	.418
Towards_Accomplishment_IM	.802	.375
To_Know_IM	.854	-.081

Figure 168 Self Determine Motivation Factor analysis - Approach I: Factor Loadings

To enhance the interpretability of the factors, only variables with factor loadings > 0.51 (factor 1), > 0.710 (factor 2) as shown in Figure 168 are selected for inclusion in their respective factors. The factors are named respectively: Autonomy (locus of Control)/ Self Determined Motivation less amotivation: Ability of Instrument to measure motivation (amotivation)/Extent of Measurability/amotivation (Factor 2).

The results of the factor analysis fall in line with theoretical expectations. The six variables Identified EM, Introjected EM, External Regulation EM, To Experience Stimulation IM, Towards_Accomplishment_IM, To_Know_IM that load on factor 1 as shown in Figure 168 are representative of the level of self-determined motivation absent the effect of amotivation, hence the factor is named "Self-Determined Motivation less amotivation". In addition to this the variables that load on factor 1 are variables that are theoretically linked by changing levels of perceived locus of control (autonomy) and as such can be combined into one factor; confirming that autonomy is a lens through which self-determined motivation can be viewed in the context of this research. While the variable Amotivation that loads on factor 2 as shown in Figure 168 is representation of a conceptual lack of motivation, or refers to the instruments measuring no motivation, with the level of amotivation being representative of the extent to which the instrument is capable of measuring the level of motivation of the subject. Based on this factor 2 is labelled "Ability of Instrument to measure motivation (amotivation)/Extent of Measurability/amotivation" (Factor 2) [66].

Figure 169 illustrates the relative orthogonal relationship between factors evaluating the variables labelled as "Self-Determined Motivation less amotivation" and "amotivation", showing that they are independent of each other. Figure 169 further shows how the respective variables contribute to the total level of motivation. With variables Identified EM, Introjected EM, External_Regulation_EM, Amotivation, To_Experience_Stimulation_IM, Towards_Accomplishment_IM, To_Know_IM clustering

together while variable Amotivation stand alone. Although some variables do contribute slightly differently than similar research looking at self-determined motivation, nevertheless the slight diversions can be associated with the nature of the population and the fact that the motivation being measured is in the context of CPD [273, 272, 66, 164]. The variation in perceived level of autonomy is not exactly as predicted or postulated in the initial theories of self-determined motivation. For example, it would have been expected that Introjected EM would contribute higher than External_Regulation_EM and that all the intrinsic motivation dimensions would contribute higher. As forms of motivation with higher level of autonomy are often expected to contribute more to overall motivation this aspect of the results actual goes to show that IM is not essentially better than EM and there are no bad motivation as different forms of motivation in the context of source contribute more or less to the overall motivation.

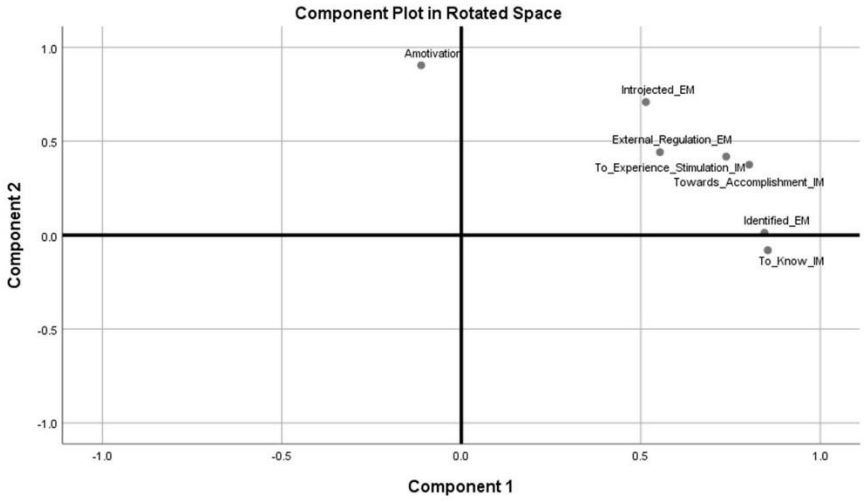


Figure 169 Self Determined Motivation Factor Analysis-Approach I: Illustration of loading of the First-order variables on resulting orthogonal factors or components

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified versions of the equations were inputted as SPSS Syntax. The variables representative of "Level of Self determined motivation less amotivation" (Factor 1) and "Extent of Measurability/Amotivation" (Factor 2) are computed as shown in Equation 66 and Equation 67 respectively

Level of Self determined motivation less amotivation (Factor 1)

Self-determination less amotivation (SDM_F1) = Identified_EM * 0.844 + Introjected_EM*0.514 + External_Regulation_EM*0.553 + To_Experience_Stimulation_IM*0.738+ Towards_Accomplishment_IM*0.802 + To_Know_IM*0.854

In order to maintain the scale of 0 to 7
SDM_F1_Index=(SDM_F1)/(0.553+0.514+0.844+0.854+0.802+0.738).

In order to move to a scale 0 to 5

Equation 66 Level of Self determined motivation less amotivation (Factor 1)

Extent of Measurability/Amotivation (Factor 2)
Extent of Measurability/amotivation (SDM_F2) = Amotivation*0.904

In order to maintain the scale of 0 to 7

Extent of Measurability amotivation (SDM_F2_Index)=(Amotivation*0.94)/0.94

In Order to move to a scale 0 of 5

SDM_F2_Index_5 = (SDM_F2_Index)/1.4

Equation 67 Extent of Measurability/Amotivation (Factor 2)

9.2.1.2.2 Based on Second-order factor analysis of Approach II

The results of second-order factor analysis carried out on the variable computed using approach II is shown below. Factor analysis enabled latent variables representative of the factor to be computed and for the interaction between the dimensions of Self determined motivation based on approach II to be understood. The result of the KMO and Bartlett's Test shown in the Figure 170 indicates that factor analysis can be carried out.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.670
Bartlett's Test of Sphericity	Approx. Chi-Square	373.453
	Df	6
	Sig.	.000

Figure 170 Self Determined Motivation Approach II Factor Analysis: KMO and Bartlett's Test

To obtain conceptually similar and significant clusters of issues of the variables, a principal component analysis with varimax rotation and Kaiser normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regard to the 4 variables used, orthogonal rotation of the variables yielded one factor, accounting for a total of 57.413 per cent of the total variance explained as shown in Figure 171 .

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.297	57.413	57.413	2.297	57.413	57.413
2	.903	22.586	79.999			
3	.495	12.370	92.369			
4	.305	7.631	100.000			

Figure 171 Self Determined Motivation Approach II Factor Analysis: Total Explained Variance

The scree plot as shown in Figure 172 supports the conclusion about the number of factors

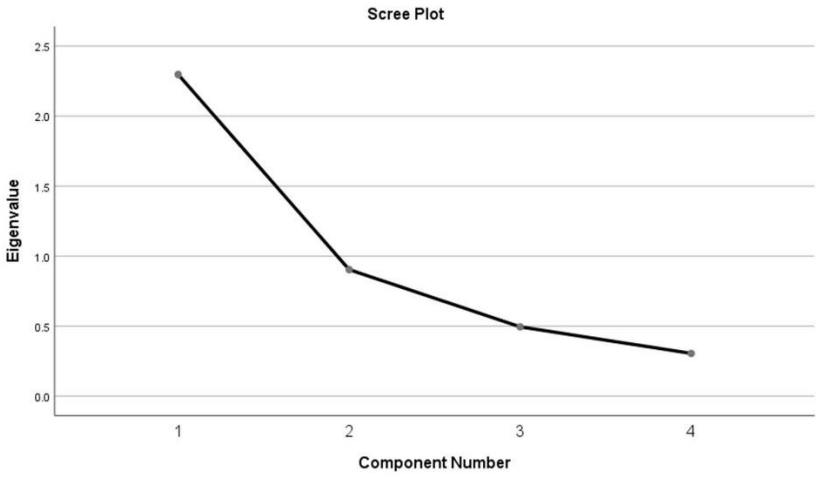


Figure 172 Self Determined Motivation Approach II Factor Analysis: Scree Plot

The factor loadings for the variables are presented in Figure 173:

Component Matrix	
	Component
	1
SDMBASE_F1_Index_5	.773
SDMBASE_F2_Index_5	.795
SDMBASE_F3_Index_5	.519
SDMBASE_F4_Index_5	.893

Figure 173 Self Determined Motivation Approach II Factor Analysis: Factor Loadings

To enhance the interpretability of the factors, only variables with factor loadings > 0.510 (factor 1), as shown in Figure 173 are selected for inclusion in their respective factors

The results of the factor analysis fall in line with theoretical expectations.

The six variables SDMBASE_F1_Index_5, SDMBASE_F2_Index_5, SDMBASE_F3_Index_5, SDMBASE_F4_Index_5 that load on factor 1 as shown in Figure 173 are representative of the level of self-determined motivation on the basis of variables computed using approach II , hence the factor is named "Level of Self-Determined Motivation – Approach II" (Factor 2). As the variables all load on one factor, the Second-order variable gives us the overall Level of Motivation using this approach, as such the computation is shown in section 9.2.2.3 below

9.2.2 Variable representing Overall Level of SDM

There are three ways in which the combined value of SDM is derived. They yield different result; theoretical underpinnings and result of correlation analysis are used to choose the most suitable method. Correlation of the result of each of the methods with LECPD is used in deciding which to select as show in section 9.2.3.

9.2.2.1 Level of SDM motivation: On Basis of autonomy

In order to create a combined value of SDM from the values of the variables for the individual dimensions of SDM is computed based on variables computed using Approach I as shown in section 9.2.1.1.1. The approaches utilised in Equation 68 takes into cognizance the nature of the relationship between the individual dimensions of self-determined motivation under pinned by extent of perceived autonomy as illustrated in Figure 174. According to Deci & Ryan, the different dimensions of motivation can be considered to be on a continuum characterised by different perceived level of autonomy, ranging from amotivation to Intrinsic Motivation to Experience Stimulation as illustrated in Figure 174. With amotivation, consider it to be representative of a relative point of no perceived autonomy while intrinsic motivation to experience stimulation is representative of a perceived notion of full/extreme autonomy (Deci, et al., 1991; Ryan & Deci, 2000). This is illustrated in the Figure 174:

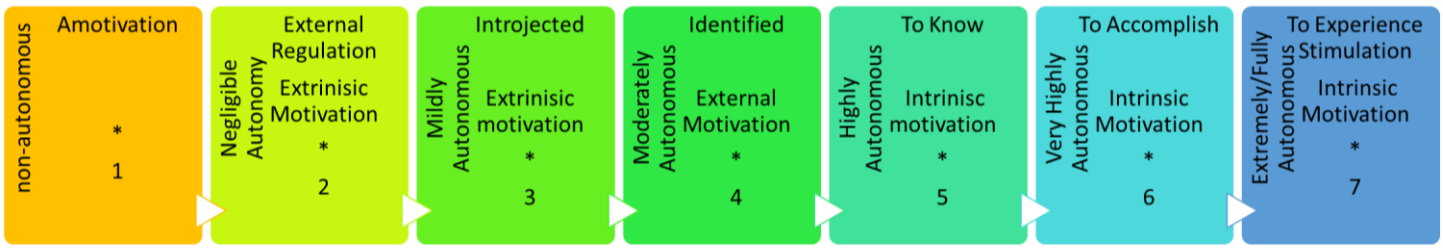


Figure 174 Dimensions of Self Determined Motivation in order of Autonomy

Adapted from [272, 66, 157, 164]

If the point of no Autonomy (amotivation) is considered to represent a 0 point of Autonomy, and the point of full Autonomy is considered to represent a point of relative unity (1), the different dimensions of motivation can be represented on a scale of 0 to 6. To cater for the fact that amotivation in practice is not an absolute zero point of motivation but more representative of the limitation of the measuring instrument to detect motivation the amotivation is better represented by 1. Hence the scale becomes an ordinal scale of 1 to 7 with 1 representing amotivation and 7 representing Intrinsic Motivation to experience stimulation as shown in Figure 174. This can be treated as a 7-point Likert scale with amotivation on one end and intrinsic motivation to experience stimulation on the other end. On the basis, the combined value of SDM is calculated by multiplying the value of each dimension of motivation by its ordinal weighting and then summing up the values for all the dimension as shown in Equation 68 Level of Self determined Motivation (SDM_Direct_Autonomy).

Level of Self determined Motivation (SDM_Direct_Autonomy)

SDM Combined value on basis of perceived level of Autonomy(SDM_Direct_Autonomy) = ((1*Amotivation)+(2*External_Regulation_EM)+(3*Introjected_EM)+(4*Identified_EM)+(5*To_Know_IM)+(6*Towards_Accomplishment_IM)+(7*To_Experience_Stimulation_IM))

To maintain scale of 0 to 7

SDM Combined value on basis of perceived level of Autonomy(SDM_Direct_Autonomy_Index) = ((1*Amotivation)+(2*External_Regulation_EM)+(3*Introjected_EM)+(4*Identified_EM)+(5*To_Know_IM)+(6*Towards_Accomplishment_IM)+(7*To_Experience_Stimulation_IM))/(1+2+3+4+5+6+7).

To maintain scale of 0 to 5

Equation 68 Level of Self determined Motivation (SDM_Direct_Autonomy)

As the value of the dimension are on a scale of range from 0 to 7, as the Self determined motivation Inventory uses a seven-point Likert scale. To maintain a scale of 0 to 5 in line with other computed variables for easy of interpretation, another variable is computed.

9.2.2.2 Level of SDM Based on Orthogonal Result of Second order variable based on Approach I

Overall Value of Level of Self Determined motivation is calculated by computing a third order variable based on approach I. The third order variable representative of the value of Self Determined Motivation based on Approach I is computed by combing the two orthogonal Second-order variables computed in section 9.2.1.2.1 by finding their resultant. As they are orthogonal variables and act at right angles to one another as illustrated in Figure 169 the Second-order variables are combined as two variables acting at right angles to one another would be combined using Pythagoras theorem as illustrated in Equation 42

'Level of Self Determined motivation on basis of Approach I'

Level of Self Determined motivation on basis of Approach I (SDM_F1F2)=SQRT(SDM _F1**2+ SDM _F1**2)

As SDM is on a seven-point Likert scale

SDM_F1Max=4.305*7=30.135
SDM_F2 Max=0.904*7=6.58

SDM_F1F2 Max= SQRT(30.135^2+6.58^2)
= 30.845

SDM_F1F2_Index Max= 30.845/4.406

SDM_F1F2_Index= SDM_F1F2/4.406

Further calculation is then done to convert it to a
5 point scale in line with others index to improve ease

SDM_F1F2_Index Max=7
SDM_F1F2_Index5 Max= 7/1.4

SDM_F1F2_Index5=SDM_F1F2_Index/1.4

SDM_F1F2=SQRT((SDM_F1**2)+(SDM_F2**2))
SDM_F1F2_Index=SDM_F1F2/ 4.406

Equation 69 Level of Self Determined motivation on basis of Approach I

9.2.2.3 Level of SDM based on Approach II

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS; modified versions of the equations were inputted as SPSS Syntax. The variables representative of "Level of Self determined motivation-Approach II (Factor 1)" (Factor 1) are computed as shown in Equation 70.

Level of Self determined motivation-Approach II (SDMALL_F1)
Level of Self-determination-Approach II (SDMALL_F1) =SDMBASE_F1_Index_5*0.773+ SDMBASE_F2_Index_5*0.795 + SDMBASE_F3_Index_5*0.519+SDMBASE_F4_Index_5*0.893.

In order to move to a scale 0 to 5

SDMALL_F1_Index=(SDMALL_F1)/(0.773+0.795+0.519+0.893).

Equation 70 Level of Self determined motivation-Approach II (Factor 1)

9.2.3 Comparing approaches and selecting preferred to method of computation of SDM

To determine which method of computing the value of Self Determined Motivation that is best fit for the purpose of this study (a study geared towards determining factors that influence and predict level engagement with LECPD) correlation analysis was carried out between the variables generated from both methods and the variable representative of the postulated LECPD (LECPD combined). The variables considered are 'Level of Self determined Motivation' (SDM Direct Autonomy),'Level of Self Determined motivation on basis of Approach I (SDM_F1F2)', 'Level of Self-determination Approach II (SDMALL_F1)' and 'LECPD Combined' factors Indexed 0 to 5'.

As shown in Figure 175 all the correlations coefficients were significant. The coefficient of correlation for SDMALL_F1_Index was the smallest as such, it was dropped from considerations. The difference between the correlation coefficients for SDM_F1F2_Index5 (0.348) and SDM_Direct_Autonomy_Index5 (0.373) was small as such both were considered. The SDM_F1F2_Index5 is calculated based on factor analysis as such the variable closely reflects the relationship between dimension of self-determined motivation for the sample population. On the other hand, SDM_Direct_Autonomy_Index5 is calculated based on established conceptualisations of the interaction or relationship of the dimensions of Self-determined Motivation based on perceived level of autonomy. At the same time the result of factor analysis carried out to compute SDM_F1F2_Index5 validates the conceptualisation of perceived autonomy utilised in computation SDM_Direct_Autonomy_Index5. Taking this into consideration and the fact that one of the key hypothesis and basis for further analysis in this research is to predict the level of engagement with CPD based on these variables and they are both combined on sound but different basis, the one with higher level of correlation is selected. The SDM Combined value on basis of perceived level of Autonomy (SDM_Direct_Autonomy_Index5) was chosen as it gave the highest level of correlation (0.373).

Correlations					
		LECPD Combined factors Indexed 0 to 5	SDM_F1F2_Index5	SDM_Direct_Autonomy_Index5	SDMALL_F1_Index
LECPD Combined factors Indexed 0 to 5	Pearson Correlation	1	.348**	.373**	.303**
	Sig. (2-tailed)		.000	.000	.000
	N	239	224	224	224
SDM_F1F2_Index5	Pearson Correlation	.348**	1	.992**	.884**
	Sig. (2-tailed)	.000		.000	.000
	N	224	325	325	325
SDM_Direct_Autonomy_Index5	Pearson Correlation	.373**	.992**	1	.873**
	Sig. (2-tailed)	.000	.000		.000
	N	224	325	325	325
SDMALL_F1_Index	Pearson Correlation	.303**	.884**	.873**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	224	325	325	325

Figure 175 SDM Computation Method Selection: Correlation Analysis

9.3 Zimbardo Time Perspective (ZTP)

For further analysis to be carried out and to establish how the items of the Zimbardo Time Perspective in the context of CPD interact together with the variables and in turn representative value of the Zimbardo Time Perspective and the different dimensions/components representative of the Zimbardo Time Perspective Inventory and emerging subscales are computed. To confirm that the values of the items from the Zimbardo Time Perspective Inventory can be combined and to establish the pattern of interaction of the variables in the factor analysis (Principal Component Analysis) was carried out. Also, to show if and how all variables can be reduced to distinct variables as postulated in the conceptual framework section of this research.

Figure 176 contains the Zimbardo Time Perspective Inventory variables/items that were utilised in this study. The items are used in computing the Variables representative of the different dimensions and the labels that would be used to denote them going forward.

Item	Label
Q104_1	I believe that getting together with one's friends to party is one of life's important pleasures.
Q104_2	Familiar childhood sights, sounds, smells often bring back a flood of wonderful memories.
Q104_3	Fate determines much in my life.
Q104_4	I often think of what I should have done differently in my life.
Q104_5	My decisions are mostly influenced by people and things around me.
Q104_6	I believe that a person's day should be planned each morning.
Q104_7	It gives me pleasure to think about my past.
Q104_8	I do things impulsively.
Q104_9	If things don't get done on time, I don't worry about it.
Q104_10	When I want to achieve something, I set goals and consider specific means for reaching those goals.
Q104_11	On balance, there is much better to recall than bad in my past.
Q104_12	When listening to my favorite music, I often lose all track of time.
Q104_13	Meeting tomorrow's deadlines and doing other necessary work comes before tonight's play.
Q104_14	Since whatever will be, it doesn't really matter what I do.
Q104_15	I enjoy stories about how things used to be in the "good old times."
Q104_16	Painful past experiences keep being replayed in my mind.
Q104_17	I try to live my life as fully as possible, one day at a time.
Q104_18	It upsets me to be late for appointments.
Q104_19	Ideally, I would live each day as if it were my last.
Q104_20	Happy memories of good times spring readily to mind.
Q104_21	I meet my obligations to friends and authorities on time.
Q104_22	I've taken my share of abuse and rejection in the past.
Q104_23	I make decisions on the spur of the moment.
Q104_24	I take each day as it is rather than try to plan it out.
Q104_25	The past has too many unpleasant memories that I prefer not to think about.
Q104_26	It is important to put excitement in my life.

Q104_27	I've made mistakes in the past that I wish I could undo.
Q104_28	I feel that it's more important to enjoy what you're doing than to get work done on time.
Q104_29	I get nostalgic about my childhood.
Q104_30	Before making a decision, I weigh the costs against the benefits.
Q104_31	Taking risks keeps my life from becoming boring.
Q104_32	It is more important for me to enjoy life's journey than to focus only on the destination.
Q104_33	Things rarely work out as I expected.
Q104_34	It's hard for me to forget unpleasant images of my youth.
Q104_35	It takes joy out of the process and flow of my activities, if I have to think about goals, outcomes, and products.
Q104_36	Even when I am enjoying the present, I am drawn back to comparisons with similar past experiences.
Q104_37	You can't really plan for the future because things change so much.
Q104_38	My life path is controlled by forces I cannot influence.
Q104_39	It doesn't make sense to worry about the future, since there is nothing that I can do about it anyway.
Q104_40	I complete projects on time by making steady progress.
Q104_41	I find myself tuning out when family members talk about the way things used to be.
Q104_42	I take risks to put excitement in my life.
Q104_43	I make lists of things to do.
Q104_44	I often follow my heart more than my head.
Q104_45	I am able to resist temptations when I know that there is work to be done.
Q104_46	I find myself getting swept up in the excitement of the moment.
Q104_47	Life today is too complicated; I would prefer the simpler life of the past.
Q104_48	I prefer friends who are spontaneous rather than predictable.
Q104_49	I like family rituals and traditions that are regularly repeated.
Q104_50	I think about the bad things that have happened to me in the past.
Q104_51	I keep working at difficult, uninteresting tasks if they will help me get ahead.
Q104_52	Spending what I earn on pleasures today is better than saving for tomorrow's security.
Q104_53	Often luck pays off better than hard work.
Q104_54	I think about the good things that I have missed out on in my life.
Q104_55	I like my close relationships to be passionate.
Q104_56	There will always be time to catch up on my work.

Figure 176 Zimbardo Time Perspective Inventory Items for Variable computation

9.3.1 Variables representing Dimensions ZTP

9.3.1.1 First Order Variable

The Zimbardo Time Perspective Inventory by Zimbardo (1997) was used in measuring Zimbardo identified dimensions of Time Perspective. The values of the individual dimensions of Zimbardo Time perspective are computed based on recommendation in the literature for the Zimbardo Time Perspective Inventory [274, 169, 193]. The variables are computed for the respective dimensions as shown in Equation 71, Equation 72, Equation 73, Equation 74 and Equation 75.

Past Negative ZTPI

Past_I_Negative_ZTPI=(MEAN(Q104_4,Q104_5,Q104_16,Q104_22,Q104_27,Q104_33,Q104_34,Q104_36,Q104_50,Q104_54)).

Equation 71 Past Negative ZTPI

Present Hedonistic ZTPI

Present_I_Hedonistic_ZTPI=(MEAN(Q104_1,Q104_8,Q104_12,Q104_17,Q104_19,Q104_23,Q104_26,Q104_28,Q104_31,Q104_32,Q104_42,Q104_44,Q104_46,Q104_48,Q104_55)).

Equation 72 Present Hedonistic ZTPI

Future ZTPI

Future_I_ZTPI=(MEAN(Q104_6,Q104_9,Q104_10,Q104_13,Q104_18,Q104_21,Q104_24,Q104_30,Q104_40,Q104_43,Q104_45,Q104_51,Q104_56)).

Equation 73 Future ZTPI

Past Positive ZTPI

Past_I_Positive_ZTPI=(MEAN(Q104_2,
Q104_7,Q104_11,Q104_15,Q104_20,Q104_25,Q104_29,Q104_41,Q104_49)).

Equation 74 Past Positive ZTPI

```
Present_I_Fatalistic_ZTPI=(MEAN(Q104_3,
Q104_14,Q104_35,Q104_37,Q104_38,Q104_39,Q104_47,Q104_
52,Q104_53)).
```

Equation 75 Present Fatalistic ZTPI

9.3.1.2 Second Order Variable based on factorial analysis

Second order variables of Zimbardo Time Perspective are calculated by carrying out factor analysis to identify the emerging subscales which are representative of the dimensions of Zimbardo Time Perspective. The variable representative of the emerging Zimbardo Time Perspective subscales and their corresponding values are the computed using the results of the factorial analysis. The variables that represent the values of the First-order dimensions/components of Zimbardo Time Perspective are computed as follows. The Factor Analysis that is carried out also showed how the variables can/should be combined and the underlying interaction of items within the scale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.675
Bartlett's Test of Sphericity	Approx. Chi-Square	657.409
	df	10
	Sig.	.000

Figure 177 Zimbardo Time Perspective Factor Analysis: KMO and Bartlett's Test

The result of the KMO and Bartlett's Test shown in the Figure 177 indicates that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, a principal component analysis with varimax rotation and Kaiser Normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regards to the five variables used, orthogonal rotation of the variables yielded two factors, accounting for 52.286 and 24.042 of the Variance respectively, a total of 76.328 per cent of the total variance explained as shown in Figure 178.

Total Variance Explained			
Component	Initial Eigenvalues	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings

	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.626	52.527	52.527	2.626	52.527	52.527	2.614	52.286	52.286
2	1.190	23.801	76.328	1.190	23.801	76.328	1.202	24.042	76.328
3	.724	14.483	90.810						
4	.256	5.119	95.930						
5	.204	4.070	100.000						

Figure 178 Zimbardo Time Perspective Factor Analysis: Total Variance Explained

The scree plot as shown in Figure 179 supports the conclusion about the number of factors

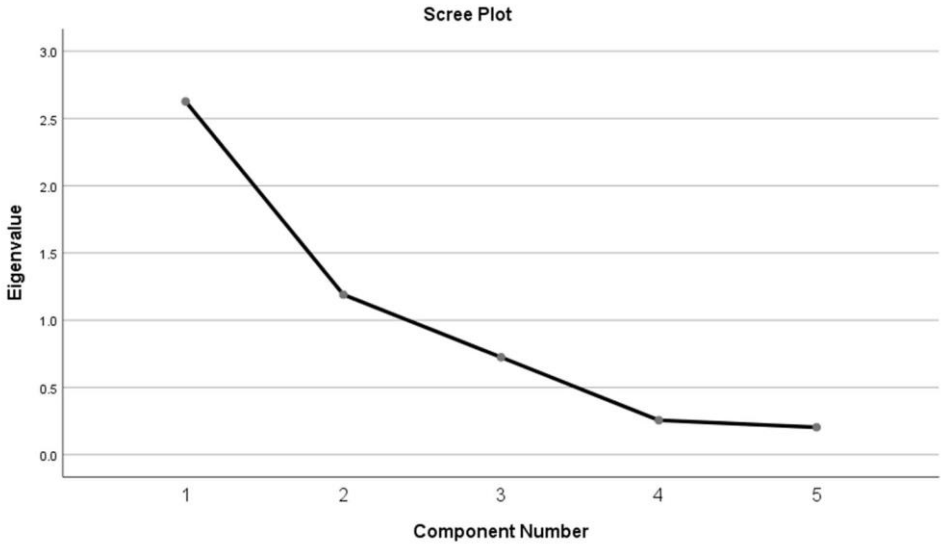


Figure 179 Zimbardo Time Perspective Factor Analysis: Scree Plot

The factor loadings for the variables are presented in Figure 180

Rotated Component Matrix		
	Component	
	1	2
Past Negative ZTPI	.876	-.023
Present Hedonistic ZTPI	.876	.233
Future ZTPI	-.223	.863
Past Positive ZTPI	.423	.620
Present Fatalistic ZTPI	.922	-.133

Figure 180 Zimbardo Time Perspective Factor Analysis: Factor Loadings

Figure 180 shows the factor loadings of the varying items. To enhance the interpretability of the factors, only variables with factor loadings > 0.870 (factor 1), > 0.610(factor 2) were selected for inclusion in their respective factors. The factors are named, respectively: 'Negative Zimbardo Time Perspective' (Factor 1): 'Positive Zimbardo Time Perspective' (Factor 2).

The three variables Past Negative ZTPI, Present Hedonistic ZTPI, Present Fatalistic ZTPI that load on Factor 1 (as shown in Figure 180) reflect the a somewhat negative time perspective characterised by Low future awareness and in some cases high anxiety, depresion or aggression as such factor 1 is labelled 'Negative Zimbardo Time Perspective '. While the 2 variables Future ZTPI, Past Positive ZTPI that load on Factor 2 (as shown in Figure 180) reflect the a somewhat positive Time Perspective characterised by low depression/anxiety and high future awareness and in some cases High self-esteem/happiness as such the Factor 2 is labelled as 'Positive Zimbardo Time Perspective ' [169, 179]. The results of the factor analysis can be interpreted as being in line with theoretical expectations although it is highly informative that the variables load on two factors. It illustrates the relative orthogonal relationship between factors examining the positive and Negative Time perspective, showing that they are independent of each other. Figure 181 illustrates how the different variables of reflection contribute to the total level of Zimbardo Time Perspective. Variables Past Negative ZTPI, Present Hedonistic ZTPI, Present Fatalistic ZTPI cluster together while the variables Future ZTPI, Past Positive ZTPI also clustered together.

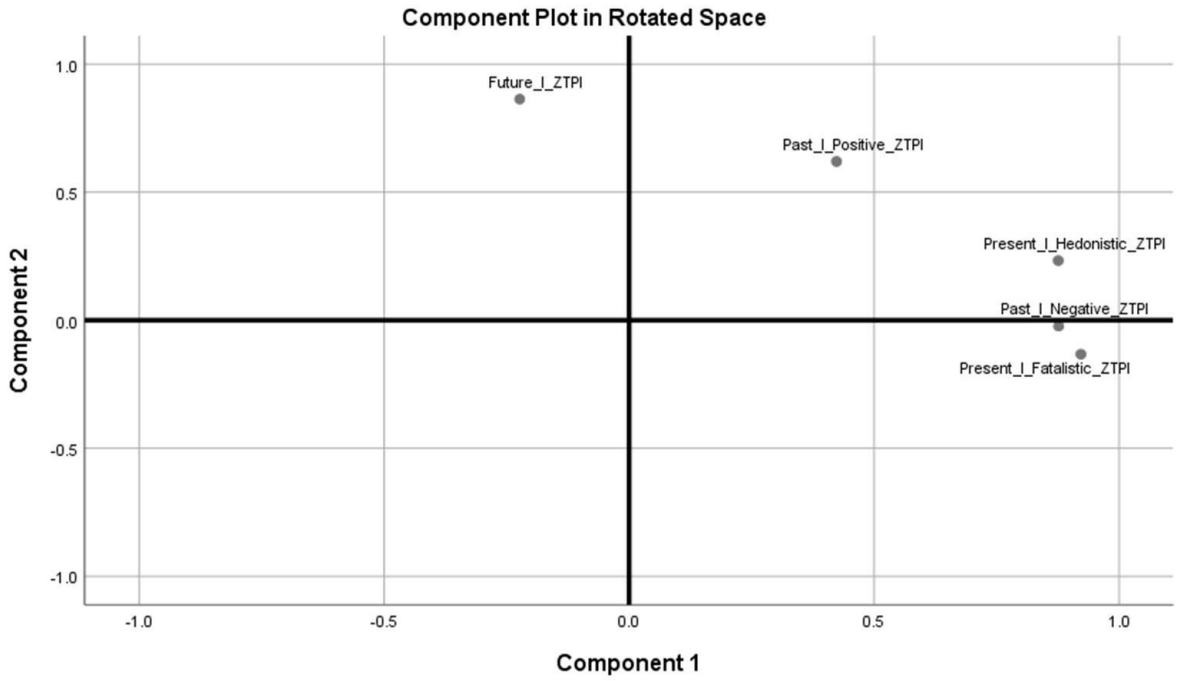


Figure 181 Illustration of how variables of items of Zimbardo Time Perspective cluster

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified versions of the equations were inputted as SPSS Syntax. The variables representative of the 'Negative Zimbardo Time Perspective' (Factor 1) and 'Positive Zimbardo Time Perspective' (Factor 2) are computed as shown in Equation 76 and Equation 77 respectively.

'Negative Zimbardo Time Perspective'(Factor 1)

Negative Zimbardo Time Perspective(ZTP_F1) = Past_Negative_ZTPI*0.876+ Present_Hedonistic_ZTPI*0.876 + Present_Fatalistic_ZTPI*0.922

In order to move to a scale 0 to 5

ZTP_F1_Index=ZTP_F1/(0.876+0.876+0.922)

Equation 76 'Negative Zimbardo Time Perspective' (Factor 1)

Positive Zimbardo Time Perspective (Factor 2)
Positive Zimbardo Time Perspective (ZTP_F2)=Past_Positive_ZTPI*0.620+Future_ZTPI*0.863

In order to move to a scale 0 to 5

ZTP_F2_Index=ZTP_F2/(0.863+0.620)

Equation 77 Positive Zimbardo Time Perspective (Factor 2)

9.3.2 Variable representing Overall Level of ZTP

9.3.2.1 Level of ZTP based on orthogonal resultant: Third order variable

A third order variable representative of the value of Zimbardo Time Perspective is computed by combing the two orthogonal Second-order variables by finding their resultant. As the second order variables the 'Negative Zimbardo Time Perspective' (Factor 1) and Positive Zimbardo Time Perspective (Factor 2) are orthogonal variables and act at right angles to one another as illustrated in Figure 181 the second order variables are combined as two variables acting at right angles to one another would be combined using Pythagoras theorem as illustrated in Equation 78.

Zimbardo Time Perspective Combined Value
Zimbardo Time Perspective (ZTP_F1F2)=SQRT((ZTP_F1**2)+(ZTP_F2**2))

In order to maintain the scale of 0 to 5

ZTP_F1 Max= (0.876+0.876+0.922)*5=2.674*5= 13.37
ZTP_F2 Max=(0.863+0.620)*5=1.483*5=7.415
ZTP_F1F2 Max= SQRT(13.37^2+7.415^2) =15.289

ZTP_F1F2_Index Max=15.289/3.0578
ZTP_F1F2_Index = ZTP_F1F2/3.0578

Equation 78 Zimbardo Time Perspective Combined Value

9.4 Multidimensional Future Time Perspective

For further analysis to be carried out and to establish how the items of the Multidimensional Future Time Perspective in the context of CPD interact together, the variables and in turn representative values of the Multidimensional Future Time Perspective and the different dimensions/components representative of the Multidimensional Future Time Perspective Inventory and emerging subscales are computed. To confirm that the values of the items from Multidimensional Future Time Perspective Inventory can be combined and to establish the pattern of interaction of the variables in the factor analysis (Principal Component Analysis) was carried out. Also, to show if and how all variables can be reduced to a distinct variable as postulated in the conceptual framework section of this research.

Figure 182 contains the Multidimensional Future Time Perspective Inventory variables/items that were utilised in this study. The items are used in computing the variables representative of the different dimensions and the labels that would be used to denote them going forward.

Q105_1	I look forward to the future with hope and enthusiasm.
Q105_2	I have the sense that time is running out.
Q105_3	My future is uncertain.
Q105_4	When I think about the future, I expect good things to happen.
Q105_5	I am beginning to experience that time is limited.
Q105_6	You cannot really plan for the future because things change so much.
Q105_7	I have little hope for the future.
Q105_8	Increasingly I feel like time is against me.
Q105_9	My future seems very vague and uncertain to me.
Q105_10	Each new day and season presents me with interesting opportunities.
Q105_11	I know that I do not have all the time in the world.
Q105_12	I do not focus on the future because it is so uncertain to me anyway.

Figure 182 Multidimensional Future Time Perspective Questionnaire Items for Variable computation

9.4.1 Variables representing Dimensions MDFTP

9.4.1.1 First Order Variable

The Multidimensional Future Time Perspective Questionnaire by Allyson et al. (2014) was used in measuring identified dimensions of Future Time Perspective. The values of the individual dimensions of Multidimensional Future Time Perspective are computed based on recommendation in the literature for the Multidimensional Future Time Perspective Questionnaire [190]. The variables are computed for the respective dimensions as shown in Equation 79, Equation 80 and Equation 81.

Opportunities MDFTP

Opportunities_I_MDFTP=MEAN(Q105_1,Q105_4,Q105_7,Q105_10).

Equation 79 Opportunities MDFTP

Limitations MDFTP

Limitations_I_MDFTP=MEAN(Q105_2,Q105_5,Q105_8,Q105_11)).

Equation 80 Limitations MDFTP

Ambiguities MDFTP

Ambiguities_I_MDFTP=MEAN(Q105_3,Q105_5,Q105_9,Q105_12).

Equation 81 Ambiguities MDFTP

9.4.1.2 Second Order Variable Based on factor analysis

Second order variables of Multidimensional Future Time Perspective are calculated by carrying out factor analysis to identify the emerging subscales which are representative of the dimensions of Multidimensional Future Time Perspective. The variable representative of the emerging Multidimensional Future Time Perspective subscales and their corresponding values are the computed using the results of the factor analysis. The variables that represent the values of the Second-order dimensions/components of Multidimensional Future Time Perspective are computed as follows. The Factor analysis that is carried out also showed how the variables can/should be combined and the underlying interaction of items within the scale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.845
Bartlett's Test of Sphericity	Approx. Chi-Square	1506.309
	Df	66
	Sig.	.000

Figure 183 Multidimensional Future Time Perspective Factor Analysis: KMO and Bartlett's Test

The result of the KMO and Bartlett's Test shown in the Figure 183 indicates that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, a principal component analysis with varimax rotation and Kaiser normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regards to the twelve variables used, orthogonal rotation of the variables yielded two factors, accounting for 52.286 and 24.042 of the variance respectively, a total of 76.328 per cent of the total variance explained as shown in Figure 184.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.176	34.796	34.796	4.176	34.796	34.796	4.175	34.794	34.794
2	2.570	21.417	56.213	2.570	21.417	56.213	2.570	21.419	56.213
3	.991	8.262	64.475						
4	.796	6.633	71.108						
5	.646	5.387	76.495						
6	.599	4.988	81.483						
7	.510	4.250	85.733						
8	.485	4.045	89.779						
9	.413	3.442	93.221						
10	.317	2.645	95.866						
11	.267	2.225	98.091						
12	.229	1.909	100.000						

Figure 184 Multidimensional Future Time Perspective Factor Analysis: Total Variance Explained

The scree plot as shown in Figure 185 supports the conclusion about the number of factors

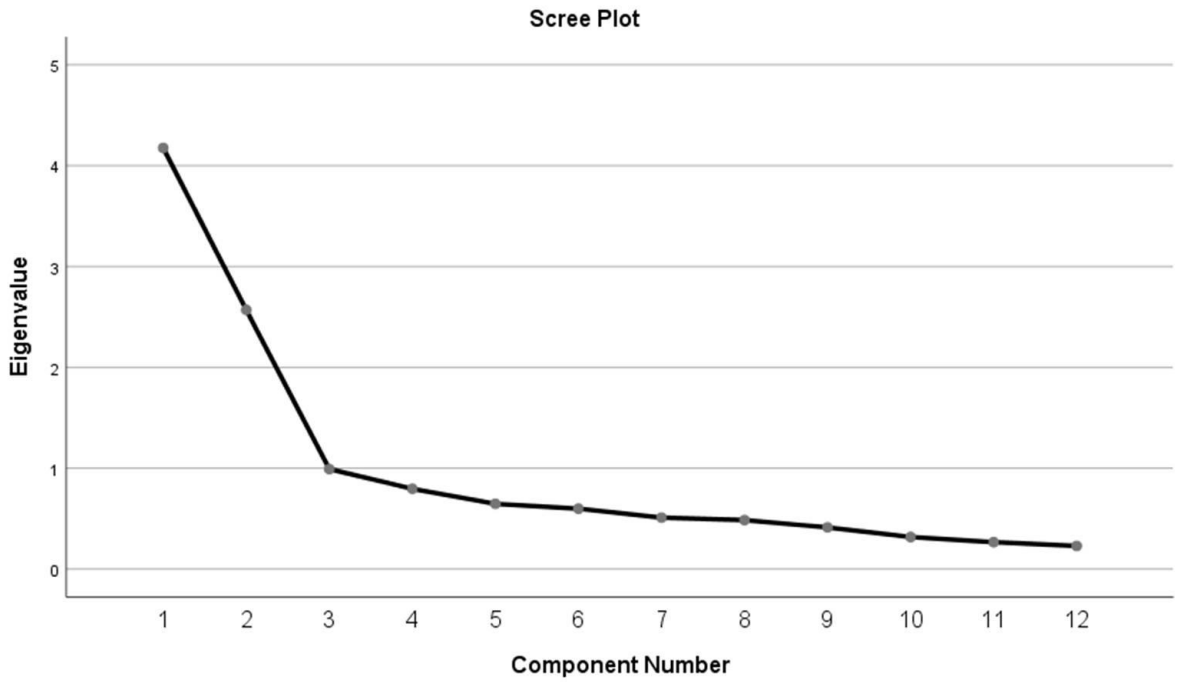


Figure 185 Multidimensional Future Time Perspective Factor Analysis: Scree Plot

The factor loadings for the variables are presented in Figure 186:

Rotated Component Matrix		
	Component	
	1	2
Q105_1	-.272	.745
Q105_2	.469	.452
Q105_3	.737	-.058
Q105_4	-.179	.697
Q105_5	.251	.641
Q105_6	.729	.075
Q105_7	-.852	.114
Q105_8	.720	.206
Q105_9	.869	-.117
Q105_10	-.086	.649
Q105_11	.157	.638
Q105_12	.825	-.085

Figure 186 Multidimensional Future Time Perspective Factor Analysis: Factor Loading

Figure 186 shows the factor loadings of the varying items. To enhance the interpretability of the factors, only variables with factor loadings > 0.460 (factor 1), > 0.630(factor 2) were selected for inclusion in their respective factors. The factors are named respectively: 'Negative Multidimensional Future Time Perspective' (Factor 1): 'Positive Multidimensional Future Time Perspective' (Factor 2).

The seven variables Q105_2, Q105_3, Q105_6, Q105_7, Q105_8, Q105_9, Q105_12 that load on Factor 1 (as shown in Figure 186) reflect some negative Multidimensional time perspective as such factor 1 is labelled 'Negative Multidimensional Future Time Perspective'. While the two variables Q105_1, Q105_4, Q105_5, Q105_10, Q105_11 that load on Factor 2 (as shown in Figure 186) reflect some positive Negative Multidimensional Future Time Perspective as such the Factor 2 is labelled as 'Positive Negative Multidimensional Future Time Perspective'. The results of the factor analysis can be interpreted as being in line with theoretical expectations although, it is highly informative that the variables load on two factors. It illustrates the relative orthogonal relationship between factors examining the positive and Negative Multidimensional Future Time Perspective, showing that they are independent of each other. Figure 181 illustrates how the different variables contribute to the total level of Multidimensional Time Perspective. Items Q105_2, Q105_3, Q105_6, Q105_7, Q105_8,

Q105_9, Q105_12 together while the items Q105_1, Q105_4, Q105_5, Q105_10, Q105_11 also cluster together

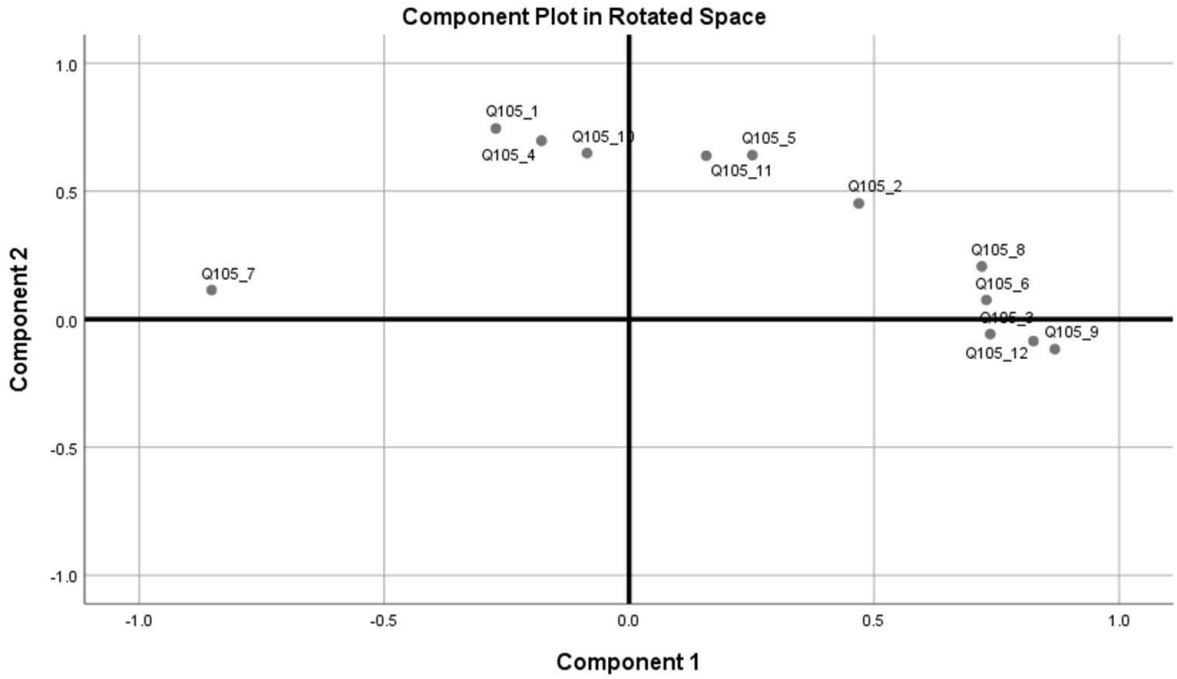


Figure 187 Illustration of how variables of items of Multidimensional Future Time Perspective cluster

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified versions of the equations were inputted as SPSS Syntax. The variables representative of the 'Negative Multidimensional Future Time Perspective' (Factor 1) and 'Positive Multidimensional Future Time Perspective' (Factor 2) are computed as shown in Equation 82 and Equation 83 respectively.

Negative Multidimensional Future Time Perspective (Factor 1)

Negative Multidimensional Future Time Perspective (MDFTP_F1)=Q105_2*0.469 +Q105_3*0.737+Q105_6*0.729 -Q105_7*0.852 +Q105_8*0.720+Q105_9*0.869+Q105_12*0.825

In order to move to a scale 0 to 5

MDFTP_F1_Index=MDFTP_F1/(0.469+0.737+0.729-0.852+0.720+0.869+0.825)

Equation 82 Negative Multidimensional Future Time Perspective (Factor 1)

Positive Multidimensional Future Time Perspective (Factor 2)

Positive Multidimensional Future Time Perspective (MDFTP_F2) =Q105_1*0.745+Q105_4*0.697 +Q105_5*0.641 +Q105_10*0.649+Q105_11*0.638.

In order to move to a scale 0 to 5

MDFTP_F2_Index=MDFTP_F2/(0.745+0.697+0.641+0.649+0.638).

Equation 83 Positive Multidimensional Future Time Perspective (Factor 2)

9.4.2 Variable representing Overall Level of MDFTP

9.4.2.1 Level of MDFTP based on orthogonal resultant: Third order variable

A third order variable representative of the value of Multidimensional Future Time Perspective is computed by combining the two orthogonal Second-order variables by finding their resultant. As the second order variables the 'Negative Multidimensional Future Time Perspective'(Factor 1) and Positive Multidimensional Future Time Perspective (Factor 2) are orthogonal variable and act at right angles to one another as illustrated in Figure 187 Illustration of how variables of items of Multidimensional Future Time Perspective cluster the Second order variables are combined as two variables acting at right angles to one another would be combined using Pythagoras theorem as illustrated in Equation 84.

Multidimensional Future Time Perspective combined value
Combined Value Multidimensional Future Time Perspective (MDFTP_F1F2)
=SQRT((MDFTP_F1**2)+(MDFTP_F2**2)).

In order to maintain the scale of 0 to 5

MDFTP_F1 Max= (0.469+0.737+0.729-0.852+0.720+0.869+0.825)*5=3.497*5= 17.485
MDFTP_F2 Max=(0.745+0.697+0.641+0.649+0.638)*5=3.370*5=16.850
MDFTP_F1F2 Max= SQRT(17.485**2+16.850**2) =24.283

MDFTP_F1F2_Index_Max=24.283/4.8566
MDFTP_F1F2_Index_Max=MDFTP_F1F2/4.8566

Equation 84 Multidimensional Future Time Perspective combined value

9.5 Future Time Perspective

For further analysis to be carried out and to establish how the items of the Future Time Perspective Inventory in the context of CPD interact together the variables and representative values of the Future Time Perspective and the different dimensions/components of the Future Time Perspective Inventory and emerging subscales are computed. To confirm that the values of the items from Future Time Perspective Inventory can be combined and to establish the pattern of interaction of the variables factor analysis (Principal Component Analysis) was carried out. Also, to show if and how all variables can be reduced to a distinct variable as postulated in the conceptual framework section of this research.

Figure 188 contains the Future Time Perspective Inventory variables/items that were utilised in this study. The items are used in computing the variables representative of the different dimensions and the labels that would be used to denote them going forward

Q106_1	Many opportunities await me in the future.
Q106_2	I expect that I will set many new goals in the future.
Q106_3	My future is filled with possibilities.
Q106_4	Most of my life lies ahead of me.
Q106_5	My future seems infinite to me.
Q106_6	I could do anything I want in the future.
Q106_7	There is plenty of time left in my life to make new plans.
Q106_8	I have the sense time is running out.
Q106_9	There are only limited possibilities in my future.
Q106_10	As I get older, I begin to experience time as limited.

Figure 188 Future Time Perspective Questionnaire Items for Variable computation

9.5.1 Variables representing Dimensions FTP

9.5.1.1 First Order Variable based on factor analysis

First order variables of Future Time Perspective are calculated by carrying out factor analysis to identify the emerging subscales which are representative of the dimensions of Future Time Perspective. The variable representative of the emerging Future Time Perspective subscales and their corresponding values are then computed using the results of the factor analysis. The variables that represent the values of the Second-order dimensions/components of Future Time Perspective are

computed as shown below. The Factor analysis that is carried out also showed how the variables can/should be combined and the underlying interaction of items within the scale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.776
Bartlett's Test of Sphericity	Approx. Chi-Square	1125.941
	Df	45
	Sig.	.000

Figure 189 Future Time Perspective Factor Analysis: KMO and Bartlett's Test

The result of the KMO and Bartlett's Test shown in the Figure 189 indicates that factor analysis can be carried out. To obtain conceptually similar and significant clusters of issues of the variables, a principal component analysis with varimax rotation and Kaiser Normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regards to the ten variables used, orthogonal rotation of the variables yielded three factors, accounting for 25.667, 21.742 and 20.726 of the variance respectively, a total of 68.136 per cent of the total variance explained as shown in Figure 190.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.553	35.531	35.531	3.553	35.531	35.531	2.567	25.667	25.667
2	2.144	21.440	56.972	2.144	21.440	56.972	2.174	21.742	47.409
3	1.116	11.164	68.136	1.116	11.164	68.136	2.073	20.726	68.136
4	.779	7.785	75.921						
5	.565	5.650	81.571						
6	.477	4.769	86.340						
7	.400	3.999	90.339						
8	.361	3.606	93.945						
9	.330	3.296	97.242						
10	.276	2.758	100.000						

Figure 190 Future Time Perspective Factor Analysis: Total Variance Explained

The scree plot as shown in Figure 191 supports the conclusion about the number of factors

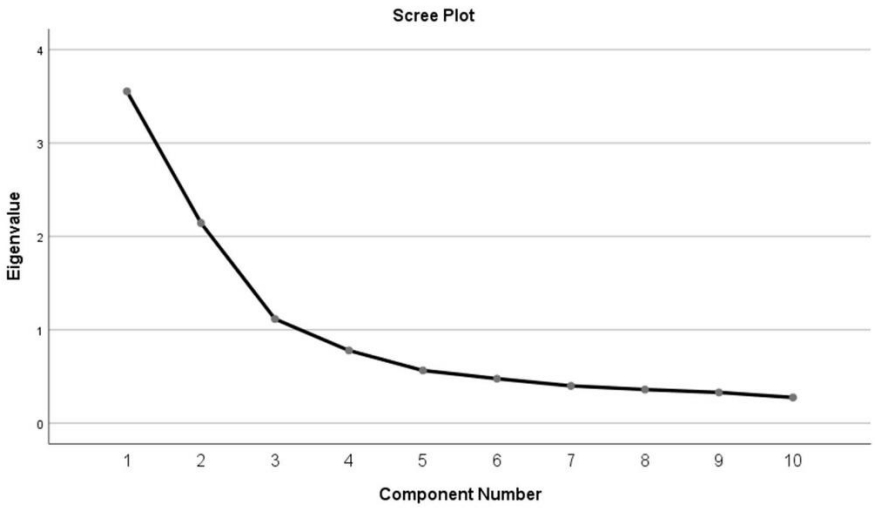


Figure 191 Future Time Perspective Factor Analysis: Scree Plot

The factor loadings for the variables are presented in Figure 192:

Rotated Component Matrix			
	Component		
	1	2	3
Q106_1	.801	.205	.048
Q106_2	.800	.341	-.058
Q106_3	.843	.093	.086
Q106_4	.507	.354	-.250
Q106_5	.237	.755	-.148
Q106_6	.323	.753	.007
Q106_7	.108	.807	-.047
Q106_8	-.063	.033	.846
Q106_9	.355	-.302	.709
Q106_10	-.121	-.053	.868

Figure 192 Future Time Perspective Factor Analysis: Factor Loading

Figure 192 shows the factor loadings of the varying items. To enhance the interpretability of the factors, only variables with factor loadings > 0.500 (factor 1), > 0.750(factor 2), > 0.700 (factor 3) were selected for inclusion in their respective factors. The factors are named respectively: 'Opened Future Time Perspective 'Extremely opened Future Time Perspective' (Factor 2), 'Limitation Future Time Perspective' (Factor 3).

The four variables Q106_1, Q106_2, Q106_3, Q106_4 that load on Factor 1 (as shown in Figure 192) reflect what opened and positive Future time perspective as such factor 1 is labelled 'Opened Future Time Perspective'. While the three variables Q106_5, Q106_6, Q106_7 that load on Factor 2 (as shown in Figure 192) reflect the an extremely opened and positive Future Time Perspective as such the Factor 2 is labelled as 'Extremely opened Future Time Perspective'. The three variables Q106_8, Q106_9, Q106_10 that load on Factor 3 (as shown in Figure 192) reflect a somewhat negative future time perspective focused on limitations as such factor 3 is labelled 'Limitation Future Time Perspective'.

The results of the factor analysis can be interpreted as being in line with theoretical expectations although it is highly informative that the variables load on 3 factors. It illustrates the relative orthogonal relationship between factors examining the, Opened, extremely opened and limitation

Future Time Perspective, showing that they are independent of each other. Figure 193 illustrates how the different variables contribute to the total level of future Time Perspective.

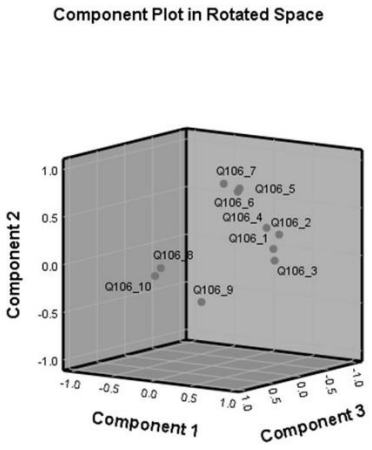


Figure 193 Illustration of how variables of items of Future Time Perspective cluster

The value of the variables would be calculated as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified versions of the equation were inputted as SPSS Syntax. The variables representative of the 'Open Future Time Perspective'(Factor 1), 'Extremely opened Future Time Perspective'(Factor 2) and 'Limitations Future Time Perspective' are computed as shown in Equation 85, Equation 86 and Equation 87 respectively.

'Opened opportunities Future Time Perspective' (factor 1)

Opened opportunities Future Time Perspective (FTP_F1) =Q106_1*0.801+Q106_2*0.800+ Q106_3*0.843+ Q106_4*0.507.

In order to maintain the scale 0 to 7

FTP_F1_Index= FTP_F1/(0.801+0.800+0.843+0.507).

In order to move to a scale 0 to 5

FTP_F1_Index5=FTP_F1_Index/1.4.

Equation 85 Opened opportunities Future Time Perspective (factor 1)

Extremely Opened opportunities Future Time Perspective (factor 2)

Extremely Opened opportunities Future Time Perspective (FTP_F2) = Q106_5*0.755+Q106_6*0.753 +Q106_7*0.807.

In order to maintain the scale 0 to 7

FTP_F2_Index=FTP_F2/(0.755+0.753+0.807).

In order to move to a scale 0 to 5

FTP_F2_Index5=FTP_F2_Index/1.4.

Equation 86 Extremely Opened opportunities Future Time Perspective (factor 2)

Limitation Future Time Perspective (factor 3)

Limitation Future Time Perspective (FTP_F3) =Q106_8*0.846+Q106_9*0.709+Q106_10*0.868.

in order to maintain the scale 0 to 7

FTP_F3_Index=FTP_F3/ (0.846+0.709+0.868).

In order to move to a scale 0 to 5

FTP_F3_Index5=FTP_F3_Index/1.4.

Equation 87 Limitation Future Time Perspective (factor 3)

9.5.1.2 Second Order Variable

The Future Orientation Scale by Carstensen & Lang (1996) was used in measuring Future Time Perspective. The values of the individual dimensions of Future Time Perspective are computed based on recommendation in the literature for the Future Orientation [275, 276, 277]. The variables are computed for the respective dimensions as shown in Equation 88 and Equation 89.

Future Time Perspective Focused on Opportunities (Focus_on_Opportunities_FTP)

Focus_on_Opportunities_FTP=MEAN(Q106_1, Q106_2,Q106_3,Q106_4,Q106_5,Q106_6,Q106_7).

Equation 88 Future Time Perspective Focused on Opportunities (Focus_on_Opportunities_FTP)

Future Time Perspective Focused on Limitations (Focus_on_Limitations_FTP)

Focus_on_Limitations_FTP=MEAN(Q106_8,Q106_9,Q106_10).

Equation 89 Future Time Perspective Focused on Limitations (Focus_on_Limitations_FTP)

9.5.2 Variable representing Overall Level of FTP

9.5.2.1 Level of FTP base on Second-order factor analysis

A third order variable representative of the value of Future Time Perspective is computed. This is done by carrying out factor analysis to identify the emerging subscales which are representative of the dimensions of Future Time Perspective. The variable representative of the emerging Future Time Perspective subscales and their corresponding values are then computed using the results of the factor analysis. The variables that represent the values of the overall value of Future Time Perspective are computed as shown below. The Factor analysis that is carried out showed how the variables can/should be combined and the underlying interaction of items within the scale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.473
Bartlett's Test of Sphericity	Approx. Chi-Square	106.669
	df	3
	Sig.	.000

Figure 194 Future Time Perspective Factor Analysis: KMO and Bartlett's Test

The result of the KMO and Bartlett's Test shown in the Figure 194 indicates that factor analysis can be carried out. Although, it should be noted that the value of the KMO return is somewhat low, this is understandable given the relatively few variables. To obtain conceptually similar and significant clusters of issues of the variables, a principal component analysis with varimax rotation and Kaiser Normalisation were conducted. Factors with Eigen values equal to or greater than 1.00 were extracted. With regards to the three variables used, orthogonal rotation of the variables yielded one factor, accounting for 51.539 of the variance respectively, a total of 68.136 per cent of the total variance explained as shown in Figure 195.

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.546	51.539	51.539	1.546	51.539	51.539
2	.999	33.298	84.838			
3	.455	15.162	100.000			

Figure 195 Future Time Perspective Second Factor Analysis: Total Variance Explained

The scree plot as shown in Figure 196 supports the conclusion about the number of factors

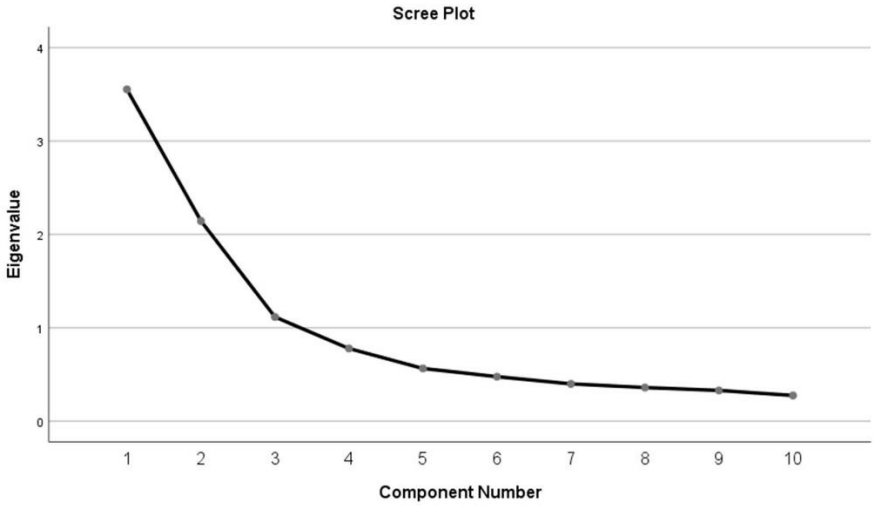


Figure 196 Future Time Perspective Second-order Factor Analysis: Scree Plot

The factor loadings for the variables are presented in Figure 197:

Component Matrix	
	Component
	1
Opened opportunities Future Time Perspective Index scale 0 to 5	.826
Extremely Opened opportunities Future Time Perspective Index Scale 0 to 5	.879
Limitation Future Time Perspective Index Scale 0 to 5	-.302

Figure 197 Future Time Perspective Second-order Factor Analysis: Factor Loading

Figure 197 shows the factor loadings of the varying items. To enhance the interpretability of the factors, only variables with factor loadings > 0.300 (factor 1) were selected for inclusion. The three variables 'Opened Future Time Perspective 'Extremely opened Future Time Perspective', 'Limitation Future Time Perspective' that load on Factor 1 (as shown in Figure 192) reflect the value of Future Time perspective and as such are labelled 'Combined value of Future Time Perspective'.

The results of the factor analysis can be interpreted as being in line with theoretical expectations. Although, it is highly informative that the variable 'Limitation Future Time Perspective' has Factor load with a negative coefficient, showing that the effect of Limited Perspective is the opposite to the effects of Opened perspective.

The value of the variables would be calculated from the results of the factor analysis as shown below. The values are calculated because the researcher finds it more meaningful to calculate the values of the factor-based variables to reflect the values associated with the initial variables that combine to form the factors. This was calculated using the rotated factor loadings. The computation of the variables was carried out using SPSS, modified versions of the equation were inputted as SPSS Syntax. The variables representative of the overall value of FTP computed as shown in Equation 90 respectively.

Combined value of Future Time Perspective (factor 1)

Combined value of Future Time Perspective (FTP_SUB) =FTP_F1_Index5*0.826+FTP_F2_Index5*0.879-FTP_F3_Index5*0.302.

In order to move to a scale 0 to 5

FTP_SUB_Index= FTP_SUB/ (0.826+0.879-0.302).

Equation 90 Combined value of Future Time Perspective (factor 1)

9.6 Chapter Summary

In this section, the variables representative of dimensions of Motivation and associated subsets were computed. The variables of Motivation computed in this Chapter in conjunction with the variable representative of LECPD computed in the previous Chapter enable exploration of the relationship between the dimensions of Motivation and LECPD in Chapter 10 and Chapter 11. In addition to the process of computing the variables using Factor analysis, the Chapter also provided valuable insight and inference about Motivation in the context of CPD. The research objectives were achieved, objective pertaining to determining the Level of Motivation in the specific context of CPD through computation of variable representative of underlying interaction specific to the sample population. Information and knowledge gleaned in this Chapter would be used in further analysis and to draw meaningful inferences.

Chapter Ten

10 Establishing Relationship between Variables for Motivation and LECPD.

In this Chapter in-depth evaluation of the relationship between level of engagement with CPD and motivation to engage with CPD is carried out; by effect answering key research questions and hypothesis in regard to the relationship between variables representative of different dimensions and components of motivation and LECPD. These allow for exploration and understanding the interaction between varying dimensions of motivation in the context of CPD. Pearson correlation and Canonical correlation are used to establish the nature of the relationship between the said dimensions of motivation and CPD. In so doing, engaging with some of the key objectives of this research which 1) establishing the nature of the relationship between LECPD and dimension of motivation including associated subsets 2) get greater insight into the overall interaction of the aspect of CPD and the dimension of motivation. This chapter tests the related hypothesis using Pearson correlations and Canonical correlation. Hypothesis that state that: 1) There is a relationship between LECPD and different dimensions of motivation and respective associated emergent subsets of said dimensions of motivation. 2) There is a relationship between the given variable set for level of engagement with Aspects of CPD and the other Variables set of dimensions of motivation.

10.1 Relationship of individual variables with LECPD

10.1.1 Relationship of Variables representing Dimensions AM with LECPD

To further confirm which of the sets of computed AM variables have a relationship with LECPD, and gleam if they are appropriate for further analysis involving level of engagement with CPD(LECPD) correlation of the varying derived variables and LECPD was carried out. The Figure 198 contains the result of the correlations which shows that all the variables except 'AM - Avoidance of Task Index' have statistically significant correlation, the extent of correlations are adequate for behaviour related studies as behaviour particularly motivation is an over determined construct. As such, extremely high figures of correlation are not expected. The level of correlation from the variables derived from AM factor analysis shows that there is a significant direct relationship between them and that they are suited for use in further analysis. The highest level of correlation among first order Variables was displayed by AM_F5_Index denoting 'AM - Affinity of Challenge Index' and AM_F3_Index denoting 'AM - Success and challenge approaching Index'. The second order variable AMSUB_F1_Index which

denotes 'Achievement motivation in the context of concerted effort' has the highest level of correlation with LECPD among all the variable which makes logical sense and is in line with theoretical expectations, as it would be expected that a concerted effort would result in higher level of engagement with CPD. The third order variables AMSUB_F1F2_Index which denotes Overall Level of Achievement Motivation also show a good level of correlation with level of engagement with CPD showing that the overall resultant of all emergent dimensions of achievement motivation have a significant relationship with LECPD.

It is of interest that the Second order variable AMSUB_F2_Index which denotes 'Achievement motivation in the context of laissez-faire and approbation' has a negative correlation with LECPD. This again makes logical sense and is in line with theoretical expectations, as those who have displayed laissez-faire attitude towards work and approbation lust (desire for praise irrespective of veracity of effort or possible at the expense of success) would be expected to engage less with continuous professional development. It is also interesting that the first-order variable for AM_F2_Index which denotes AM - Affinity for approval and competitiveness has a negative correlation indicative of an inverse relationship with LECPD, showing that Achievement motivation geared towards approbation lust and competitiveness just for the sake of competitiveness has a negative impact on level of engagement with CPD. Although the correlation of AM_F1_Index which denotes 'AM - Avoidance of Task Index' is not statistically significant and very small, it is interesting as this in itself yields important information showing us that although there might be a minimal negative influence of avoidance of task on engagement with CPD, the influence in itself is in no way significant, the implications of this are worthy of further investigation. In all, the findings from the comparison of the variables elucidates on the relationship between level of engagement with CPD and Achievement motivation in such a manner that adds to understanding of the relationship in such a way that makes logical sense and builds on theorised expectations.

Correlation											
		First Order variables							Second order Variables		Third Order Variables
		AM_F1_Index	AM_F2_Index	AM_F3_Index	AM_F4_Index	AM_F5_Index	AM_F6_Index	AM_F7_Index	AMSUB_F1_Index	AMSUB_F2_Index	AMSUB_F1F2_Index
LECPD Combined factors Indexed	Pearson Correlation	-.002	-.311**	.348**	.248**	.386**	.340**	.254**	.460**	-.191**	.396**
	Sig. (2-tailed)	.981	.000	.000	.000	.000	.000	.000	.000	.003	.000
	N	233	233	233	233	233	233	233	233	233	233

Figure 198 Achievement Motivation Derived Variables Correlation

10.1.2 Relationship of Variables representing Dimensions SDM With LECPD

To further confirm which of the sets of computed SDM variables have a relationship with LECPD and gleam if they are appropriate for further analysis involving the Level of engagement with CPD(LECPD), correlation of the varying derived and emergent variables and LECPD was carried out. Figure 199 contains the result of the correlations which shows that all the variables have statistically significant correlation except the variable for External_Regulation_EM_Index , the extent of correlations are adequate for behaviour related studies as behaviour particularly, motivation is an overdetermined construct. As such, extremely high figures of correlation are not expected. The level of correlation from the variables derived from SDM factor analysis and the LECPD shows that there is a relationship between them and they are suited for use in further analysis. The highest level of correlation was shown by the first order variables 'To_Experience_Stimulation_IM_Index' illustrating that the Intrinsic motivation to experience stimulation has a relatively strong relationship LECPD; Showing that those with high level of Intrinsic motivation to experience stimulation (the dimension of SDM with the highest level of perceived autonomy) would be expected to be more engaged with CPD. This makes logical sense and is in line with theorised expectations. The highest level of correlation among first order variables was displayed by the variables 'To_Experience_Stimulation_IM_Index' and Towards_Accomplishment_IM_Index. Among the second order variables of SDM_F1_Index_5 which denotes 'Level of Self determined motivation less amotivation' has the highest level of correlation with LECPD which makes logical sense and is line with theorised expectations as it is the variable representative of the actual value of SDM in absence of consideration for measurability of scale for an individual. Also, of interest is the fact that the Second order variable SDM_F2_Index_5 which denotes 'Extent of Measurability/Amotivation' has positive and significant correlation, hence a relationship with LECPD. This again makes logical sense and is in line with theorised expectations; the implications

are the same with the implication for that of the First-order variable Amotivation_Index which is discussed below. The Third order variables SDM_Direct_Autonomy_Index5 which denotes SDM Combined value on basis of perceived level of Autonomy indicative of the overall resultant of Self Determined motivation also show an acceptable level of correlation with level of engagement with CPD showing that the overall resultant of all dimensions of Self Determined motivation have a significant relationship with LECPD.

It is also interesting that the first-order variable for the External_Regulation_EM_Index has a very small, positive and insignificant correlation with LECPD implying that the external regulation form of extrinsic motivation does not display a relationship with LECPD of any significance; Showing that the dimension of motivation with the lowest recordable or measurable level of autonomy has no influence on the level of engagement with CPD. It is interesting that, individuals that exhibit a pre-eminence of external regulation form of extrinsic motivation and hence are more influenced by external factors would be expected to have a minimal positive influence on LECPD, the influence would be in no way significant. However, the variable for Amotivation_Index displays a higher and significant correlation with LECPD than the External_Regulation_EM_Index. This shows that the extent of measurability of self-determination of an individual which the amotivation denotes actual display of greater relationship with LECPD than the dimension of motivation with the lowest recordable or measurable level of autonomy. In turn, this goes further to illustrate that amotivation is not an absolute zero of self-determined motivation or perceived autonomy but representative of a relative zero and the extent to which the self-determined motivation of the individual is measurable. The correlation shows us that the higher the amotivation the greater the expected level of engagement with CPD; the implications of which are worthy of further investigation. In all, the findings from the comparison of the variables elucidates on the relationship between level of engagement with CPD and Self determined motivation in such a manner that adds to understanding of the relationship in such a way that makes logical sense and builds on theorised expectations.

Correlation												
		First Order variables							Second order variables		Alternative third order variables	
		To_Experience_Stimulation_IM_Index	Towards_Accomplishment_IM_Index	To_Know_IM_Index	Identified_EM_Index	Introjected_EM_Index	External_Regulation_EM_Index	Amotivation_Index	SDM_F1_Index_5	SDM_F2_Index_5	SDM_Direct_Autonomy_Index5	SDM_F1F2_Index5
LECPD Combined factors Indexed 0 to 5	Pearson Correlation	.426**	.300**	.281**	.233**	.221**	.091	.209**	.338**	.209**	.373**	.348**
	Sig. (2-tailed)	.000	.000	.000	.000	.001	.176	.002	.000	.002	.000	.000
	N	224	224	224	224	224	224	224	224	224	224	224

Figure 199 Self Determined Motivation Derived Variables Correlation.

10.1.3 Relationship of Variables representing Dimensions ZTP with LECPD

To further confirm which of the sets of computed ZTP variables have a relationship with LECPD and if they are appropriate for further analysis involving level of engagement with CPD(LECPD) correlation of the varying derived and emergent variables and LECPD was carried out. Figure 200 contains the result of the correlations which shows that all the variables have statistically significant correlations, the extent of the correlations are adequate for behaviour related studies, particularly as motivation is an overdetermined construct as such the extreme high figures of correlation are not expected. The level of correlation from the variables derived from ZTP factor analysis and the LECPD shows that there is a significant direct relationship between them, and they are suited for use in further analysis. The highest level of correlation among first order variables was displayed by the variables Future ZTPI denotative of 'Future oriented Zimbardo Time perspective' and Present Hedonistic. Among the second order variables of ZTP_F2 which denotes 'Positive dimensions of Zimbardo time perspective' has the highest level of correlation with LECPD which makes logical sense and is in line with theorised expectation. The third order variables ZTP_F1F2 which denotes 'Zimbardo Time Perspective Combined Value' indicative of the overall resultant of Zimbardo Time Perspective also shows good level of correlation with the level of engagement with CPD showing that the overall resultant of all dimensions of Zimbardo Time Perspective have a significant direct relationship with LECPD.

The highest level of correlation was shown by the second-order Variables 'Positive Zimbardo Time Perspective Index' denoted by 'ZTP_F2' illustrating that the positive dimensions of Zimbardo time perspective has the strongest direct relationship with LECPD. Illustrating that, those with pre-eminent positive Zimbardo time perspective outlook characterised by low depression/anxiety and high future

awareness and in some cases, high self-esteem/happiness would be expected to experience the highest level of increase in levels of engagement with CPD among ZTP dimension as the value of the dimension increases. This makes logical sense and is in line with theorised expectations. However, it should be noted that the level of correlation and strength of the direct relationship of LECPD and 'ZTP-F2' is only marginally higher than the level of correlation of LECPD and the third-order variable 'ZTP_F1F2' indicative of the overall resultant of Zimbardo time perspective. Also, of interest is the fact that the Second order variable ZTP_F1 which denotes 'Negative Zimbardo Time Perspective' has positive and significant correlation, hence indicative of a direct relationship with LECPD. Implying that, those with pre-eminent Negative dimension of Zimbardo time perspective characterised by Low future awareness and in some cases high anxiety, depression or aggression that can be past and/or present focused can be expected to engaged more with CPD as their outlook in said dimension increase but not to the same extents as those with a pre-eminent postive dimension of Zimarbo time persepctive. This again makes logical sense and is in line with theorised expectations. It is quite interesting the dimension of ZTP all have a positive correlation with LECPD even the relatively negative dimensions, this is worthy of further exploration.

It is in line with expectation that the positive relationship between the Future ZTPI and LECPD would be the strongest among the first-order dimensions of ZTP. This is in line with expectation that those with future focused Zimbardo Time perspective would tend to engage more with CPD as CPD activity are generally future focused activities. The extent of relationship between the variable denotative of Present Hedonistic ZTPI and LECPD is quite interesting, showing that the LECPD has significant positive relationship with present Hedonistic, second only to the Future ZTPI dimension. This implies that, the intrinsic worth, novelty and sensation generating ability of CPD activi0ty being engaged with, can have an influence on the level of engagement with CPD for individuals with a pre-eminent Present Hedonistic dimension. The variable past Positive ZTPI has the lowest level of correlation with LECPD among the variables, this is interesting and shows that those with positive sentimental attitude to past tends to engage less with CPD than all the other dimensions. Although, the relationship between them is a direct relationship like that of all the other dimensions of ZTP the extent to which the level of engagement with CPD would increase for an individual with a pre-eminent past Positive dimension of ZTP would experience less than those of other pre-eminent dimensions.

In all the findings from the comparison of the variables, it elucidates the relationship between level of engagement with CPD and Zimbardo Time Perspective in such a manner that adds to understanding of the relationship in such a way that makes logical sense and builds on theorised expectations.

Correlations									
		First Order variables					Second Order variables		Third order variables
		Past Negative ZTPI	Present Hedonistic ZTPI	Future ZTPI	Past Positive ZTPI	Present Fatalistic ZTPI	ZTP_F1	ZTP_F2	ZTP_F1F2
LECPD Combined factors Indexed	Pearson Correlation	.268**	.294**	.340**	.150*	.201**	.277**	.353**	.345**
	Sig. (2-tailed)	.000	.000	.000	.029	.003	.000	.000	.000
	N	212	212	212	212	212	212	212	212

Figure 200 Zimbardo Time Perspective Derived variables Correlation

10.1.4 Relationship of Variables representing Dimensions MDFTP with LECPD

To further confirm which of the sets of computed MDFTP variables have a relationship with LECPD and if they are appropriate for further analysis involving Level of engagement with CPD(LECPD), correlation of the varying derived and emergent variables and LECPD was carried out. Figure 201 contains the result of the correlations which shows that all the variables have statistically significant correlation except the first-order variable Ambiguities_I_MDFTP denotative of 'Ambiguities Multidimensional Future Time Perspective' and the second order variable MDFTP_F1_Index denotative of 'Negative Multidimensional Future Time Perspective'. The extent of correlations is adequate for behaviour related studies as behaviour, particularly motivation is an overdetermined construct therefore extreme high figures of correlation are not expected. The level of correlation from the variables derived from MDFTP factor analysis and the LECPD shows that there is a significant direct relationship between them and that they are suited for use in further analysis. The highest level of correlation among first order variables was displayed by the variables Opportunities_I_MDFTP denotative of 'Opportunities Multidimensional Time Perspective' and Limitations_I_MDFTP denotative of 'Limitations Multidimensional Time Perspective'. Among the second order variables of MDFTP_F2_Index which denotes 'Positive Multidimensional Future Time Perspective' has the highest level of correlation with LECPD which makes logical sense and is in line with theorised expectations. The third order variables MDFTP_F2_Index which denotes 'Combined Value Multidimensional Future Time Perspective' is indicative of the overall resultant of Multidimensional Future Time Perspective Time Perspective also shows good level of correlation with level of engagement with CPD showing

that the overall resultant of all dimensions of Zimbardo Time Perspective have a significant direct relationship with LECPD.

The highest level of correlation was shown by the second-order variables 'Positive Multidimensional Future Time Perspective' denoted by 'MDFTP_F2_Index' illustrating that the Positive dimensions of Multidimensional time perspective has the strongest direct relationship LECPD; illustrating that those with pre-eminent positive Multidimensional time perspective outlook be expected to experience the highest level of increase in level of engagement with CPD among MDFTP dimensions as the value of the dimension increase. These make logical sense and is in line with theorised expectations. However, it should be noted that the level of correlation and hence strength of the direct relationship of LECPD and 'MDFTP_F2_Index' is only marginally higher than the level of correlation of LECPD and the third-order variable 'MDFTP_F1F2_Index' indicative of the overall resultant of Multidimensional Future time perspective. Also, the fact that the Second order variable MDFTP_F1_Index which denotes 'Negative Multidimensional Time Perspective' has positive but insignificant correlation, hence indicative of no substantial relationship with LECPD, same as the First order variable Ambiguities_I_MDFTP denotative of 'Ambiguities Multidimensional Future Time Perspective'.

In all, the findings from the comparison of the variables elucidates on the relationship between level of engagement with CPD and Multidimensional Future Time Perspective. This is done in such a manner that adds to the understanding of the relationship in a way that it makes logical sense and builds on theorised expectations.

Correlations

		First Order Variables			Second Order variables		Third Order variables
		Opportunities_I_MDFTP	Limitations_I_MDFTP	Ambiguities_I_MDFTP	MDFTP_F2_Index	MDFTP_F1_Index	MDFTP_F1F2_Index
LECPD Combined factors Indexed	Pearson Correlation	.246**	.230**	.005	.350**	.085	.315**
	Sig. (2-tailed)	.000	.001	.943	.000	.226	.000
	N	206	206	206	206	206	206

Figure 201 Multidimensional Future Time Perspective Derived Variables Correlation

10.1.5 Relationship of Variables representing Dimensions FTP With LECPD

To further confirm which of the sets of computed FTP variables have a relationship with LECPD and if they are appropriate for further analysis involving level of engagement with CPD(LECPD), correlation of the varying derived variables and LECPD was carried out. The Figure 202 contains the result of the correlations which shows that all the variables have statistically significant correlation, the extent of correlations are adequate for behaviour related studies as behaviour, particularly motivation is an over-determined construct as high figures of correlation are not expected. The level of correlation from the variables derived from factor analysis shows that they are suited for use in further analysis. The highest levels of correlation was shown by the first order Variables FTP_F2 denotative of 'Extremely Opened opportunities Future Time Perspective Index Scale 0 to 5 (rotated)', the second order variable 'Focus_on_Opportunities_FTP' denotative of Future Time Perspective Focused on Opportunities', the third order variables FTP_SUB denotative of 'Combined value of Future Time Perspective using Factor analysis Index (Based on rotated)'. FTP_SUB shows the overall highest level of correlation justifying the combination. It is also worthy to note that the first-order variable for 'Limitation Future Time Perspective' and second-order variable of 'Limitation Future Time Perspective' both have an inverse relationship with LECPD, this does makes logical sense and is in line with theoretical expectations.

Correlation							
		First-Order Variables			Second-order Variables		Third Order Variable
		FTP_F1	FTP_F2	FTP_F3	Focus_on_Limitations_FTP	Focus_on_Opportunities_FTP'	FTP_SUB
LECPD Combined factors Indexed	Pearson Correlation	.273**	.383**	-.180**	-.177*	.359**	.405**
	Sig. (2-tailed)	.000	.000	.010	.011	.000	.000
	N	206	206	206	206	206	206

Figure 202 Future Time Perspective Derived Variables Correlation

10.1.6 Section Summary

Figure 203 contains a summary of the nature of relationship between level of motivation and engagement with CPD established in this Section. Showing that most vairables have direct relatiohship with LECPD, while variables such as AM_F2_Index, FTP_F3 have inverse relatiohsip with LECPD although a few vairable such as Ambiguities_I_MDFTP and AM_F1_Index have no significant relationship with LECPD.

	Achievement Motivation		Self-Determined Motivation		Zimbardo Time Perspective		Multidimensional Future Time		Future Time Perspective	
	Variable	Relationship	Variable	Relationship	Variable	Relationship	Variable	Relationship	Variable	Relationship
First Order variables	AM_F1_Index	Insignificant **(Rejected)**	To_Experience_Stimulation_IM_Index	**Direct**	Past Negative ZTPI	Direct	Opportunities_I_MDFTP	**Direct**	FTP_F1	Direct
	AM_F2_Index	Inverse	Towards_Accomplishment_IM_Index	Direct	Present Hedonistic ZTPI	Direct	Limitations_I_MDFTP	Direct	FTP_F2	**Direct**
	AM_F3_Index	Direct	To_Know_IM_Index	Direct	Future ZTPI	**Direct**	Ambiguities_I_MDFTP	Insignificant **(Rejected)**	FTP_F3	Inverse
	AM_F4_Index	Direct	Identified_EM_Index	Direct	Past Positive ZTPI	Direct				

	AM_F5_Index	**Direct**	Introjected_EM_Index	Direct	Present Fatalistic ZTPI	Direct				
	AM_F6_Index	Direct	External_Regulation_EM_Index	Insignificant **(Rejected)**						
	AM_F7_Index	Direct	Amotivation_Index	Direct						
Second order Variables	AMSUB_F1_Index	**Direct**	SDM_F1_Index_5	**Direct**	ZTP_F1	Direct	MDFTP_F2_Index	**Direct**	Focus_on_Limitations_FTP	Inverse
	AMSUB_F2_Index	Inverse	SDM_F2_Index_5	Direct	ZTP_F2	**Direct**	MDFTP_F1_Index	Insignificant **(Rejected)**	Focus_on_Opportunities_FTP	**Direct**
Third Order Variables	AMSUB_F1F2_Index	**Direct**	SDM_Direct_Autonomy_Index5	**Direct**	ZTP_F1F2	**Direct**	MDFTP_F1F2_Index	**Direct**	FTP_SUB	**Direct**
			SDM_F1F2_Index5	Direct						

Figure 203 Summary of nature of Relationship between LECPD and Variables of Motivation

10.2 Network of interaction of all variables and dimensions of motivation and engagement with CPD

A key objective of the research is to get greater insight into the overall interaction of the aspect of CPD and the dimension of motivation, Canonical correlation was carried out to establish the interaction of all the dimensions of motivation and the dimensions of LECPD as established in the preceding two chapters. When examining behavioural constructs which are often overdetermined, it is important to carry out multivariate analysis. In carrying out multivariate analysis; especially when dealing with more than one set of variables, Canonical analysis is a very useful tool. Canonical correlation is a special form of multivariate analysis that goes a step further in facilitating the examination of interaction of multiple factors. Canonical correlation does this by allowing a researcher to compare two sets of factors without a need to combine the factors in each set.

In this research, in addition to other multivariate techniques that have explored the effect of a set of independent variables (Predictor) on a dependent variable (criterion), the study explored the relationship between two sets of variables one predictor (given) set and one criterion (other) set on each other. The study will be exploring the interaction, relationship of the Level of engagement with aspects of CPD as the independent (given) set of variables versus the dimensions of motivation as the dependent (other) set of variables. The use of Canonical analysis to simultaneously explore all the variables in a single analysis ensures the ecological validity of the study. It also sheds light on what occurs when the relationship and associated effect occur simultaneously [241]. The results of the canonical analysis aided in: 1) having a more holistic understanding of the what motivates engagement with CPD. 2) showing and allowing for understanding of underlying interaction between the subsets of CPD variables and dimensions of motivation. 3) allowing for consideration of the different effects of the variables acting in isolation on the individual aspects of CPD and effect of the variables acting on all the Aspects of CPD simultaneously thereby allowing understanding of approach to either address an aspect in isolation or in combination with others aspects. 4) allowing for examination of the validity of the methods used to combine the engagement with the aspects of CPD to produce a unitary value. The results allows for understanding of the impact of said combination of the aspects of CPD (or lack of combination).

The following research question was answered, and hypothesis tested

Research Question: What is the relationship between aspects of CPD and dimensions of motivation when effects occur simultaneously?

Hypothesis: There is a relationship between the given variable set for level of engagement with Aspects of CPD and the other Variables set of dimensions of motivation.

In the context of this research the purpose of Canonical correlation analysis is to evaluate the multivariate relationship between the sets of Level of Engagement with aspect of CPD variables and the dimension of motivation variables and how individual variables within these sets relate to each other. The result of which are different from regression analysis as they try to maximize relatedness of the variables [239, 278].

A canonical correlation analysis was conducted using the four variables indicative of level of engagement with respective aspects of CPD as given variable set and of the 25 variables indicative of the first order emergent and identified dimension of motivation in the context of CPD to evaluate the multivariate shared relationship between the two variable sets (i.e., Engagement with CPD and Motivation). Canonical correlation analysis yields a number of canonical functions that corresponds with the number of variables in the variables set (given or other) with the least number of variables. Each canonical function is a linear equation representative of the complex relations between two latent variables one for each set of variables (formed by a linear combination of variables) and the variables in the sets. Figure 205, Figure 206and Figure 207 are diagrammatic representation of the Canonical functions in this specific case. Canonical functions are such that one canonical function doesn't correlate with another [239, 278].

The canonical functions reflect the interaction between two latent variates representative of respective sets. So, canonical function often includes a latent variate representative of the given set of variables and another representative of the other set of variables. The Pearson 'r' for a canonical function is the correlation between these two latent variates. Figure 205 below illustrates the relationship between the latent variables and variables of the sets for significant Canonical functions. The first canonical function usually accounts for the largest amount of correlation among the variables sets producing the largest square coefficients. This is followed by other canonical functions that yields concurrently lower amounts of correlation characterised by lower squared because each following function represents the correlation of variables not accounted for by the previous function. This therefore accounts for residual variance. Canonical functions have different levels of correlation and significance; as such only significant Canonical functions should be taken into consideration [278, 239, 241].

In evaluating the results of Canonical Analysis, the first step to take is to evaluate the predictive power of the entire model, this is done calculating the effect size R_c^2 (the amount of variance not shared between the variable sets) using the Wilks's λ, Effect Size(R_c^2)= 1 – λ . The effect size can be interpreted in the same way as R-squared in regression analysis. R_c^2 is indicative of the proportion of variance shared between the variable sets across all canonical functions [241] .

Effect Size (R_c^2)= 1 – λ

1 - .246 = .754

75.4%

Equation 91 Derivation of Effect Size

This shows that the canonical model has great accuracy and predictive power at 75.4%. Indicative of the model accounting for 75.4% of proportion of variance shared between the LECPD variable set and motivation variables set across all canonical functions.

	Correlation	Eigenvalue	Wilks Statistic	F	Num D.F.	Denom D.F.	Sig.
1	.685	.883	.246	2.986	100.000	704.248	.000
2	.580	.508	.464	2.169	72.000	532.812	.000
3	.483	.304	.700	1.523	46.000	358.000	.020
4	.296	.096	.912	.788	22.000	180.000	.738

H0 for Wilks test is that the correlations in the current and following rows are zero

Figure 204 Canonical Correlation

The second step is to determine which canonical functions are worthy of further examination evaluating the extent to which each canonical function of explains the relationship between the variable sets offered by the function. Although the significance of canonical functions offers some guidance to this effect, nevertheless it is inadequate in elucidating the extent of contribution of canonical function in explaining the variance between variable sets. To adequately elucidate the extent of contribution, the squared canonical correlation of each function must be examined along with the significance [241, 239]. It can be seen from Figure 204 that the first three canonical functions are significant at $p<0.05$ while the fourth canonical function is not significant. The first two canonical variates are highly significant with P=.000. In addition to the squared canonical correlation of the

canonical functions which are: 46.92%, 33.87%, 23.32% and 8.76% respectively. As such, the canonical functions that are to be interpreted are the first three canonical functions as they explain 46.92%, 33.87% and 23.32% of the variance within the variable sets. While the fourth canonical function apart from being insignificant explains just 8.76% of the variance of the variable sets which is insufficient to warrant further interpretation.

Figure 205, Figure 206 and Figure 207 shows the relationship between, within and across latent variates and variables of the respective sets. These relationships is reflected by the: 1) Pearson r showing the relationship between latent variates. 2) Canonical loading showing the relationship between a latent variate and the respective variables that linearly combine to form the latent variate. 3) Cross loading showing the relationship between a variate and the variables that are linearly combined to form the other latent variate in the pair.

The structure coefficient often referred to as Canonical loadings is indicative of the contribution of each variable to the latent variate. It shows the extent to which a variable is useful in creating and modelling the latent variate. The Canonical loadings is basically the Pearson r indicative of the correlation between a variable (observed) and it latent variate. The canonical loading is analogous to factor loadings in factor analysis and can be treated accordingly (See preceding chapters on interpretation of factor analysis) [241, 239]. For Canonical correlation as with factor loading a cut of point has to be selected, the selection of the cut of point is usually arbitrary and dependent on the judgement of the researcher and theoretical underpinnings of construct being researched.

10.2.1 First Canonical Function

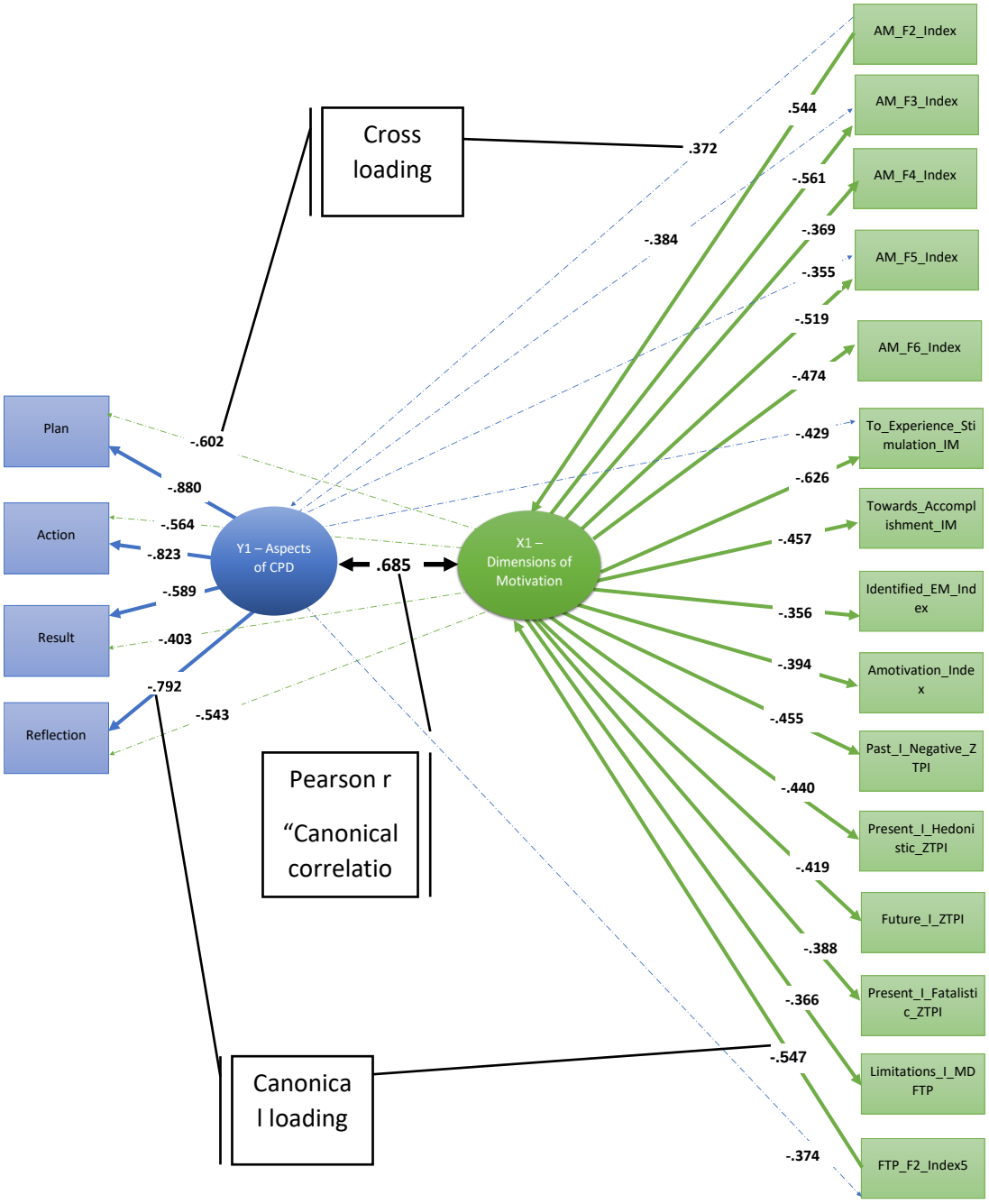


Figure 205 Diagrammatic representation of First Canonical Function

The Figure 205 is a model illustrating the First canonical Variate representative of the largest proportion of variance. The given latent variate relating to aspects of CPD for the first canonical function is denoted by Y_1, while the other canonical variate relating to motivation for the first canonical function is denoted by X_1. Figure 205 shows that the Pearson r is indictive of the extent of correlation between the Y_1 and X_1 is .685 showing a high level of correlation and a substantial

relationship. The selected cut off point for canonical and cross loadings for the first canonical function was .350.

In relation to Y_1 the variable with the highest canonical loadings is Plan variable indicative of level of engagement with plan aspect of CPD and the variable with the highest cross loading is the To_experience_stimulation_IM denotative of intrinsic motivation to experience stimulation. On the other hand in relation to Y_1 the variable with the lowest canonical loadings is Result variable indicative of level of engagement with Result aspect of CPD (although it should be noted that the loading at .589 is high nevertheless) and the variable with the lowest cross loading is the 'AM_F5_Index' denotative of 'Achievement Motivation in the context of Affinity of Challenge'. Implication of this are clear, showing that in the context of the First canonical function that explains the largest aspect of variation, Level of engagement with Plan aspect of CPD has the strongest relationship with the first latent variate associated with aspects of CPD Y_1, while level of engagement with Result aspect has the weakest relationship with said latent variable Y_1. On the other hand, among the Dimension of Motivation variables, intrinsic motivation to experience stimulation has the strongest relationship with the same latent variate Y_1, While 'AM_F5_Index' denotative of 'Achievement Motivation in the context of Affinity of Challenge' has the weakest relationship with the said latent variable/variate Y_1.

In relation to X_1 the variable with the highest canonical loadings is To_experience_stimulation_IM denotative of intrinsic motivation to experience stimulation and the variable with the highest cross loading is the Plan variable indicative of level of engagement with plan aspect of CPD. On the other hand in relation to X_1 the variable with the lowest canonical loadings is 'Identified_EM_Index' denotative of 'Identified Extrinsic motivation' and the variable with the lowest crossloading is the Result variable indicative of level of engagement with Result aspect of CPD. Implication of this are clear, showing that in the context of the First canonical function that explains the largest aspect of variation, intrinsic motivation to experience stimulation has the strongest relationship with the first latent variable/variate associated with Dimensions of Motivation X_1, while 'Identified_EM_Index' denotative of 'Identified Extrinsic motivation' has the weakest relationship with said latent variate X_1. On the other hand among the aspects of CPD, Plan variable indicative of level of engagement with plan aspect of CPD has the strongest relationship with the same latent variate X_1, While Result variable indicative of level of engagement with Result aspect of CPD has the weakest relationship with the said latent variable/ variate X_1.

10.2.2 Second Canonical Function

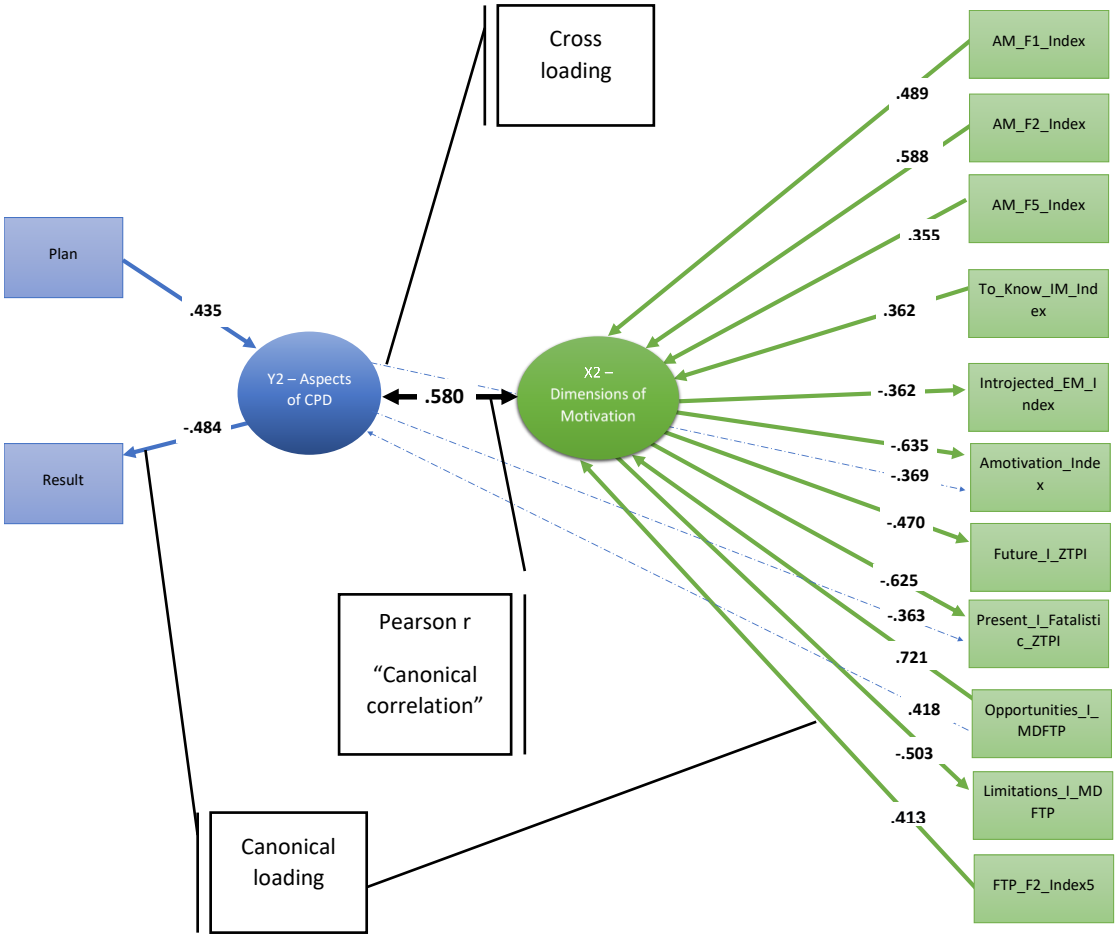


Figure 206 Diagrammatic representation of Second Canonical Function

The Figure 206 is a model illustrating the Second canonical Function representative of the second largest proportion of variance. The given latent variate relating to aspects of CPD for the second canonical function is denoted by Y_2, while the other canonical variate relating to motivation for the first canonical function is denoted by X_2. The figure shows that the Pearson r is indictive of the extent of correlation between the Y_2 and X_2 is .580 showing a high level of correlation and a substantial relationship. The selected cut off point for canonical and cross loadings for the Second canonical function was .350.

In relation to Y_2 the variable with the highest canonical loadings is Results variable indicative of level of engagement with Result aspect of CPD and the variable with the highest cross loading is the Opportunities_I_MDFTP denotative of 'Opportunities Multidimensional Time Perspective indicative of focus on future opportunities'. On the other hand the variable with the lowest canonical loadings is

plan variable indicative of level of engagement with Plan aspect of CPD (although it should be noted that the loading at .435 is high nevertheless) and the variable with the lowest cross loading is the Present_I_Fatalistic_ZTPI variable denotative of the 'Present Fatalistic Zimbardo Time Perspective indicative of a helpless and hopeless attitude towards time as a whole'. Implication of this are clear, showing that in the context of the Second canonical function that explains the second largest proportion of variation, Level of engagement with Results aspect of CPD has the strongest relationship with the second latent variable/variate associated with aspects of CPD Y_2 , while level of engagement with plan aspect has the weakest relationship with said latent variable Y_2. On the other hand, among the Dimension of Motivation variables, Opportunities Multidimensional Time Perspective indicative of focus on future opportunities has the strongest relationship with the same latent variate Y_2, While 'the Present_I_Fatalistic_ZTPI variable indicative of a helpless and hopeless attitude towards time as a whole has the weakest relationship with the said latent variable/variate Y_2 .

In relation to X_2 the variable with the highest canonical loadings is Opportunities_I_MDFTP variable denotative of 'Opportunities Multidimensional Time Perspective indicative of focus on future opportunities', On the other hand the variable with the lowest canonical loadings is 'AM_F5_Index' variable denotative of 'Achievement Motivation in the context of Affinity of Challenge'. There are no variables of aspect of CPD variables that cross load on X_2 above the stated cut off point. Implication of this are clear, showing that in the context of the Second canonical function that explains the second largest proportion of variation, Opportunities Multidimensional Time Perspective indicative of focus on future opportunities has the strongest relationship with the Second latent variate associated with Dimensions of Motivation X_2 , while Achievement Motivation in the context of Affinity of Challenge has the weakest relationship with said latent variable X_2. On the other hand, none of the Aspect of CPD variables have a relationship of note (to extent of the selected cut off point) with the said latent variate X_2.

10.2.3 Third Canonical Function

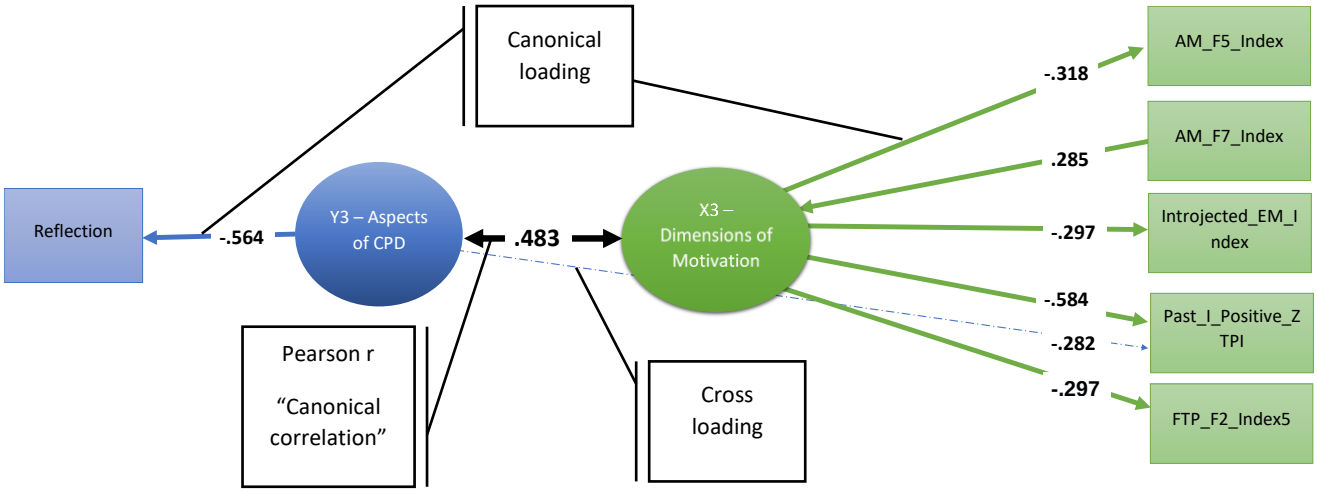


Figure 207 Diagrammatic representation of Third Canonical Function

The Figure 207 is a model illustrating the Third canonical Function representative of the proportion of variance not explained by the other preceding Canonical functions. The given latent variable/variate relating to aspects of CPD for the Third canonical function is denoted by Y_3, while the other canonical variate relating to motivation for the Third canonical function is denoted by X_3. The figure shows that the Pearson r is indictive of the extent of correlation between the Y_3 and X_3 is .483 showing a high level of correlation and a substantial relationship. The selected cut off point for canonical and cross loadings for the Second canonical function was .350 although to get a more holistic picture involving a wider number of Motivation dimensions a cut of point of .270 is explored.

In relation to Y_3 Reflection variable indicative of level of engagement with Reflection aspect of CPD is the only variable with canonical loading above the cut-off point (although it should be noted that the loading at .564 is high nevertheless). There are no variables of dimension of motivation that cross load on Y_3 above the initial stated cut off point of .350. However, if the cut off is reduced to .270 the variable Past_I_Postive_ZTPI denotative of 'Past Positive dimension of Zimbardo time Perspective implying a positive sentimental attitude to past forgone' cross loads on Y_3 with a cross loading of .282.

Implication of this are clear, showing that in the context of the third canonical function that explains the proportion of variation not explained by the other canonical functions, Level of engagement with Reflection aspect of CPD has the strongest and only relationship of note with the latent

variable/variate associated with aspects of CPD Y_3. On the other hand, among the Dimension of Motivation variables, none of the variables have a relationship at the initial cut-off point. However, when examined at a lower threshold Past_I_Postive_ZTPI denotative of 'Past Positive dimension of Zimbardo time Perspective implying a positive sentimental attitude to past forgone' has a weak relationship with the same latent variate Y_3.

In relation to X_3 the variable with the highest canonical loadings is Past_I_Postive_ZTPI denotative of 'Past Positive dimension of Zimbardo time Perspective implying a positive sentimental attitude to past forgone'. These is the only variable above the initial stated cut off point of .350. However, when a lower cut-off threshold of .270 is considered the variable with the lowest canonical loading is AM_F7_Index denotative of 'Dislike of Failure' which is indicative of 'an extent of intolerance for failure, with concerted effort to prevent failure through hard work '. There are no variables of aspect of CPD that cross load on X_3 above the stated cut off point. Implication of this are clear, showing that in the context of the third canonical function that explains the proportion of variation not explained by the other canonical functions, 'Past Positive dimension of Zimbardo time Perspective implying a positive sentimental attitude to past forgone' has the strongest relationship with the third latent variate associated with Dimensions of Motivation X_3. While on other the variable has a relationship of note at the initial cut-off threshold, when examined at a lower threshold AM_F7_Index denotative of 'Dislike of Failure' which is indicative of 'an extent of intolerance for failure, with concerted effort to prevent failure through hard work ' has the weakest relationship with the same latent variate X_3.

10.2.4 Relationship/interaction of variables in the Functions

	Variable	Function 1 (Interrelations of All Aspect of CPD)	Function 2 (Plan & Result: Negative interrelation of planning and result')	Function 3 (Interrelation of Reflection)
Given Variables Set	Reflection_F1F2_Index	**-.792**	.096	**-.564**
	Result_F1F2_Index	**-.589**	**-.484**	-.168
	Action_F1_Index	**-.823**	-.280	.253
	Plan_F1F2_Index	**-.880**	**.435**	.187
Other Variables Set	AM_F1_Index	.047	**.489**	.238
	AM_F2_Index	**.544**	**.588**	.191
	AM_F3_Index	**-.561**	.222	-.064
	AM_F4_Index	**-.369**	-.052	-.150
	AM_F5_Index	**-.519**	**.355**	-.318
	AM_F6_Index	**-.474**	.092	-.143
	AM_F7_Index	-.308	.185	.285
	To_Experience_Stimulation_IM_Index	**-.626**	.003	-.222
	Towards_Accomplishment_IM_Index	**-.457**	-.064	-.181
	To_Know_IM_Index	-.333	**.362**	-.041
	Identified_EM_Index	**-.356**	.182	-.111
	Introjected_EM_Index	-.345	**-.362**	-.297
	External_Regulation_EM_Index	-.171	-.043	-.233
	Amotivation_Index	**-.394**	**-.635**	-.107
	Past_I_Negative_ZTPI	**-.455**	-.268	.064
	Present_I_Hedonistic_ZTPI	**-.440**	-.329	-.148
	Future_I_ZTPI	**-.419**	**.470**	.181
	Past_I_Positive_ZTPI	-.155	.061	**-.584**
	Present_I_Fatalistic_ZTPI	**-.388**	**-.625**	-.103
	Opportunities_I_MDFTP	-.217	**.721**	-.163
	Limitations_I_MDFTP	**-.366**	.008	.212
	Ambiguities_I_MDFTP	-.125	**-.503**	-.072
	FTP_F1_Index5	-.318	**.413**	-.164
	FTP_F2_Index5	**-.547**	.067	-.291
	FTP_F3_Index5	.328	.209	.068

Figure 208 Canonical Loadings

Looking at the Function 1, one sees that with the exception of, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', all of the variables in the Given and other sets of variables have' Canonical loadings with the same sign, indicating that they were all positively related with exception of 'AM_F2_Index' (as shown in Figure 208). 'AM_F2_Index' was inversely related to the aspects of CPD and other Dimensions of motivation. This result elucidates on the uniquely inverse relationship of Achievement Motivation in the context of Affinity for approval and competitiveness' and makes logical sense. This is further supported by results in the next section. The results in relation to the functions were generally supportive of the theoretically expected relationships between the aspects of CPD and the motivation dimensions; especially the effects of undue affinity for approval and competitiveness on the different aspects of CPD. This is an important finding in this study. Given the nature of the interactions of the variables, the function including the fact that all aspects of CPD are relevant in the function is labelled 'Interrelation of all aspect of CPD'

Moving to Function 2, the variables of relevance in the given set Plan and Results are inversely related. Implying that there are instances in which planning is negatively related to results. This is an important finding for this study. The relevant variables of the other sets comprising of variables representative of different dimensions of motivation are negatively related to each other. The variables 1) 'AM_F1_Index' denotative of 'Achievement motivation in the context of Avoidance of Task', 2) 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', 3) AM_F5_Index denotative 'Achievement Motivation in the context of Affinity of Challenge', 4) 'To_Know_IM_Index' denotative of 'Intrinsic motivation associated with knowledge acquisition and validation', 5) 'Future ZTPI' denotative of 'Future oriented Zimbardo Time perspective indicative of a conscientious attitude towards time as a whole', 6) Opportunities_I_MDFTP denotative of 'Opportunities Multidimensional Time Perspective indicative of focus on future opportunities', and 7) 'FTP_F1_Index5' denotative of 'opened and positive Future time perspective' are negatively related to 1) 'Introjected_EM_Index' denotative of Introjected type of Extrinsic Motivation indicative of exogenous forms of motivation, 2) 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined motivation/amotivation', 3) Present_I_Fatalistic_ZTPI variable denotative of the 'Present Fatalistic Zimbardo Time Perspective indicative of a helpless and hopeless attitude towards time as a whole', and 4) Ambiguities_I_MDFTP denotative of Future as Ambiguous, indicative of the subjects focus on the uncertainty of the future.

Looking at the entire function The motivations variables 'AM_F1_Index', 'AM_F2_Index', 'AM_F5_Index', 'To_Know_IM_Index', 'Future ZTPI', 'Opportunities_I_MDFTP', and 'FTP_F1_Index5' are positively related to the 'Plan' Variable but are negatively related to the Result' Variable. While 'Introjected_EM_Index', 'Amotivation_Index', 'Present_I_Fatalistic_ZTPI', and 'Ambiguities_I_MDFTP, are positively related to 'Result' but are negatively related to 'Plan'. Given the nature of the interactions of the variables the function is labelled 'Negative interrelation of planning and result'

Moving to Function 3, it can be seen that the only aspect of CPD of relevance is the Reflection aspects of CPD and the only dimension of motivation of relevance is the Past_I_Postive_ZTPI denotative of 'Past Positive dimension of Zimbardo time Perspective implying a positive sentimental attitude to past forgone'. The variables of reflection and Past_I_Postive_ZTPI are positively related to each other. Given the nature of the interactions of the variables the function is labelled 'Interrelation of Reflection'

In conclusion, when examining the first canonical function representative of 'interrelation all aspect of CPD' the motivation variable with strongest relationship is intrinsic motivation to experience stimulation. The only negatively related variable is the 'Achievement Motivation in the context of Affinity for approval and competitiveness'. When examining second canonical function representative of the 'Negative interrelation of planning and result' the variables of relevance in the given set Plan and Results are inversely related. Implying that there are instances in which planning is negatively related to results. The motivation variable with the strongest relationship to this function is Opportunities Multidimensional Time Perspective and it has a positive relationship with Plan variable and inversely related to results. When examining the third canonical function representative of the interrelations of Reflection the variables of relevance are the Reflection aspect of CPD from the given set and past positive Zimbardo Time perspective from the Other set. Both variables are positively related to each other.

The **Error! Reference source not found.** and **Error! Reference source not found.** below show a su mmary of the results.

Wilks's λ	Accuracy/ Effect Size	Number of Canonical Functions
0.254	75.4%	3

Figure 209 Summary of Canonical Correlation

Canonical Function	F , Sig (P)	Correlation, squared canonical correlation	Latent Variable/ variate	Direct		Cross Loading	
				Strongest	Weakest	Strongest	Weakest
First	2.986, .000	.685, 46.92%	associated with Aspect of CPD - Y_1	Plan	Result	To_experience_stimulation_IM	AM_F5_Index
			Dimensions of Motivation X_1	To_experience_stimulation_IM	Identified_EM_Index	Plan	Result
Second	2.169, .000	.580, 33.87%	associated with Aspect of CPD – Y_2	Results	Plan	Opportunities_I_MDFTP	Present_I_Fatalistic_ZTPI
			Dimensions of Motivation X_2	Opportunities_I_MDFTP	AM_F5_Index		
Third	1.523, .020	.483, 23.32%	associated with Aspect of CPD – Y_3	Reflection			
			Dimensions of Motivation X_3	Past_I_Postive_ZTPI			

Figure 210 Summary of Canonical functions

10.3 Chapter Summary

In this section, the variables of Motivation computed in the previous Chapter in conjunction with the variable representative of LECPD also computed in the previous Chapter enable exploration of the relationship between the dimensions of Motivation and LECPD. The explored relationship offers valuable insight and inference about Motivation in the context of CPD, showing that some motivation variables have a significant direct or Inverse relationship with LECPD. In contrast, a few have no significant relationship. Form this, it was gleaned that the highest Level of correlation was shown by the first-order variables' To_Experience_Stimulation_IM_Index', illustrating that the Intrinsic Motivation to experience stimulation has a relatively strong relationship LECPD.

The Chapter also established the interactive network of Motivation that propels individuals to engage with said development activity. As shown in this Chapter, exploring the intricate relationship between all the identified base level variables of Motivation and engagement with CPD enables a better understanding of engagement with CPD and allows a clearer understanding of the interaction between Motivation and engagement with CPD. To this effect, canonical analysis was carried out taking into cognisance the variables representative of the aspects of CPD and dimensions of Motivation. This analysis sheds crucial light on the variables of Motivation that most effectively allow for a clear understanding of individuals' behaviour in the context of engaging with CPD. The implication of this can range from the development of bespoke approaches for individuals to change behaviour in the context of Motivation to effectively engage with Continuous Professional development, establishing a foundation on which tools and policy for evaluating and promoting engagement with CPD for institutions, universities and industry. The research objectives were achieved; objectives pertaining to Establishing the nature of the relationship between LECPD and dimension of Motivation, including associated subsets; In addition, the related hypothesis was partially confirmed. The hypothesis stating that: there is a relationship between LECPD and different dimensions of Motivation and respective associated emergent subsets of said dimensions of Motivation. The hypothesis was confirmed for all the dimensions of the Motivation (Third-order variables). In contrast, the hypothesis was confirmed for most of the associated immediate subsets of the dimensions of Motivation (Second-order variables) and the base level subset (First-order variables) .

The objective pertaining to getting a greater insight into the overall interaction of the aspect of CPD and the dimensions of Motivation was attained using relevant. The hypothesis stating that there is a

relationship between the given variable set for Level of engagement with Aspects of CPD and the other Variables set of dimensions of Motivation was confirmed. In all, 75.4% of the proportion of variance of the Level of engagement with CPD can be explained by Motivation towards engagement with CPD Information and knowledge gleaned in this Chapter would be used in further analysis and to draw meaningful inferences.

Chapter Eleven

11 Predictors of Level of Engagement with CPD and Aspects of CPD

In analysis of student motivation and engagement with Continuous Professional Development (CPD) it is important to explore which dimensions of motivation have crucial impact on the level of engagement with CPD and its respective aspects. To this effect, there is a need not only to investigate which dimensions and variables of motivation have a relationship or correlate with LECPD as was done in the preceding chapter, but to also carry out further multivariate analysis to examine which dimensions and variables of motivation effectively predict level of engagement with CPD and its respective aspects. Said Multivariate analysis in the form of multiple regression was carried out making use of variables for LECPD established in chapter 7 and variables of motivation established in Chapter 10. Regression was used to explore the effect of a set of independent variables (Predictor) on a dependent variable (criterion). In this case, the Independent Predictor variables, being the dimensions of motivation towards engagement with CPD and associated subsets, and the Criterion variable being the individual variables of LECPD and its aspects respectively.

The regression analysis is carried out using an all possible subset regression procedure, which is highly recommended by many authors but not often used because of the vigorous nature of the procedure [279, 280] . The importance and power of considering all possible regression is supported by Chatterjee and Hadi(2013) due to the fact that it provides the “maximum amount of information available” for making the decision of which model of the relationship between the predicted and predictor variable is most representative. Although at the same time Chatterjee and Hadi (2013) acknowledge that the amount of computation involved is prohibitively large stating that “Even with only six predictor variables, there are 64 (26) equations to consider; with seven variables, the number grows to 128 (27), neither feasible nor practical” [281]. Chatterjee and Hadi, position is also supported by authors such as Mendenhall & Sincich (2012) [282]

The use of this procedure is now feasible due to the simplification and automation of the procedure in the SPSS software package. In this study, the procedure is carried out using the Automatic Linear modelling function of SPSS; a method that in which SPSS automatically selects the best fit model avoiding the misuse due to its simplicity. In carrying out the procedure, SPSS carries out automatic data preparation and automatic model selection.

The chapter takes us through how the predictors of Level of engagement with CPD denoted by the aforementioned variables representative of LECPD and its respective aspects were identified among aforementioned variables representative of the different dimensions of motivations. In so doing seeking to achieve some of the major objectives of this study which are 1) to determine to what extent, if at all LECPD and its respective aspects can be predicted from motivation profile, 2) To develop a model for predicting the value of LECPD and its respective aspects using elements of individual's motivation profile, 3) To identify the most suitable model for predicting Level of engagement with CPD among the different tiers of motivation variables 4) To specify which element of motivation profile that most facilitates or affects the LECPD and its respective aspects. Showing how the hypothesis regarding the predictability of LECPD is tested, the different hypothesis are stated in their respective sections below. In all, this chapter intends not only to show that motivation and its many dimensions can be effective predictors of engagement with CPD and its respective aspects, but also establish the intricate network of levels of motivation variables that come together to propel individuals to engage with said development activity.

11.1 Predictors of Level of Engagement with CPD

In order to test the hypothesis stating that: 1) There are predictors of LECPD among first-order variables, Second-order variables and Third order variables of the identified and emergent dimensions of motivation. 2) Different dimensions of motivation have different level of effect on level of engagement with CPD 3) First-order variables are better at predicting and modelling level of engagement with CPD than Second order and Third-order variables of identified and emergent dimensions of motivation. They are tested as follows:

11.1.1 First-order predictors (Base value predictors)

Linear Regression was carried out to test the hypothesis stating that: 1) There are Predictors of LECPD among first-order variables of identified and emergent dimensions of motivation and 2) Compared to other first order dimensions of motivation, Affinity for Challenge form of Achievement motivation (AM_F5_Index) has a greater effect on LECPD.

In conducting and interpreting the results of regression one most consider the theoretical underpinnings, fit of the model, the predictive power of model, accuracy of the model, the utility of the model and the simplicity of the model. To this effect, theoretical underpinning, the information criteria, R-squared value and F-statistics of the model are taken into consideration, with F-statistics being the primary factor for model selection, variable inclusion and removal [283, 284, 285, 286, 218]. F-statistics is a statistical measure that indicates the significance of a group of variables and is a global

test for examining the utility of the overall regression model. It is a global test of all of the Beta values of the parameters in the model In Regression analysis. It is a tool for testing the utility or predictive capability of the regression model by conducting a t-test taking into cognisance all the Beta values of the variables in the model the F-statistics examines if the model is adequate to predict the dependent/predicted variable. The F-statistics is a ratio of explained and unexplained variance, if the F-statistic is found to be significant in a case where the p-value of the F-statistic is less than alpha level then the higher the value of the F-statistics the better. According to Mendenhall & Sincich (2012) " [282] SPSS automatically calculates the F-statistics and it associated p-value which is indicative of its significance as such, the calculation of the F-statistics would not be explored in more detail as this is calculated by SPSS Automatic [284, 285, 286, 282] .

Linear regression was carried out using SPSS Automatic linear modelling feature with a Forward stepwise model selection method. The forward stepwise involves adding postulated plausible predictor variables one at a time and testing if any variable should be removed and repeating the process until the end criterion is met. The traditional entry and removal criterion of F-statistics and associated P-Value is utilised in this study [287]. The entry level $\alpha < 0.5$ is selected so as to Include variables/effects with p-value less than 0.05, a removal level $\alpha > 0.1$ is selected so as to remove variable/effects with p-value greater than 0.1. In carrying out the forward step-wise regression, first-order variables across different dimensions of motivations (as shown in Figure 211) were selected as plausible dependent/predictor variables and included in the regression analysis While LECPD was the Target/dependent/Criterion variable.

	First order variable as Dependent Variables
1	AM_F1_Index
2	AM_F2_Index
3	AM_F3_Index
4	AM_F4_Index
5	AM_F5_Index
6	AM_F6_Index
7	AM_F7_Index
8	To_Experience_Stimulation_IM_Index
9	Towards_Accomplishment_IM_Index
10	To_Know_IM_Index

11	Identified_EM_Index
12	Introjected_EM_Index
13	External_Regulation_EM_Index
14	Amotivation_Index
15	Past Negative ZTPI
16	Present Hedonistic ZTPI
17	Future ZTPI
18	Past Positive ZTPI
19	Present Fatalistic ZTPI
20	Opportunities_I_MDFTP
21	Limitations_I_MDFTP
22	Ambiguities_I_MDFTP
23	FTP_F1
24	FTP_F2
25	FTP_F3

Figure 211: First order variables included in regression analysis

There are key assumptions that underlay multiple regression, the assumptions include Independence, noncollinearity homogeneity of variance, assumption of linearity and assumption of normality [282, 285]. In order to examine whether said assumptions are confirmed, the plots of residuals are examined. In Automatic linear modelling conformity to the baseline, assumptions are automatically tested and where needed the parameters are automatically transformed using appropriate techniques to ensure that they conform with these assumptions where possible [287]. Techniques in line with recommendations by Lomax & Hahs-Vaughn (2012) [285]. In this particular case of regression, the variables were automatically prepared by SPSS Trimming of outliers and replacement of missing variables. Trimming outliers is done due to the sensitivity of regression estimates to outliers, the effect of outliers on the precision of said estimates and coefficient of determination which denotes extent to which (how well) independent variables predict the dependent variable [285] . The outliers of note are presented in the Figure 212.

Record ID	LECPD Combined factors Indexed 0 to 5	Cook's Distance
235	4.58	0.085
202	2.51	0.078
71	2.80	0.044
505	4.42	0.043
234	2.42	0.031
469	3.43	0.031
241	4.58	0.027
218	5.00	0.024
225	2.56	0.023
227	4.32	0.022
201	2.96	0.022
254	4.82	0.021
503	2.60	0.021
301	1.88	0.020
232	4.97	0.020
219	2.59	0.019
212	2.08	0.019
369	2.45	0.018
48	3.16	0.018

Records with large Cook's distance values are highly influential in the model computations. Such records may distort the model accuracy.

Figure 212 LECPD First order predictors: Outliers

Automatic linear modelling will not occur if the baseline assumption is not conformed to and transformation cannot be carried out. Despite this, it is important to manually examine that the

assumption of normality is conformed with the Histogram and Q-Q plots in Figure 213 and Figure 214 shows conformation to the assumption of normality [287].

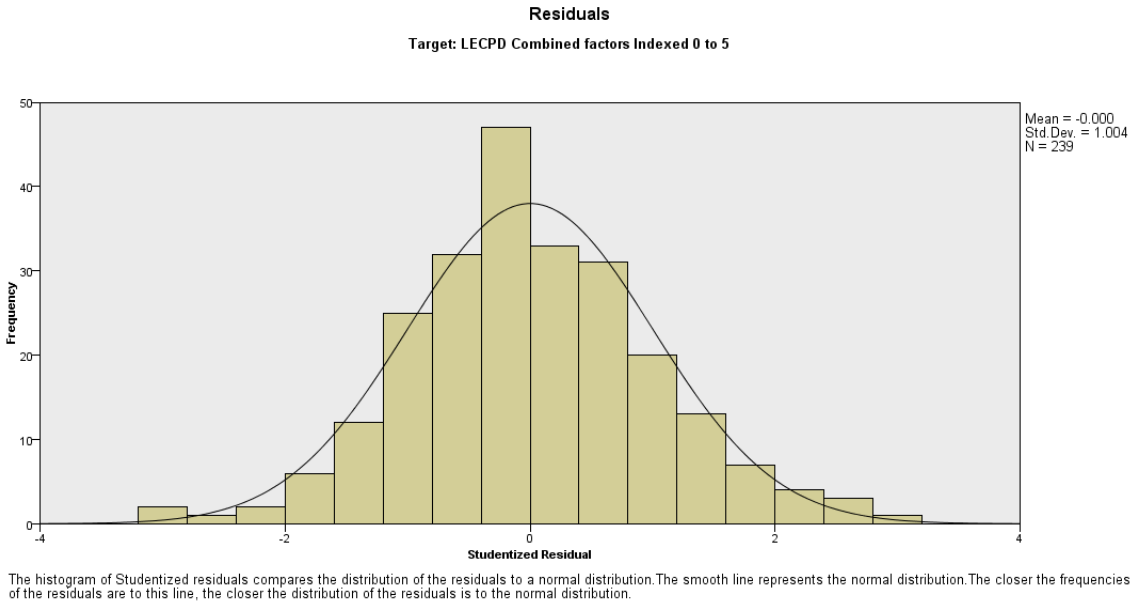


Figure 213 LECPD First order predictors: Histogram of Studentized residuals

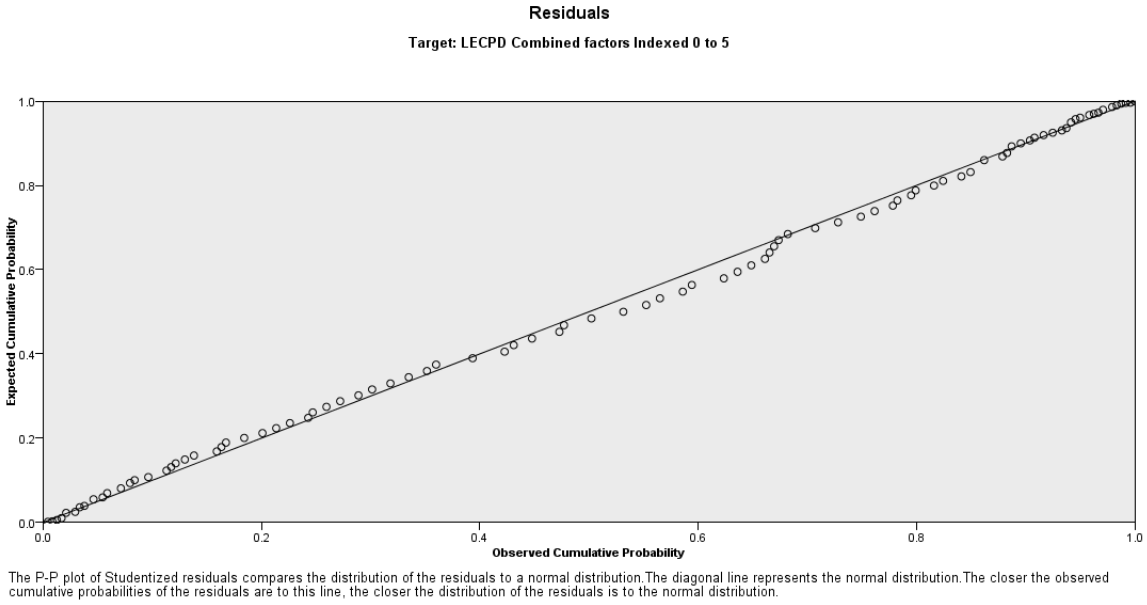


Figure 214 LECPD First order predictors: P-P plot of Studentized residuals

It can be seen from the slop of the Probability-Probability plot in Figure 214 shows that the variability of the residuals are similar to the variability of a normal distribution, implying that it meets the underlying assumption.

The forward step-wise regression yields 8 iterations of models before selecting the best model. The selection of the best fit model was principally based on the utility of the model using the F-Statistic Criterion by evaluating significance of the F-Value [285]. Nevertheless, taking into consideration the predictive power of the model using the R-squared value, and the quality of model by using Akaike information criterion (AIC) which evaluates relative quality of models on basis of the quantity of information lost by the model [288, 289, 290, 218] .

Figure 215 illustrates the different iterations of models gone through and shows that the best model in terms of a combination of the above-mentioned condition is model 8 with a F-Value = 6.779 which is a highly significant F value at α=0.05 with a p-value = .010 showing the utility of the model.

		Step							
		1	2	3	4	5	6	7	8
Significance of F Value		.000	.000	.000	.001	.014	.017	.031	.010
Effect	To_Experience_Stimulation_IM_Index_transformed	✓	✓	✓	✓	✓	✓	✓	✓
	AM_F5_Index_transformed		✓	✓	✓	✓	✓	✓	✓
	AM_F2_Index_transformed			✓	✓	✓	✓	✓	✓
	Future_I_ZTPI_transformed				✓	✓	✓	✓	✓
	FTP_F2_Index5_transformed					✓	✓	✓	✓
	Towards_Accomplishment_IM_Index_transformed						✓	✓	✓
	Amotivation_Index_transformed							✓	✓
	AM_F1_Index_transformed								✓

The model building method is Forward Stepwise using the F Statistic criterion.
A checkmark means the effect is in the model at this step.

Figure 215 LECPD Regression Analysis: Model Building/selection Summary

The selected model as shown in the Figure 216 has an AIC of -294.775 which shows a good level of information retention, the more negative the AIC the better the result [288]. An R-squared (Coefficient of determination) value 0.354 which shows a comparatively high level of predictive ability or accuracy of the model at 35.4%. The interpretation of R Squared is context specific, especially in the context of

behaviour related research where R squared equals to or greater than 10% is considered acceptable given the over determined nature of human behaviour and motivation [291, 292, 293, 294, 218].

Target	LECPD Combined factors Indexed 0 to 5
Automatic Data Preparation	On
Model Selection Method	Forward Stepwise
Information Criterion	-294.775

The information criterion is used to compare to models. Models with smaller information criterion values fit better.

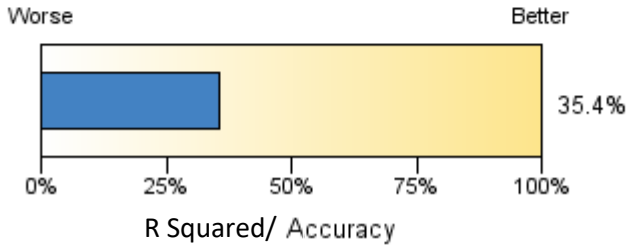


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Figure 216 Model Summary: AIC and R Squared

The predictors from selected iterations as shown Figure 215 had 8 first-order variables along the three main dimensions of motivation that are of relevant to this study. Along the Source dimension Self determined motivation: 1) 'To_Experience_Stimulation_IM_Index' denotative of Intrinsic motivation towards stimulation , 2) 'Towards_Accomplishment_IM_Index' denotative of Intrinsic motivation towards accomplishment, and 3) 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined motivation/amotivation'. Along the Intensity Dimension – achievement motivation: 4) 'AM_F1_Index' denotative of 'Achievement motivation in the context of Avoidance of Task', 5) 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', and 6) AM_F5_Index denotative 'Achievement Motivation in the context of Affinity of Challenge'. Along Time Perspective dimension: 7) 'Future ZTPI' denotative of 'Future oriented Zimbardo Time perspective' and 8) 'FTP_F2' that is denotative of 'extremely opened future time perspective'. Thus, confirming the hypothesis that

states that, there are Predictors of LECPD among first-order variable of identified and emergent dimensions of motivation.

In automatic linear model and other forms of SPSS regression analysis the importance of the predictor variables is ranked on the basis of the predictor variables sensitivity measure in relations to the criterion/predicted variable and is computed by SPSS as a normalised sensitivity. It is denotive of the reduction in variance of the predicted/criterion variable attributable to each predictor variable [287]. The level of importance is a relative value that ranges between 0 and 1 for each variable but whose sum for all the variables in the model never exceeds one [295]. Figure 217 shows the ranking of the variables in terms of importance.

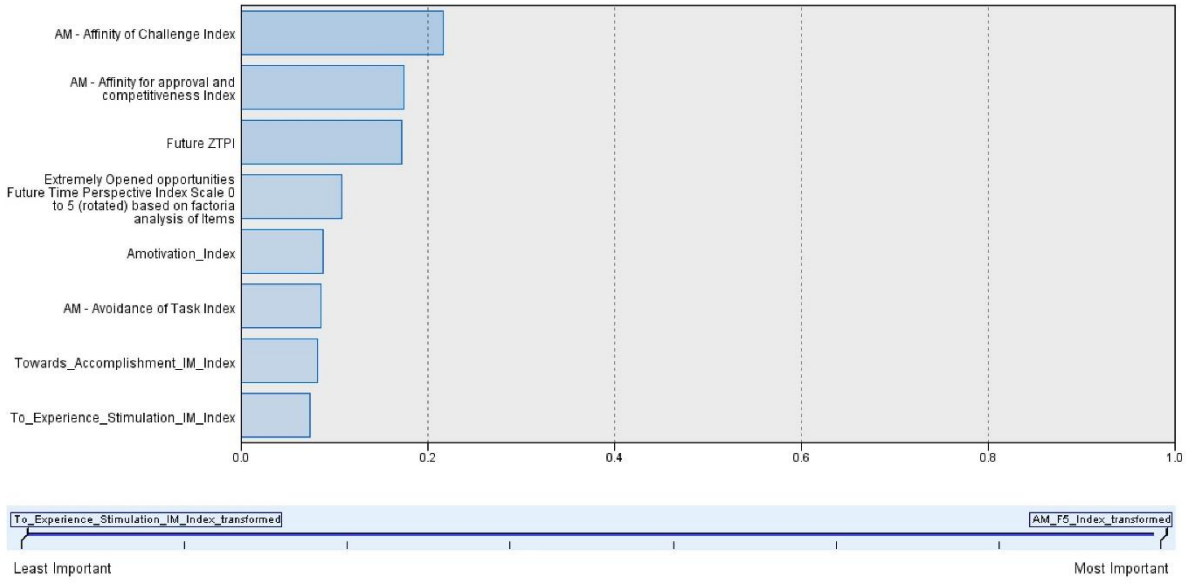

Figure 217 LECPD First order predictors: Predictors important

In terms of level of importance, the most important of the predictor variables (as shown in Figure 217) was the variable 'AM_F5_Index' denotative of Affinity of Challenge at a relative importance level of 0.216, while the least important predictor was Intrinsic motivation to experience stimulation at a relative importance level of 0.074. Showing that an individual's affinity for challenge is the most important factor in predicting/determining the extent to which the individual would engage with CPD, and has the greatest effect on the individual's level of engagement with CPD; while the individual's intrinsically motivated desire to experience stimulation is the least important factor in predicting/determining the extent to which the individual would engage with CPD and has the least

effect on the individual's level of engagement with CPD. In so doing, confirming the hypothesis that states that: 'Compared to other first order dimensions of motivation, Affinity for Challenge form of Achievement motivation (AM_F5_Index) has a greater effect on LECPD'.

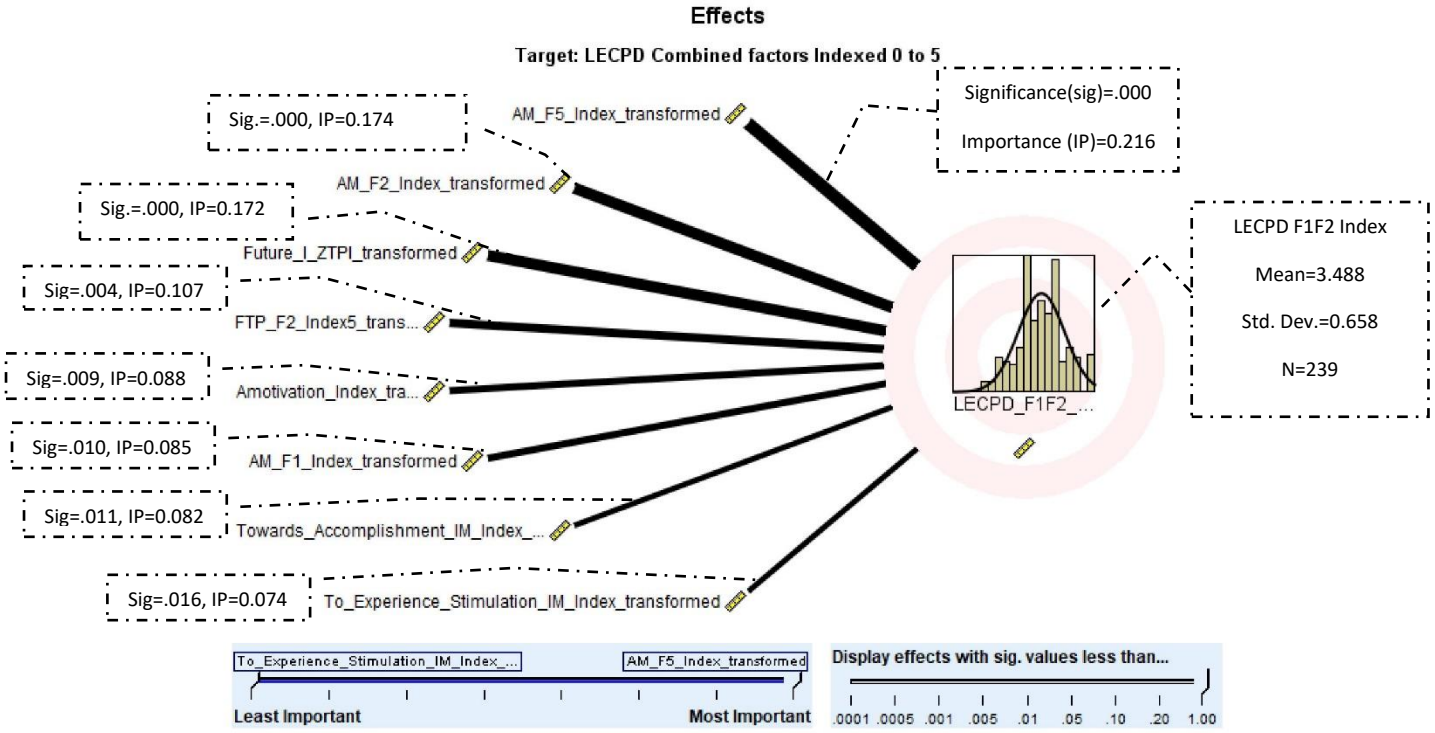

Figure 218 Illustration of regression models: Effects of Predictor variable on LECPD in descending order

Figure 218 goes further to illustrate the effect of the individual predictor variables on the level of engagement with CPD in descending order of importance. While illustrating the significance of the effect of each predictor variable employing the thickness of the lines, with thicker lines symbolising a predictor of LECPD with higher significant effect. As shown in Figure 218 all the predictor effects are significant α = 0.05 with p-value ranging between .000 to .018, but have different levels of importance in terms of effect ranging from 0.216 to 0.074.

Figure 219 on the other hand contains the results of the ANOVA further providing details of the model effects illustrated by Figure 218, including the Sum of squares indicating that the data is well represented by the model and the F – statistics indicating the utility of the model.

Source	Sum of Squares	df	Mean Square	F	Sig.	Importance
Corrected Model ▼	38.811	8	4.851	17.337	.000	
AM_F5_Index_transformed	4.812	1	4.812	17.197	.000	0.216
AM_F2_Index_transformed	3.878	1	3.878	13.858	.000	0.174
Future_I_ZTPI_transformed	3.827	1	3.827	13.675	.000	0.172
FTP_F2_Index5_transformed	2.381	1	2.381	8.510	.004	0.107
Amotivation_Index_transformed	1.964	1	1.964	7.019	.009	0.088
AM_F1_Index_transformed	1.897	1	1.897	6.779	.010	0.085
Towards_Accomplishment_IM_Index_transformed	1.834	1	1.834	6.553	.011	0.082
To_Experience_Stimulation_IM_Index_transformed	1.640	1	1.640	5.860	.016	0.074
Residual	64.360	230	0.280			
Corrected Total	103.171	238				

Figure 219 LECPD First order predictors: ANOVA table indicating the effects and nature of relationship between variables in the model

As the method of least square is a method for fitting the multiple regression models, the sum of squares and mean of squares are informative regarding the extent to which the models fits i.e. Model that best estimates, minimises or/and symbolises the entire relationship and value of the overall model. The value of the Sum of square and means of square as shown in Figure 219 is found to be adequate [282].

The global F statistic of the entire model with F-ratio= 17.337 and 8 degrees of freedom, is found to be highly significant at $\alpha = 0.05$ with p-value= .000 as shown in Figure 219. The large F-ratio indicating that a linear model is more appropriate for the data than a non-linear model. The significance of the F- statistic further implies that at least one of the coefficients for the parameters predicting LECPD in the models is non-zero, which tells us that there is at least a linear relationship between the variables in the model. Connoting that the model merits further consideration and is useful for further prediction and that the model predicts the LECPD reasonably well [282]. To further evaluate how well the model predicts the level of engagement with CPD, a plot of the predicted value of LECPD against the observed value is produced as show in Figure 220 .

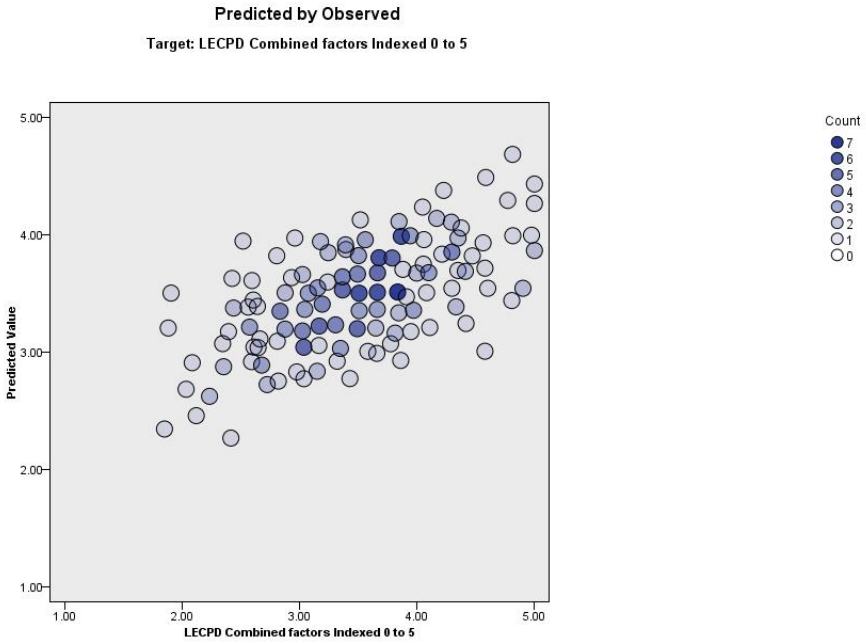

Figure 220 LECPD First order predictors: Predicted Vs observed value of LECPD

Figure 220 is a scatterplot of predicted value versus observed value of LECPD. Observed value imply the original computed value of LECPD. It can be seen from Figure 220 that a 45 degree line can be drawn through the middle of the points on the plot, which indicates that the target variable is well predicted by the model.

It can also be seen from Figure 219 that all the individual predictors with F-ratio ranging from 17.197 to 5.860 are also found to be significant at $\alpha = 0.05$ with p-value ranging from .000 to .016 (Figure 219) showing that there is a linear relationship between the Criterion variable and each of the predictor variables. Further showing that not only is the model useful in predicting the value of LECPD but that each of the parameters are useful to that effect. Figure 221 below sheds further light on the linear relationship between the individual predictor variables and LECPD.

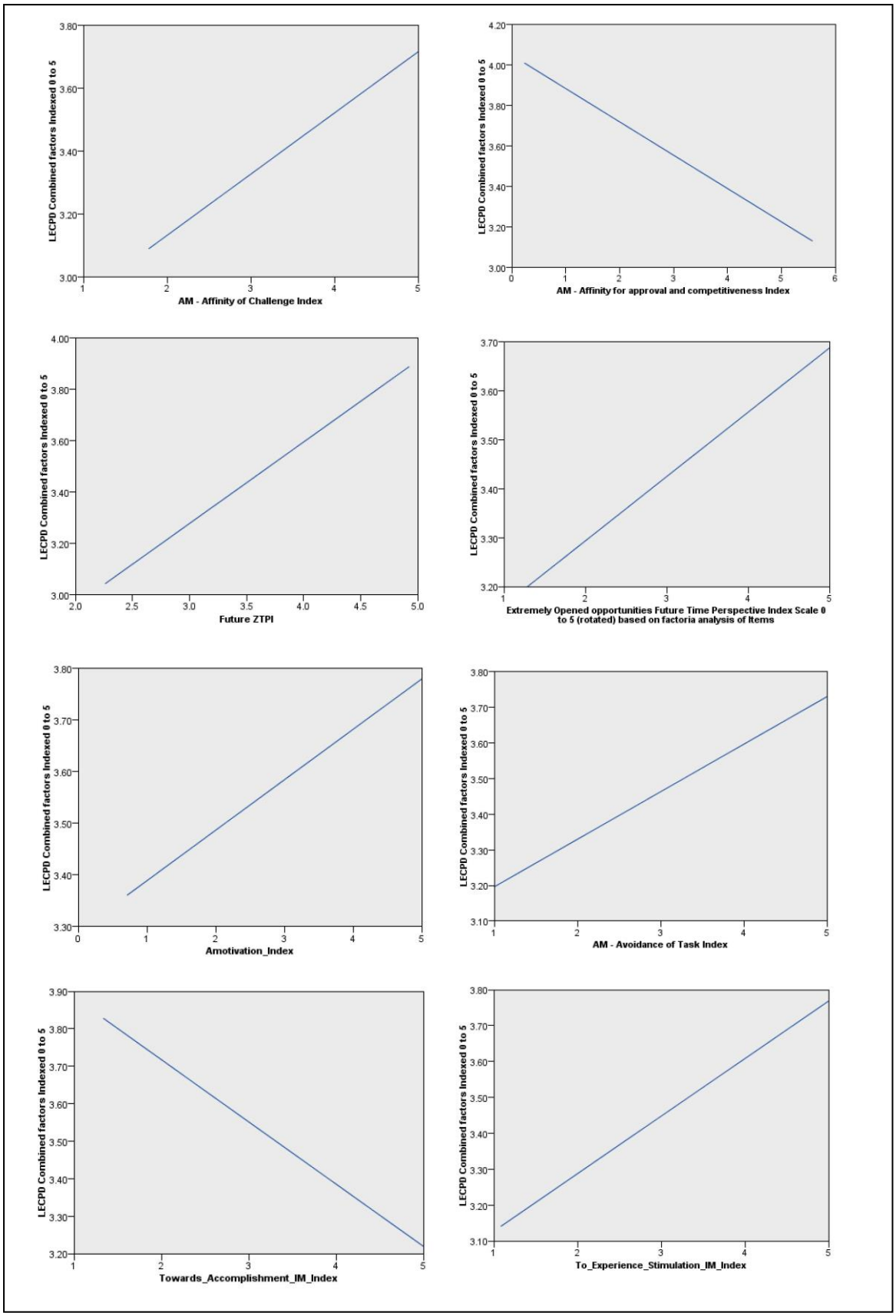

Figure 221 LECPD First order predictors: Estimate means Chart for significant effects (p< 0.5)

It can be seen from Figure 221 that in line with results from the previous Chapter, predictor variables have a direct relationship with the LECPD while some have an inverse relationship with LECPD; Indicating that some parameters positively contribute to the overall engagement with CPD while some parameters negatively contribute to the level of engagement with CPD. This is reflected in the coefficients (β) of the regression parameter as shown in Figure 222.

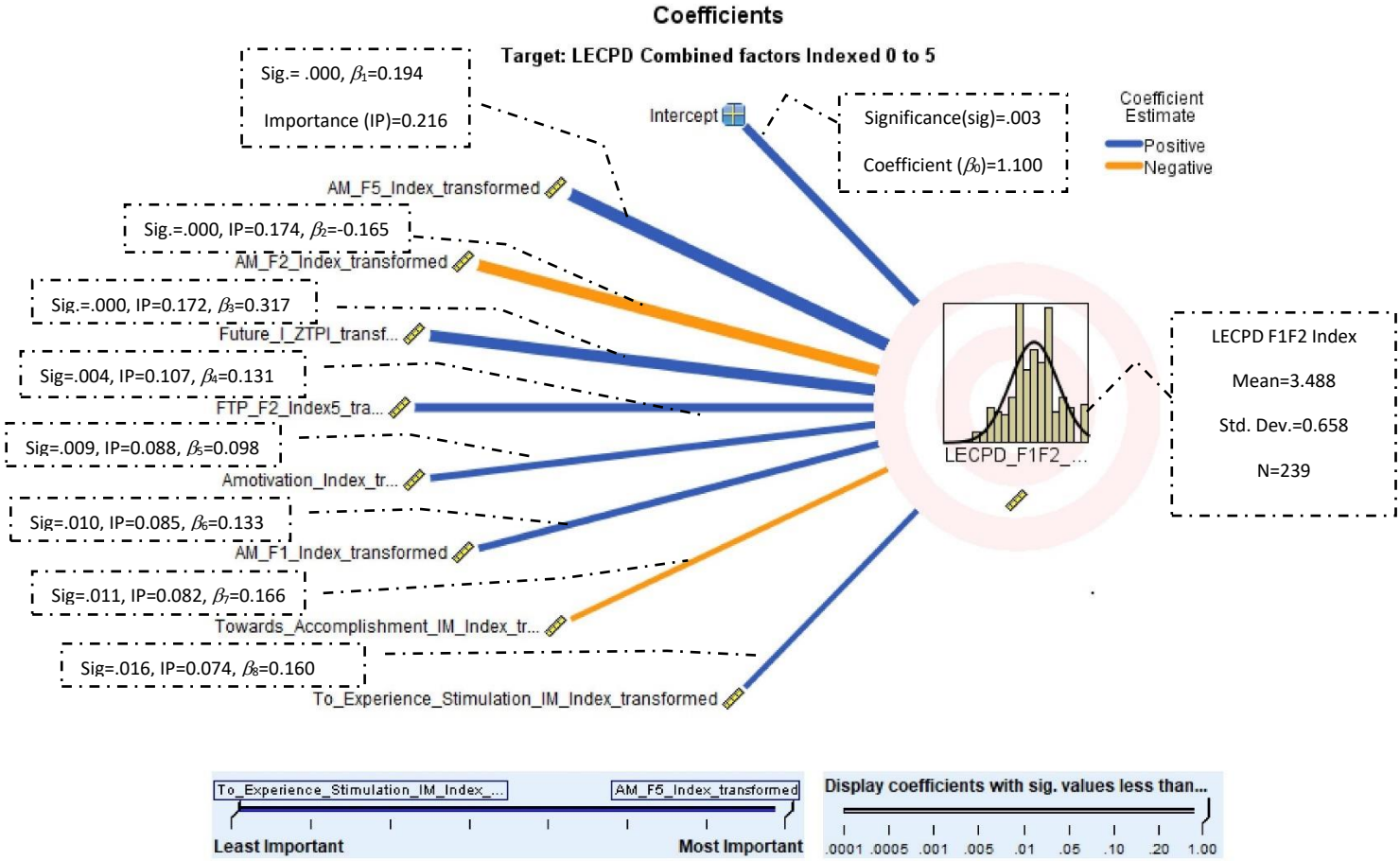

Figure 222 Illustration of regression models: the coefficients of the predictor variables including intercept

Figure 222 is a model illustrating the coefficients of the predictor variables relative to the criterion variable and to each other, as such it is a diagrammatic illustration of the model for predicting LECPD The width of the lines illustrates the level of the coefficient significance of the predictor variables while the colour indicate the sign of the coefficient in terms of its relationship with or contribution to the predicted value of the target/criterion variable LECPD i.e. direct (positive) or inverse (negative) While Figure 223 provides (ranked in order of importance) some of the information reflected in the illustration in Figure 222 such as coefficient, significance, importance of each predictor variable and

additional information such as the standard error, t statistics and confidence interval which shed more light on the nature of the predictive parameters of the model.

Model Term	Coefficient ▼	Std.Error	t	Sig.	95% Confidence Interval		Importance
					Lower	Upper	
Intercept	1.100	0.367	2.997	.003	0.377	1.824	
AM_F5_Index_transformed	0.194	0.047	4.147	.000	0.102	0.287	0.216
AM_F2_Index_transformed	-0.165	0.044	-3.723	.000	-0.252	-0.077	0.174
Future_I_ZTPI_transformed	0.317	0.086	3.698	.000	0.148	0.486	0.172
FTP_F2_Index5_transformed	0.131	0.045	2.917	.004	0.043	0.220	0.107
Amotivation_Index_transformed	0.098	0.037	2.649	.009	0.025	0.170	0.088
AM_F1_Index_transformed	0.133	0.051	2.604	.010	0.032	0.234	0.085
Towards_Accomplishment_IM_Index_transformed	-0.166	0.065	-2.560	.011	-0.294	-0.038	0.082
To_Experience_Stimulation_IM_Index_transformed	0.160	0.066	2.421	.016	0.030	0.291	0.074

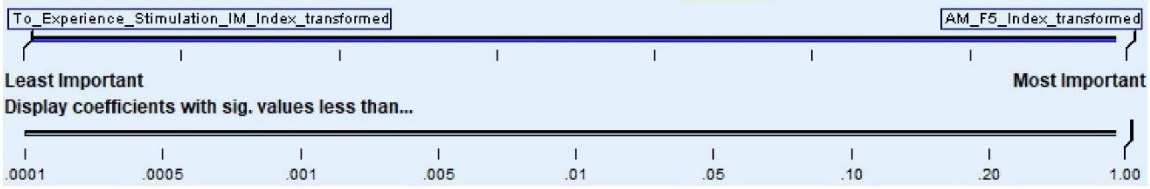

Figure 223 LECPD First order predictors: values, significance tests, and confidence intervals for the individual model coefficients

Further to the Anova table and F-statistics the coefficients tell us the extent to which each variable contributes to calculating the value of the predicted/criterion variable LECPD and the level of significance of the contribution. From Figure 222 and Figure 223 it can be seen that the contribution of all the predictor variables with coefficient range from -0.166 To 0.317 are all significant at α= 0.5 with p-value ranging from .000 to .016. It can also be seen that the variable for intrinsic motivation towards accomplishment and AM_F2_Index which denotes AM - Affinity for approval and competitiveness have a negative coefficient as such an inverse or negative contribution to the value of the predicted variable LECPD.

The General Form of the Multiple Regression Model as stipulated by Mendenhall & Sincich (2012) is shown in Equation 92 [282]

$$Y = f(x_1, x_2, \ldots x_k)$$

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k$$

where

Y is the dependent variable

$x_1, x_2, \ldots, x_k$ are the independent variables, which can be higher order variable for quantitative predictors

β_i *is the coefficient of the independent variable and* denotes the contribution of the independent variable x_i

Equation 92 General form of the multiple regression model

[282]

In line with the Equation 92 the equation that denotes the regression model for prediction of LECPD on the basis of First-order dimension of motivation is as shown in Equation 93. All components of this equation are significant as shown in Figure 223.

$$Y = f(X_{F1}, X_{F2}, X_{F3}, X_{F4}, X_{F5}, X_{F6}, X_{F7}, X_{F8})$$

$$Y = 1.100 + 0.194X_{F1} - 0.165X_{F2} + 0.317X_{F3} + 0.131X_{F4} + 0.098X_{F5} + 0.133X_{F6} - 0.166X_{F7} + 0.160X_8$$

Where

Y is the dependent variable= LECPD Combined

$X_{F1}, X_{F2}, X_{F3}, X_{F4}, X_{F5}, X_{F6}, X_{F7}, X_{F8}$ are the independent variables

X_{F1} ='AM_F5_Index' denotative 'Achievement Motivation in the context of Affinity of Challenge'

X_{F2}= 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness'

X_{F3}= 'Future ZTPI' denotative of 'Future oriented Zimbardo Time perspective'

X_{F4}= 'FTP_F2' that is denotative of 'extremely opened future time perspective'

X_{F5}= 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined

Equation 93 LECPD First-order Predictors: Multiple regression model

11.1.2 Second-order predictors

Linear Regression was carried out to test the hypothesis stating that: 1) There are Predictors of LECPD among Second-order variables of identified and emergent dimensions of motivation and 2) Compared to other Second order dimensions of motivation, 'Achievement motivation in the context of a concerted effort' (AMSUB_F1_Index) has a greater effect on LECPD.

Linear regression was carried out using SPSS Automatic linear modelling feature with a Forward stepwise model selection method. The entry and removal criteria were on the bases of F Statistics, including variables/effects with p-value less than 0.05 and removing variable/effects with p-value greater than 0.1.

In carrying out the forward stepwise regression, Second-order variables across different dimensions of motivations (as shown in Figure 224) were selected as possible dependent/predictor variables and included in the regression analysis While LECPD was the Target/dependent/Criterion variable.

	First order variable as Dependent Variables
1	AMSUB_F1_Index
2	AMSUB_F2_Index
3	SDM_F1_Index_5
4	SDM_F2_Index_5
5	ZTP_F1
6	ZTP_F2
7	MDFTP_F2_Index
8	MDFTP_F1_Index
9	Focus_on_Limitations_FTP
10	Focus_on_Opportunities_FTP

Figure 224: LECPD Second order variables included in regression analysis

In this particular case of regression, the variables were automatically prepared by SPSS Trimming of outliers and replacement of missing variables. The outliers of note are presented in the Figure 225.

Record ID	LECPD Combined factors Indexed 0 to 5	Cook's Distance
288	4.97	0.088
83	2.80	0.071
291	4.58	0.063
257	2.51	0.056
276	5.00	0.036
281	2.56	0.033
507	3.70	0.031
204	4.31	0.031
462	2.45	0.030
256	2.96	0.029
268	2.08	0.027
275	2.59	0.024
237	5.00	0.024
196	4.11	0.022
169	2.83	0.021
194	1.85	0.020
297	4.58	0.019
273	3.43	0.018
114	2.03	0.018

Records with large Cook's distance values are highly influential in the model computations. Such records may distort the model accuracy.

Figure 225 LECPD Second order variables: Outliers

It is important to examine that the assumption of normality is conformed with the Histogram and Q-Q plots in Figure 226 and Figure 227 shows conformation to the assumption of normality [287].

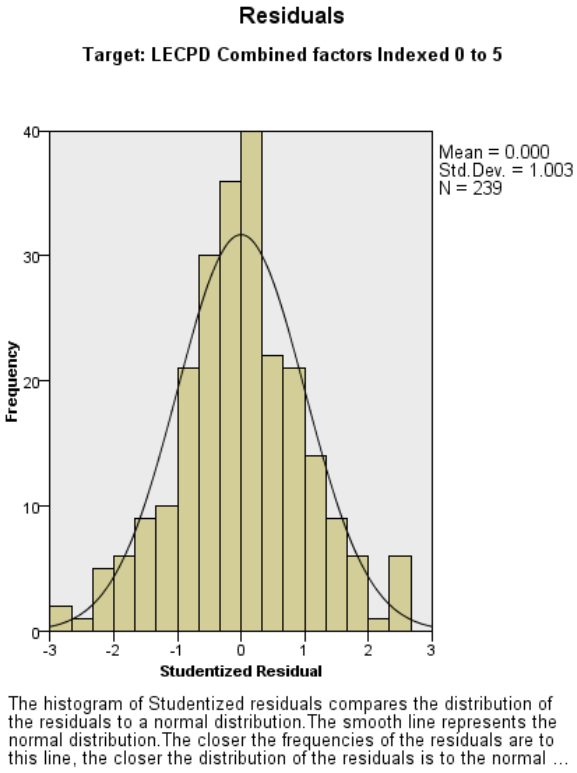

Figure 226 LECPD Regression Second order predictors: Histogram of Studentized residuals

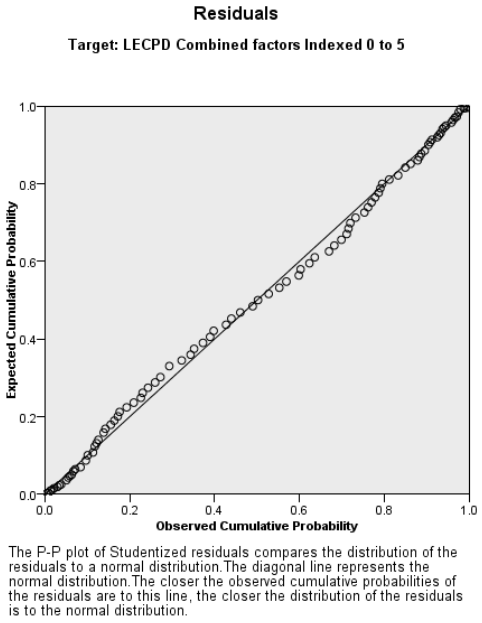

Figure 227 LECPD Second order predictors: P-P plot of Studentized residuals

It can be seen from the slop of the probability-Probability plot in Figure 227 shows that the variability of the residuals are similar to the variability of a normal distribution, implying that it meets the underlaying assumption.

The forward stepwise regression yields 4 iterations of models before selecting the best model. The selection of models was principally based on the utility of the model using the F-Statistic Criterion by evaluating significance of the F-Value [285]. Nevertheless, taking into consideration the predictive power of the model using the R-squared value, and the quality of model by using Akaike information criterion (AIC) which evaluates relative quality of models on basis of the quantity of information lost by the model [288, 289, 290, 218] .

Figure 228 illustrates the different iterations of models gone through and shows that the best model in terms of a combination of the above-mentioned condition is model 4 with a F-Value = 4.653 which is a significant F value at α=0.05 with a p-value = .032 showing the utility of the model.

		Step			
		1	2	3	4
Significance of F Value		.000	.000	.003	.032
Effect	AMSUB_F1_Index_transformed	✓	✓	✓	✓
	SDM_F2_Index_5_transformed		✓	✓	✓
	Focus_on_Opportunities_FTP_Index_transformed			✓	✓
	ZTP_F2_Index_transformed				✓

The model building method is Forward Stepwise using the F Statistic criterion.
A checkmark means the effect is in the model at this step.

Figure 228 LECPD Second order predictors: Model Building/selection Summary

The selected model as shown in the Figure 229 has an AIC of -275.501 which shows a good level of information retention, the more negative the AIC the better the result [288]. An R-squared (Coefficient of determination) value 0.287 which shows a comparatively high level of predictive ability or accuracy of the model at 28.7%. The interpretation of R Squared is context specific, especially in the context of

behaviour related research where R squared equals to or greater than 10% is considered acceptable given the over determined nature of human behaviour and motivation [291, 292, 293, 294, 218].

Target	LECPD Combined factors Indexed 0 to 5
Automatic Data Preparation	On
Model Selection Method	Forward Stepwise
Information Criterion	-275.501

The information criterion is used to compare to models. Models with smaller information criterion values fit better.

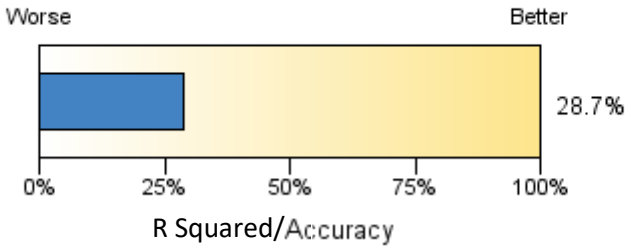

Figure 229 LECPD Second order predictors Model Summary: AIC and R Squared

The predictors from selected iteration as shown Figure 228 had 4 Second-order variables along the three main dimensions of motivation that are of relevant to this study. Along the Source dimension Self determined motivation: 1) SDM_F2_Index_5 which denotes 'Extent of Measurability/Amotivation'. Along the Intensity Dimension – achievement motivation: 2) AMSUB_F1_Index which denotes 'Achievement motivation in the context concerted effort'. Along Time Perspective dimension: 3) 'Focus_on_Opportunities_FTP_Index' denotative of Future Time Perspective Focused on Opportunities' and 4) 'ZTP_F2' which denotes 'Positive dimensions of Zimbardo time perspective'. Thus, confirming the hypothesis that states that, there are Predictors of LECPD among Second-order variables of identified and emergent dimensions of motivation.

The level of importance is a relative value that ranges between 0 and 1 for each variable but whose sum for all the variables in the model never exceeds one [295]. Figure 230 shows the ranking of the variables in terms of importance.

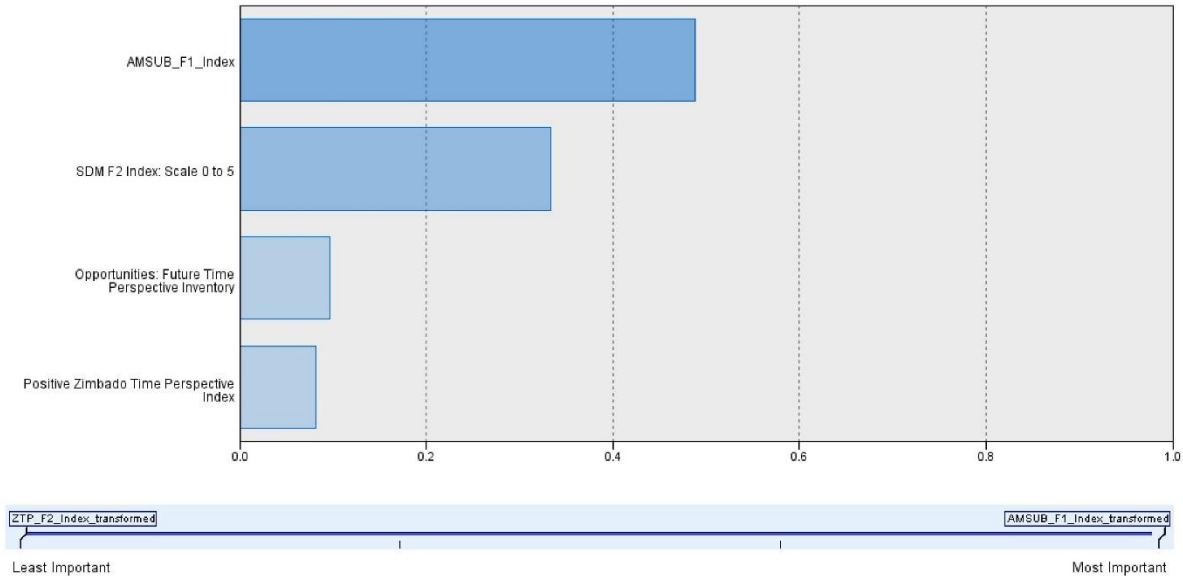

Figure 230 LECPD Second order predictors: Predictors important

In terms of level of importance, the most important of the predictor variables (as shown in Figure 230) was the variable AMSUB_F1_Index which denotes 'Achievement motivation in the context of concerted effort' at an relative importance level of 0.49 while the least important predictor was 'ZTP_F2' which denotes 'Positive dimensions of Zimbardo time perspective' at a relative importance level of 0.08. Showing that an individual's Achievement motivation in the context of a concerted effort is the most important factor in predicting/determining the extent to which the individual would engage with CPD, has the greatest effect on the individual's level of engagement with CPD. While the individual's positively oriented Zimbardo Time Perspective is the least important factor in predicting/determining the extent to which the individual would engage with CPD and has the least effect on the individual's level of engagement with CPD. In so doing, confirming the hypothesis that states that; compared to other Second order dimensions of motivation, 'Achievement motivation in the context concerted effort' (AMSUB_F1_Index) has a greater effect on LECPD.

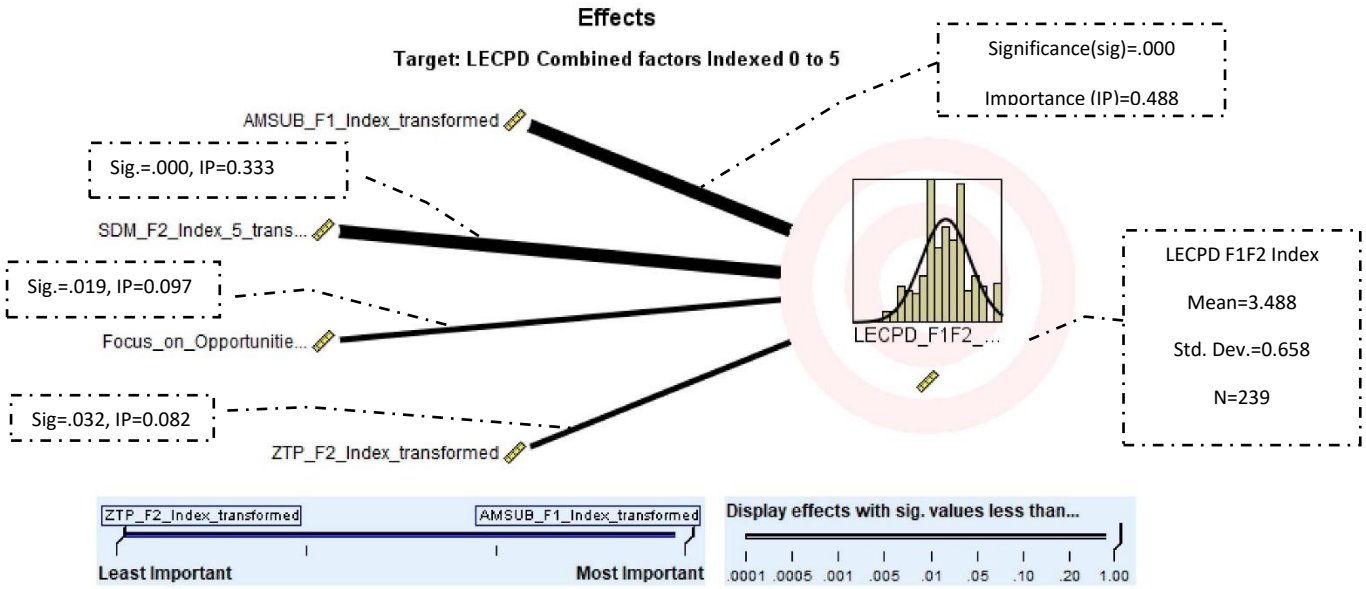

Figure 231 LECPD Second-order predictor: Effects of Predictor variable on LECPD in descending order

Figure 231 goes further to illustrate the effect of the individual predictor variables on the level of engagement with CPD in descending order of importance. While illustrating the effect significance of each predictor variable employing the thickness of the lines, with thicker lines symbolising a predictor of LECPD with higher significant effect. As shown in Figure 218 all the predictor effects are significant $\alpha = 0.05$ with p-value ranging between .000 to .032, but have varying level of importance in terms of effect ranging from 0.488 to 0.082.

Figure 232 on the other hand contains the results of the ANOVA further providing details of the model effects illustrated by Figure 231, including the Sum of squares indicating that the data is well represented by the model and the F – statistics connoting the utility of the model. The value of the Sum of square and means of square as shown in Figure 232 is found to be adequate [282].

Source	Sum of Squares	df	Mean Square	F	Sig.	Importance
Corrected Model ▼	30.871	4	7.718	24.979	.000	
AMSUB_F1_Index_transformed	8.612	1	8.612	27.874	.000	0.488
SDM_F2_Index_5_transformed	5.875	1	5.875	19.014	.000	0.333
Focus_on_Opportunities_FTP_Index_transformed	1.710	1	1.710	5.536	.019	0.097
ZTP_F2_Index_transformed	1.438	1	1.438	4.653	.032	0.082
Residual	72.300	234	0.309			
Corrected Total	103.171	238				

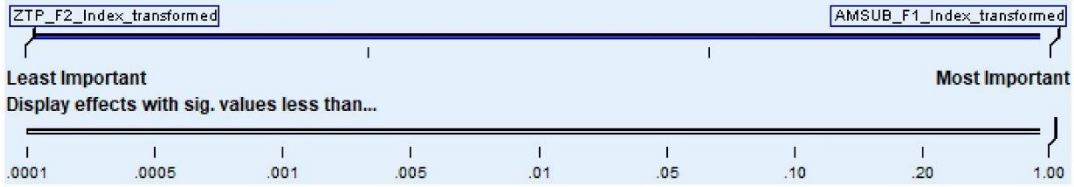

Figure 232 LECPD Second order predictors: ANOVA table indicating the effects and nature of relationship between variables in the model

The global F statistic of the entire model with F-ratio 24.979 and 4 degrees of freedom, is found to be highly significant at α = 0.05 with p-value= .000 as shown in Figure 232. The large F-ratio indicating that a linear model is more appropriate for the data than a non-linear model. The significance of the F- statistic further implies that at least one of the coefficients for the parameters predicting LECPD in the models is non-zero, which tells us that there is at least a linear relationship between the variables in the model. Connoting that the model merits further consideration and is useful for further prediction and that the model predicts the LECPD reasonably well [282]. To further evaluate how well the model predicts the level of engagement with CPD, a plot of the predicted value of LECPD against the observed value is produced as show in Figure 233 .

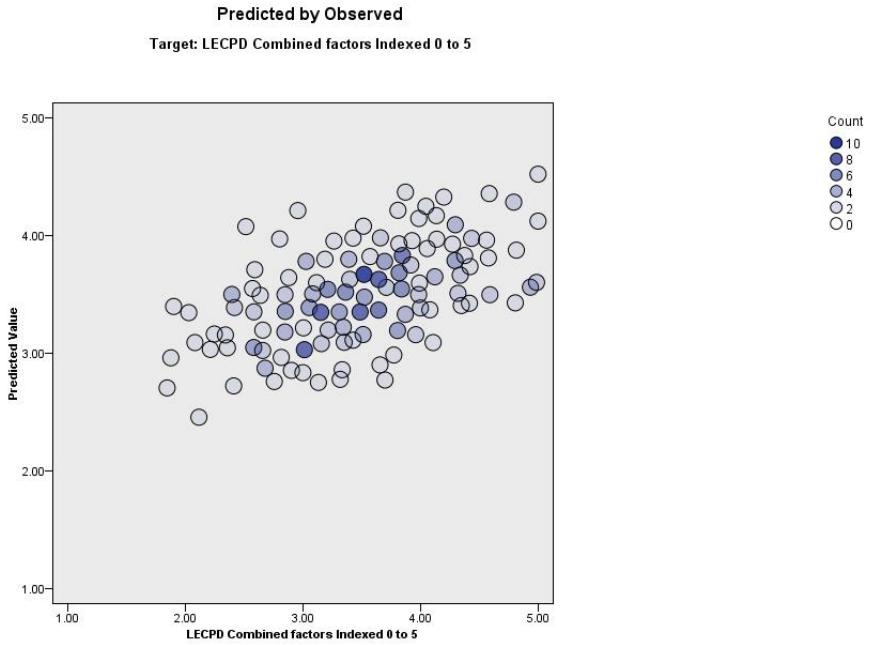

Figure 233 LECPD Second order predictors: Predicted Vs observed value of LECPD

Figure 233 is a scatterplot of predicted value versus observed value of LECPD. Observed value implies the original computed value of LECPD. It can be seen from Figure 233 that a line close to 45 degrees can be drawn through the middle of the points on the plot, which indicates that the target variable is well predicted by the model.

It can also be seen from Figure 232 that all the individual predictors with F-ratio ranging from 27.874 to 4.653 are also found to be significant at $\alpha = 0.05$ with p-value ranging from .000 to .032 (Figure 232) showing that there is a linear relationship between the Criterion variable and each of the predictor variables. Further showing that not only is the model useful in predicting the value of LECPD but that each of the parameters are useful to that effect. Figure 234 below sheds further light on the linear relationship between the individual predictor variables and LECPD.

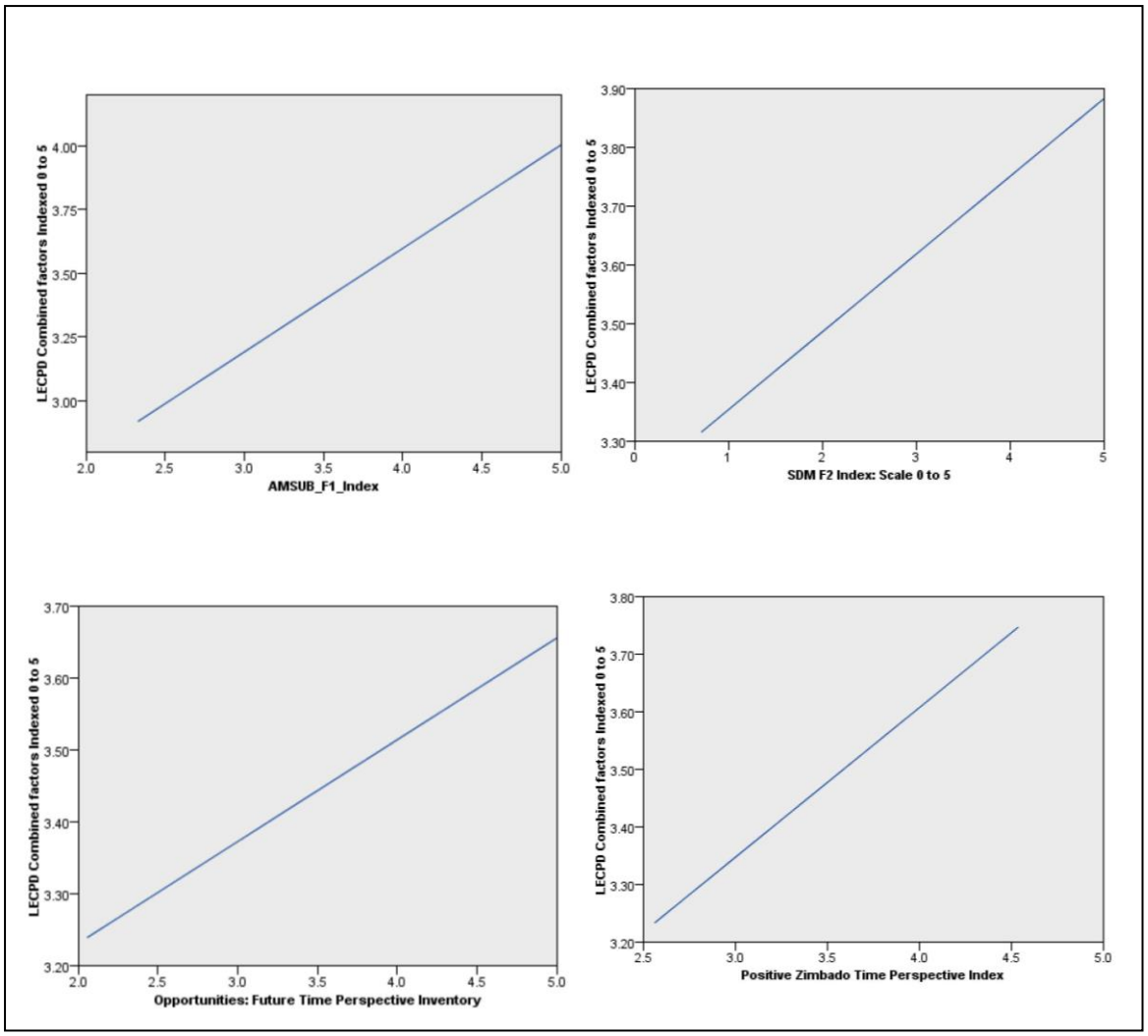

Figure 234 LECPD Second order predictors: Estimate means Chart for significant effects (p< 0.5)

It can be seen from Figure 234 that in line with results from the previous Chapter, all of the predictor variables have a direct relationship with the LECPD; Indicating that all parameters will positively contribute to the overall engagement with CPD. This is reflected in the coefficients (β) of the regression parameter as shown in Figure 235.

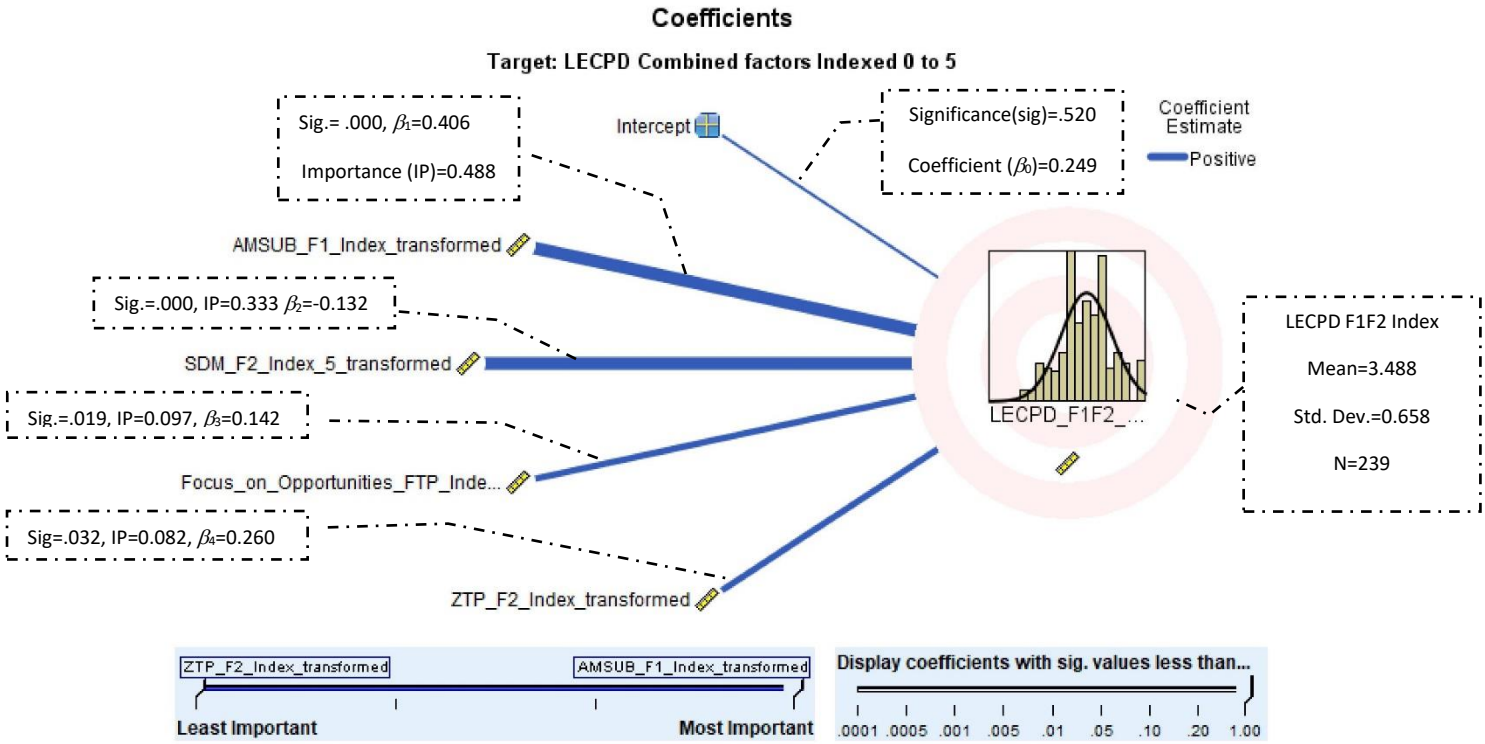

Figure 235 LECPD Second Order Predictors: the coefficients of the predictor variables including intercept

Figure 235 is a model illustrating the coefficients of the predictor variables relative to the criterion variable and to eachother; as such it is a diagrammatic illustration of the model for predicting LECPD. The width of the lines illustrates the level of the coefficient significance of the predictor variables while the colour indicates the sign of the coefficient in terms of its relationship with or contribution to the predicted value of the target/criterion variable LECPD i.e. direct (positive) or inverse (negative) While Figure 236 provides (ranked in order of importance) some of the information reflected in the illustration in Figure 235, such as coefficient, significance, importance of each predictor variable and additional information such as the standard error, t statistics and confidence interval which shed more light on the nature of the predictive parameters of the model.

Coefficients

Target: LECPD Combined factors Indexed 0 to 5

Model Term	Coefficient ▼	Std.Error	t	Sig.	95% Confidence Interval		Importance
					Lower	Upper	
Intercept	0.249	0.386	0.644	.520	-0.512	1.009	
AMSUB_F1_Index_transformed	0.406	0.077	5.280	.000	0.254	0.557	0.488
SDM_F2_Index_5_transformed	0.132	0.030	4.361	.000	0.072	0.192	0.333
Focus_on_Opportunities_FTP_Index_transformed	0.142	0.060	2.353	.019	0.023	0.260	0.097
ZTP_F2_Index_transformed	0.260	0.120	2.157	.032	0.023	0.497	0.082

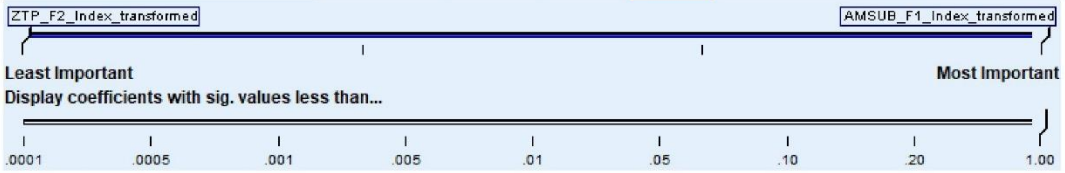

Figure 236 LECPD Second order predictors: values, significance tests, and confidence intervals for the individual model coefficients

Further to the Anova table and F-statistics the coefficients tell us the extent to which each variable contributes to calculating the value of the predicted/criterion variable LECPD and the level of significance of the contribution. From Figure 235 and Figure 236 it can be seen that the contribution of all the predictor variables (except for the Intercept) with coefficients ranging from 0.132To 0.406 are all significant at α= 0.5 with p-value ranging from .000 to .032. The Intercept with p-value = .520 is not significant at α= 0.05, although the intercept is not significant it has to be taken into consideration when calculating the value of the LECPD using the deterministic model. It can also be seen that the variable for AMSUB_F1_Index denotative of 'Achievement motivation in the context concerted effort' which has the greatest effect on LECPD is not only the most important predictor of level of engagement (IP=0.488) with CPD among the second-order variables, but is also makes the largest contribution when calculating the deterministic value of level of engagement. As AMSUB_F1_Index has the highest coefficients (β_2=0.406, P-value=.000) of all the predictors of Level of engagement with CPD.

In line with the Equation 92the equation that denotes the regression model for prediction of LECPD on the basis of Second-order dimension of motivation is as shown in Equation 94, the version of this equation that contains only significant effects or coefficients is as shown in Equation 95. Depending

on the context of use, equations representative of regression models are used with or without insignificant components as such both, are presented:

$$Y = f(X_{S1}, X_{S2}, X_{S3}, X_{S4})$$

$$Y = 0.249 + 0.406X_{S1} + 0.132X_{S2} + 0.142X_{S3} + 0.260X_{S4}$$

where

Y is the dependent variable= LECPD Combined

$X_{S1}, X_{S2}, X_{S3}, X_{S4}, X_{S5}, X_{S6}, X_{S7}, X_{S8}$ are the independent variables

X_{S1} = AMSUB_F1_Index which denotes 'Achievement motivation in the context concerted effort'

X_{S2}= SDM_F2_Index_5 which denotes 'Extent of Measurability/Amotivation'

X_{S3}= 'Focus_on_Opportunities_FTP_Index' denotative of Future Time

Equation 94 LECPD Second-order predictors: Multiple regression model including Predictors with non-significant effects

$$Y = f(X_{S1}, X_{S2}, X_{S3}, X_{S4})$$

$$Y = 0.406X_{S1} + 0.132X_{S2} + 0.142X_{S3} + 0.260X_{S4}$$

where

Y is the dependent variable= LECPD Combined

$X_{S1}, X_{S2}, X_{S3}, X_{S4}, X_{S5}, X_{S6}, X_{S7}, X_{S8}$ are the independent variables

X_{S1} = AMSUB_F1_Index which denotes 'Achievement motivation in the context concerted effort'

X_{S2}= SDM_F2_Index_5 which denotes 'Extent of Measurability/Amotivation'

X_{S3}= 'Focus_on_Opportunities_FTP_Index' denotative of Future Time

Equation 95 LECPD Second-order predictors: Multiple regression Deterministic model for only predictors with significant effects

11.1.3 Third-order Predictors (Collective Value Predictor)

Linear Regression was carried out to test the hypothesis stating that: 1) There are Predictors of LECPD among Third-order variables of identified and emergent dimensions of motivation and 2) Compared to other Third order dimensions of motivation, Resultant Achievement motivation (AMSUB_F1F2_Index) has a greater effect on LECPD.

Linear regression was carried out using SPSS Automatic linear modelling feature with a Forward stepwise model selection method. The entry and removal criteria were on the bases of F Statistics, including variables/effects with p-value less than 0.05 and removing variable/effects with p-value greater than 0.1.

In carrying out the forward stepwise regression Third-order variables across different dimensions of motivations (as shown in Figure 237) were selected as possible dependent/predictor variables and included in the regression analysis, While LECPD was the Target/dependent/Criterion variable.

	First order variable as Dependent Variables
1	AMSUB_F1F2_Index
2	SDM_Direct_Autonomy_Index5
3	ZTP_F1F2_Index
4	MDFTP_F1F2_Index
5	FTP_SUB_Index

Figure 237: LECPD Third order variables included in regression analysis

In this case of regression, the variables were automatically prepared by SPSS Trimming outliers and replacing of missing variables. The outliers of note are presented in the Figure 238.

Record ID	LECPD Combined factors Indexed 0 to 5	Cook's Distance
288	4.97	0.115
83	2.80	0.049
507	3.70	0.042
256	2.96	0.037
257	2.51	0.036
281	2.56	0.030
276	5.00	0.028
169	2.83	0.027
273	3.43	0.024
194	1.85	0.022
111	2.34	0.019
363	1.88	0.018
275	2.59	0.018

Records with large Cook's distance values are highly influential in the model computations. Such records may distort the model accuracy.

Figure 238 LECPD Third order variables: Outliers

It is important to examine that the assumption of normality is conformed with, the Histogram and Q-Q plots in Figure 239 and Figure 240 shows conformation to the assumption of normality [287].

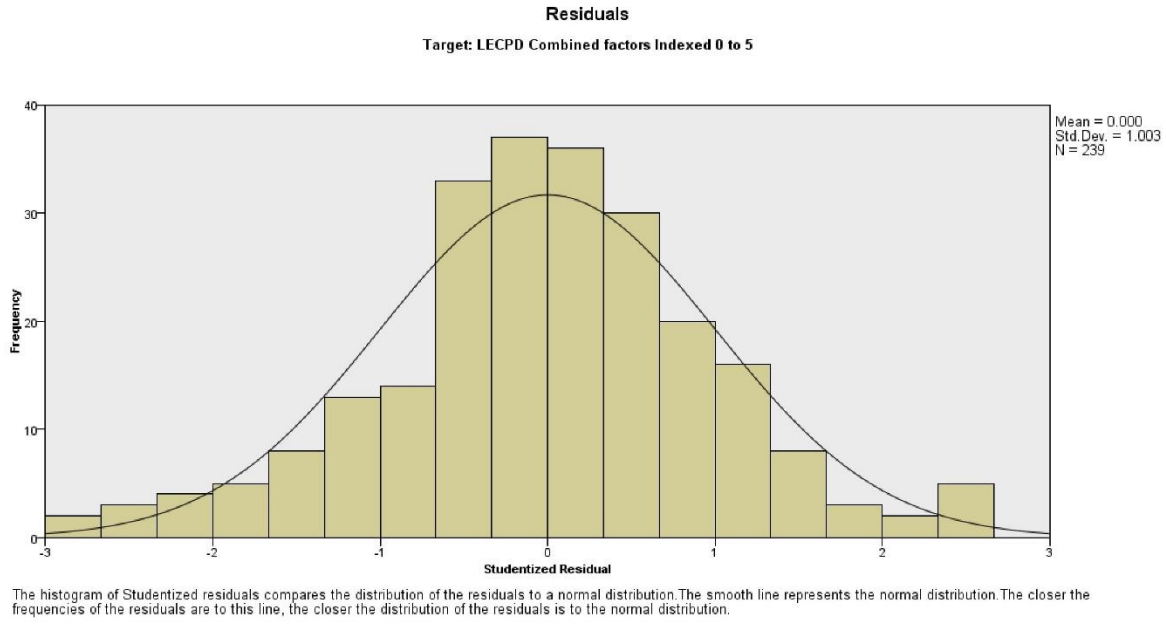

Figure 239 LECPD Regression Third order predictors: Histogram of Studentized residuals

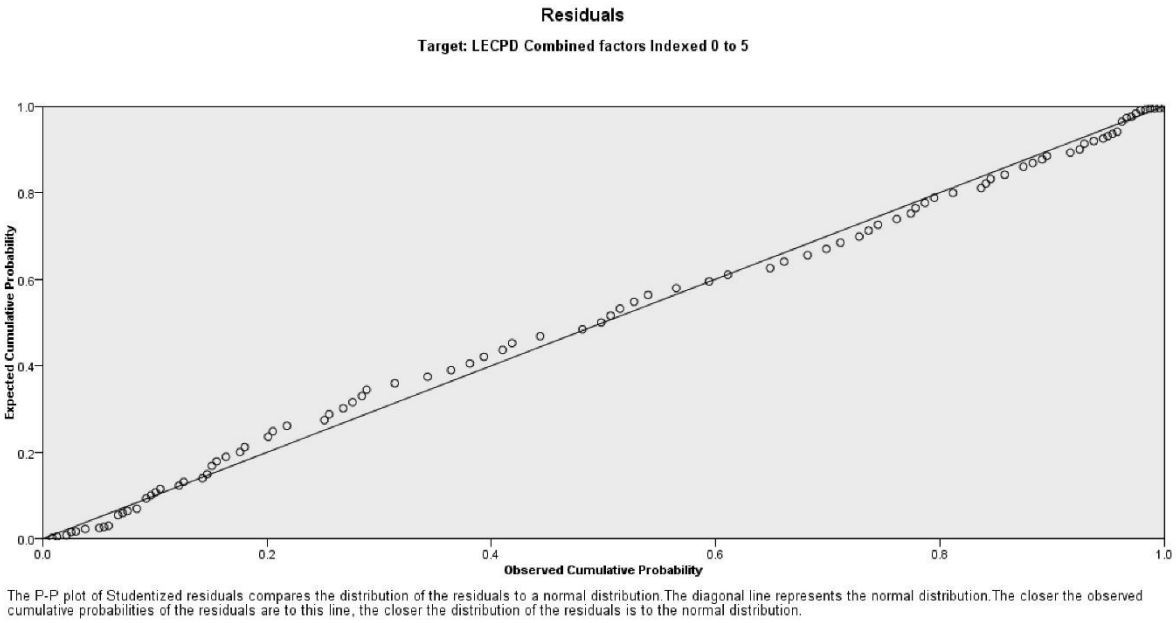

Figure 240 LECPD Third order predictors: P-P plot of Studentized residuals

It can be seen from the slop of the probability-Probability plot in Figure 240 shows that the variability of the residuals are similar to the variability of a normal distribution, implying that it meets the underlying assumption.

The forward step wise regression yields 3 iterations of models before selecting the best model. The selection of the best fit model was principally based on the utility of the model using the F-Statistic Criterion by evaluating significance of the F-Value [285]. Nevertheless, taking into consideration the predictive power of the model using the R-squared value, and the quality of model by using Akaike information criterion (AIC) which evaluates relative quality of models on basis of the quantity of information lost by the model [288, 289, 290, 218] .

Figure 241 illustrates the different iterations of models gone through and shows that the best model in terms of a combination of the above-mentioned condition is model 3 with a F-Value = 6.582 which is a highly significant F value at α=0.05 with a p-value = .011 showing the utility of the model.

		Step		
		1	2	3
Significance of F Value		.000	.000	.011
Effect	AMSUB_F1F2_Index_transformed	✓	✓	✓
	ZTP_F1F2_Index_transformed		✓	✓
	FTP_SUB_Index_transformed			✓

The model building method is Forward Stepwise using the F Statistic criterion.
A checkmark means the effect is in the model at this step.

Figure 241 LECPD Third order predictors: Model Building/selection Summary

The selected model as shown in the Figure 242 has an AIC of -270.005 which shows a good level of information retention, the more negative the AIC the better the result [288]. An R-squared (Coefficient of determination) value 0.267 which shows a comparatively high level of predictive ability or accuracy of the model at 26.7%. The interpretation of R Squared is context specific, especially in the context of behaviour related research where R squared equals to or greater than 10% is considered acceptable given the over determined nature of human behaviour and motivation [291, 292, 293, 294, 218].

Model Summary

Target	LECPD Combined factors Indexed 0 to 5
Automatic Data Preparation	On
Model Selection Method	Forward Stepwise
Information Criterion	-270.005

The information criterion is used to compare to models. Models with smaller information criterion values fit better.

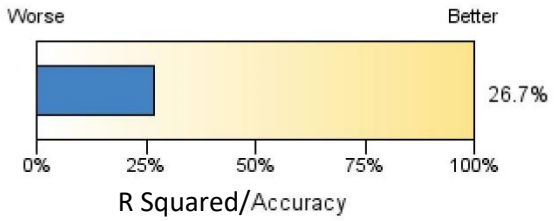

Figure 242 LECPD Third order predictors Model Summary: AIC and R Squared

The predictors from selected iterations as shown Figure 241 had 3 Third-order variables along the two out of the three main dimensions of motivation that are of relevant to this study; along the source dimension; along the Intensity Dimension – achievement motivation: 1) AMSUB_F1F2_Index which denotes 'Overall Level of Achievement Motivation'; along Time Perspective dimension: 2) ZTP_F1F2 which denotes 'Zimbardo Time Perspective Combined Value' indicative of the overall resultant of Zimbardo Time Perspective 3) FTP_SUB denotative of 'Combined value of Future Time Perspective using Factor analysis Index (Based on rotated)'. Thus, confirming the hypothesis that states that, there are Predictors of LECPD among Third-order variables of identified and emergent dimensions of motivation.

The level of importance is a relative value that ranges between 0 and 1 for each variable but whose sum for all the variables in the model never exceeds one [295]. Figure 243 shows the ranking of the variables in terms of importance.

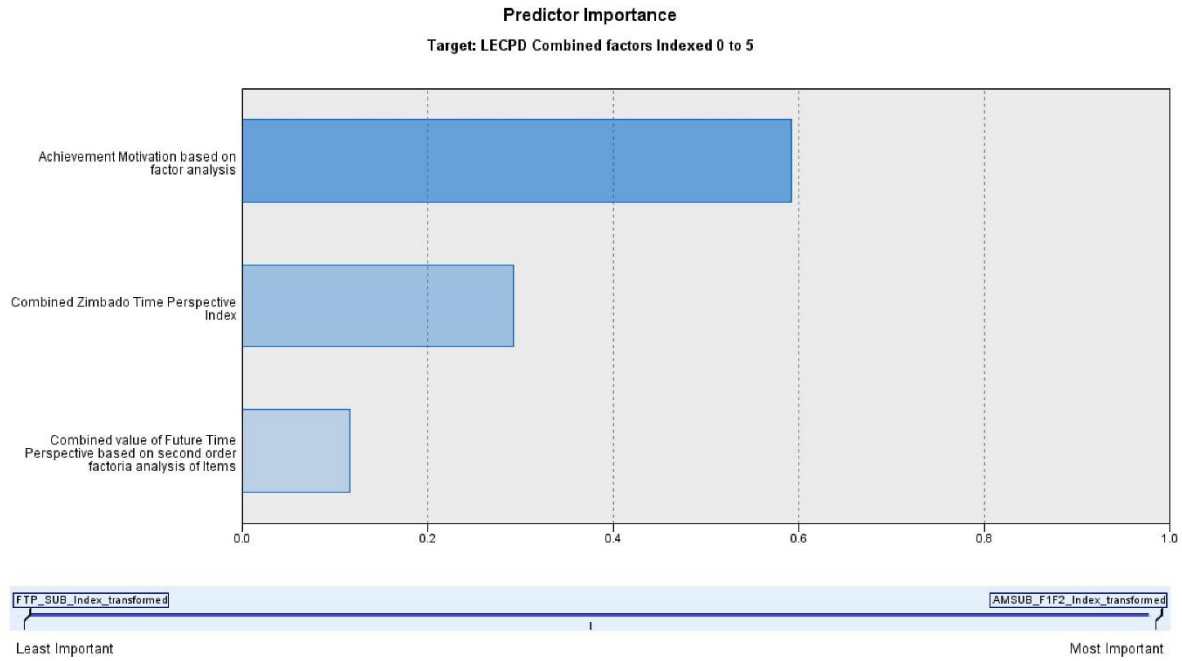

Figure 243 LECPD Third order predictors: Predictors important

In terms of level of importance, the most important of the predictor variables (as shown in Figure 243) was the variable representative of the AMSUB_F1F2_Index which denotes 'Overall Level of Achievement Motivation' at an relative importance level of 0.59 while the least important predictor was FTP_SUB denotative of 'Combined value of Future Time Perspective using Factor analysis Index (Based on rotated)' at a relative importance level of 0.12. Showing that an individual's Overall Level of Achievement Motivation is the most important factor in predicting/determining the extent to which the individual would engage with CPD, has the greatest effect on the individual's Level of engagement with CPD. While the individual's overall Future Time Perspective FTP is the least important factor in predicting/determining the extent to which the individual would engage with CPD and has the least effect on the individual's Level of engagement with CPD. In so doing confirming the hypothesis that states that, compared to other Third order dimensions of motivation, AMSUB_F1F2_Index which denotes 'Overall Level of Achievement Motivation' has a greater effect on LECPD.

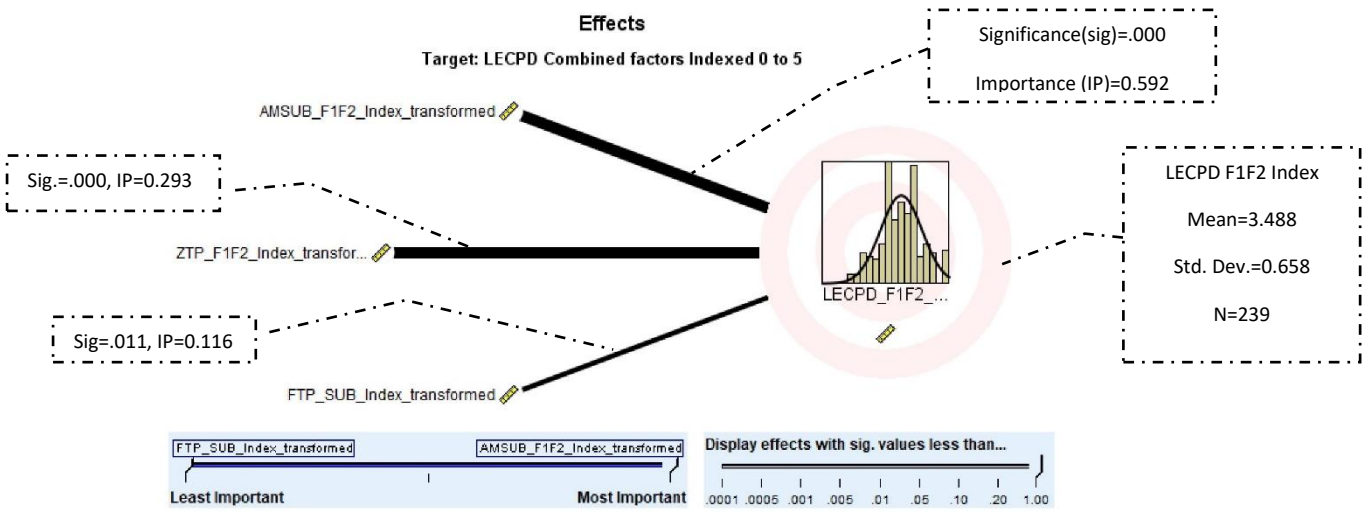

Figure 244 LECPD Third-order predictor: Effects of Predictor variable on LECPD in descending order

Figure 244 goes further to illustrate the effect of the individual predictor variables on the level of engagement with CPD in descending order of importance. While illustrating the effect significance of each predictor variable employing the thickness of the lines, with thicker lines symbolising a predictor of LECPD with higher significant effect. As shown in Figure 244 all the predictor effects are significant $\alpha = 0.05$ with p-value ranging between .000 to .011, but have varying level of importance in terms of effect ranging from 0.592 to 0.116.

Figure 245 on the other hand contains the results of the ANOVA further providing details of the model effects illustrated by Figure 244, including the Sum of squares indicating that the data is well represented by the model and the F – statistics connotating the utility of the model. The value of the Sum of square and means of square as shown in Figure 245 is found to be adequate [282].

Effects

Target: LECPD Combined factors Indexed 0 to 5

Source	Sum of Squares	df	Mean Square	F	Sig.	Importance
Corrected Model ▼	28.541	3	9.514	29.957	.000	
AMSUB_F1F2_Index_transformed	10.701	1	10.701	33.695	.000	0.592
ZTP_F1F2_Index_transformed	5.291	1	5.291	16.661	.000	0.293
FTP_SUB_Index_transformed	2.090	1	2.090	6.582	.011	0.116
Residual	74.630	235	0.318			
Corrected Total	103.171	238				

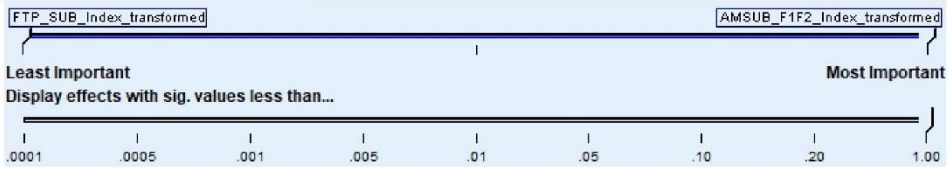

Figure 245 LECPD Third-order predictors: ANOVA table indicating the effects and nature of relationship between variables in the model

The global F statistic of the entire model with F-ratio 29.957 with 3 degrees of freedom, is found to be highly significant at α = 0.05 with p-value= .000 as shown in Figure 245. The large F-ratio indicating that a linear model is more appropriate for the data than a non-linear model. The significance of the F-statistics further implies that at least one of the coefficients for the parameters predicting LECPD in the models is non-zero, which tells us that there is at least a linear relationship between the variables in the model. Connoting that the model merits further consideration and is useful for further prediction and that the model predicts the LECPD reasonably well [282]. To further evaluate how well the model predicts the level of engagement with CPD, a plot of the predicted value of LECPD against the observed value is produced as show in Figure 246 .

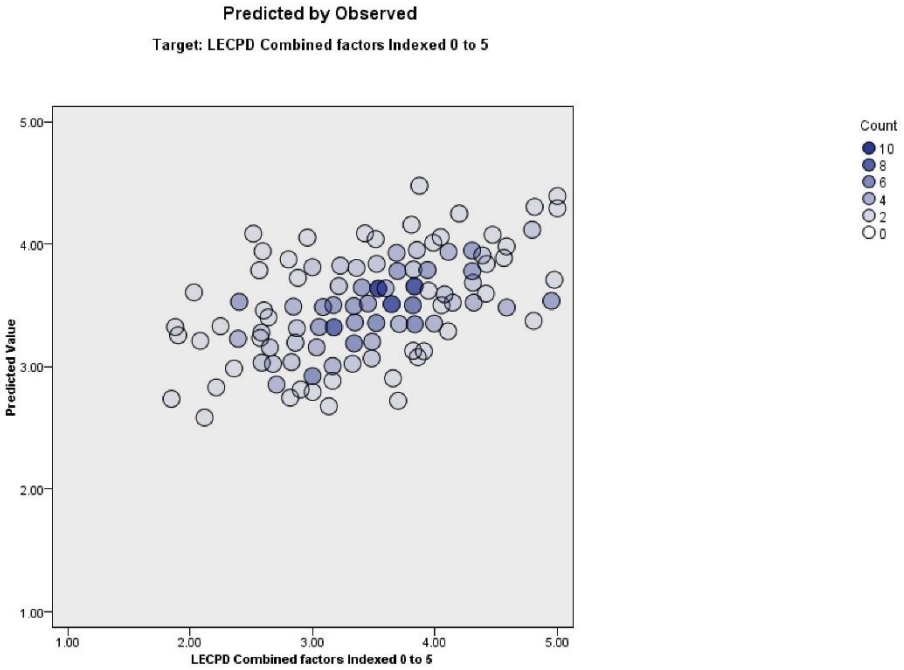

Figure 246 LECPD Third-order predictors: Predicted Vs observed value of LECPD

Figure 246 is a scatterplot of predicted value versus observed value of LECPD. Observed value implies the original computed value of LECPD. It can be seen from Figure 246 that a line close to 45 degrees can be drawn through the middle of the points on the plot, which indicates that the target variable is well predicted by the model.

It can also be seen from Figure 245 that all the individual predictors with F-ratio ranging from 33.695 to 6.852 are also found to be significant at $\alpha = 0.05$ with p-value ranging from .000 to .011 (Figure 245) showing that there is a linear relationship between the Criterion variable and each of the predictor variables. Further showing that not only is the model useful in predicting the value of LECPD but that each of the parameters are useful to that effect. Figure 247 below sheds further light on the linear relationship between the individual predictor variables and LECPD.

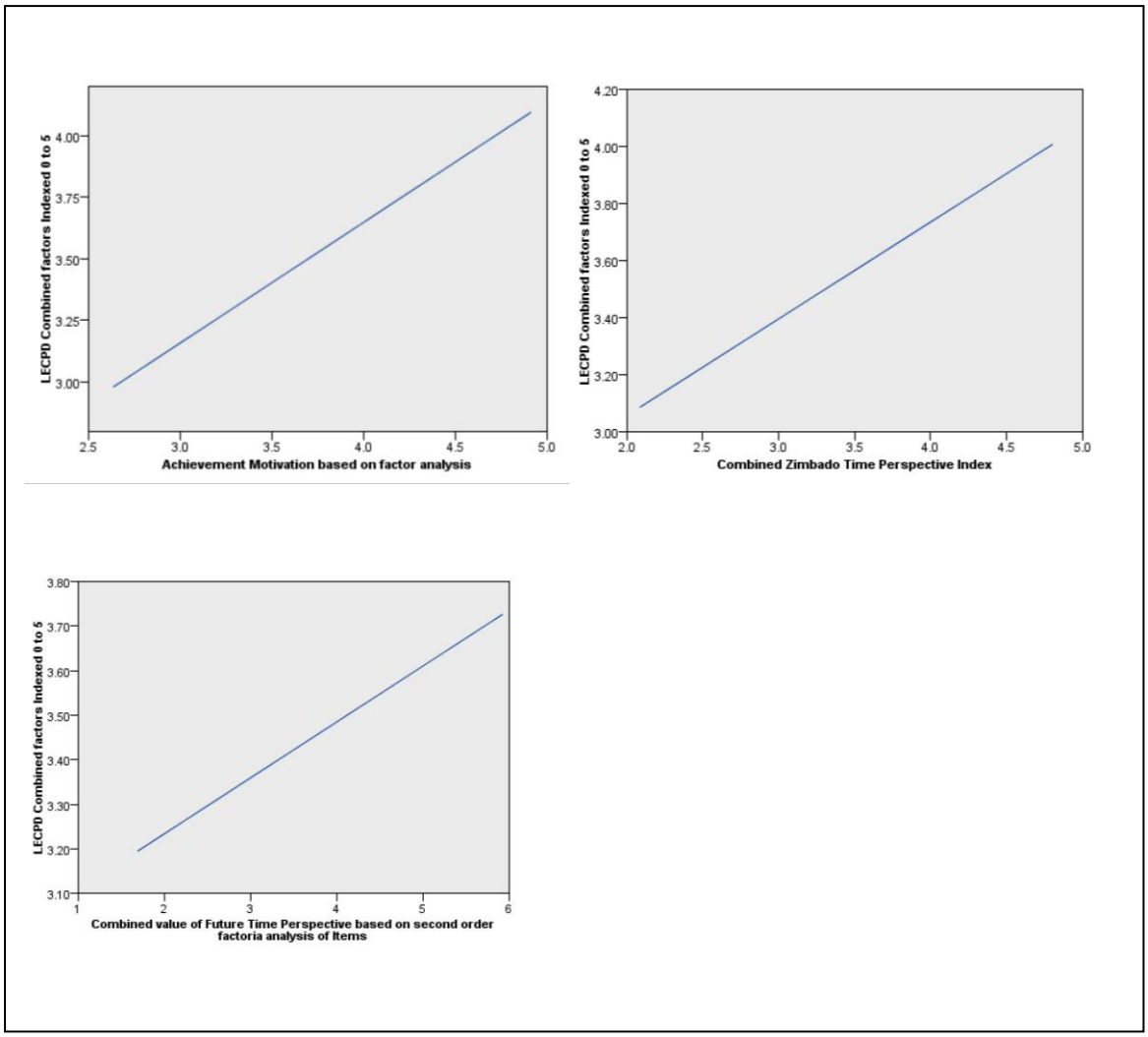

Figure 247 LECPD Third Order predictors: Estimate means Chart for significant effects (p< 0.5)

It can be seen from Figure 247 that in line with results from the previous Chapter all of the predictor variables have a direct relationship with the LECPD; Indicating that all parameters will positively contribute to the overall engagement with CPD. This is bound to be reflected in the coefficients (β) of the regression parameter as shown in Figure 248.

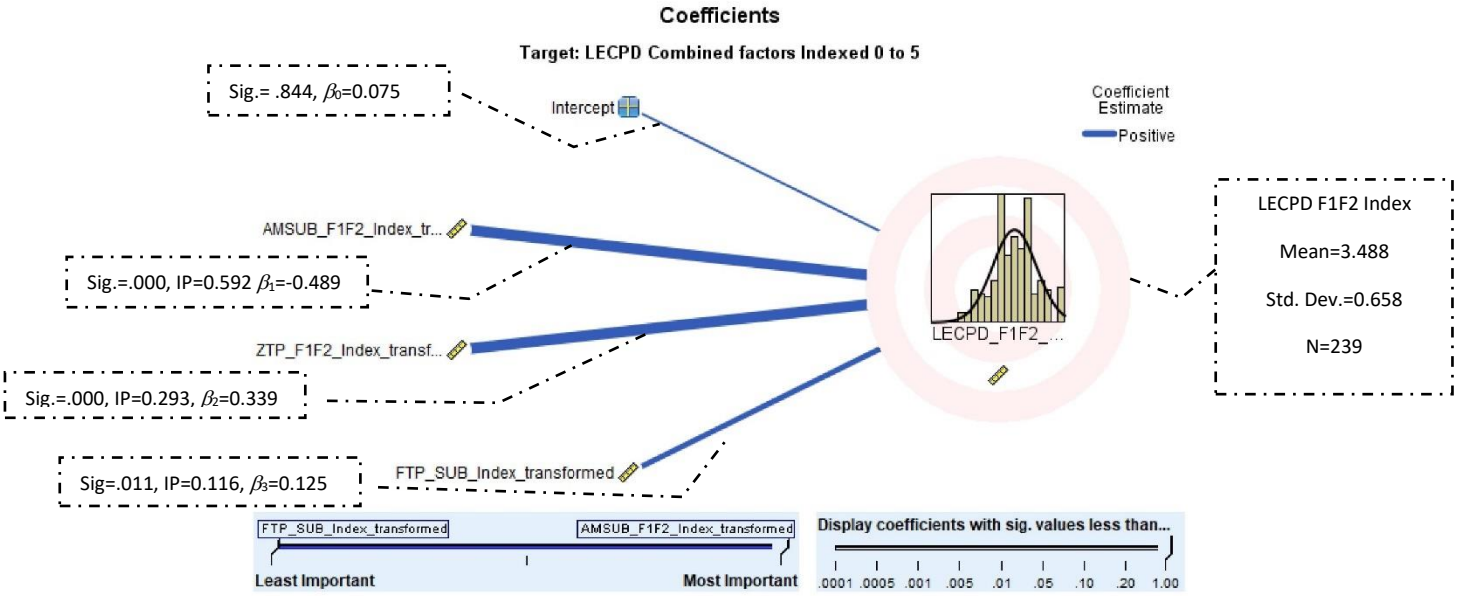

Figure 248 LECPD Third Order Predictors: the coefficients of the predictor variables including intercept

Figure 248 is a model illustrating the coefficients of the predictor variables relative to the criterion variable and to eachother; as such it is a diagrammatic illustration of the model for predicting LECPD. The width of the lines illustrates the level of the coefficient significance of the predictor variables while the colour indicates the sign of the coefficient in terms of its relationship with or contribution to the predicted value of the target/criterion variable LECPD i.e. direct (positive) or inverse (negative) While Figure 249 provides (ranked in order of importance) some of the information reflected in the illustration in Figure 248, such as coefficient, significance, importance of each predictor variable and additional information such as the standard error, t statistics and confidence interval which shed more light on the nature of the predictive parameters of the model.

Coefficients

Target: LECPD Combined factors Indexed 0 to 5

Model Term	Coefficient ▼	Std.Error	t	Sig.	95% Confidence Interval		Importance
					Lower	Upper	
Intercept	0.075	0.379	0.197	.844	-0.672	0.821	
AMSUB_F1F2_Index_transformed	0.489	0.084	5.805	.000	0.323	0.656	0.592
ZTP_F1F2_Index_transformed	0.339	0.083	4.082	.000	0.175	0.503	0.293
FTP_SUB_Index_transformed	0.125	0.049	2.565	.011	0.029	0.222	0.116

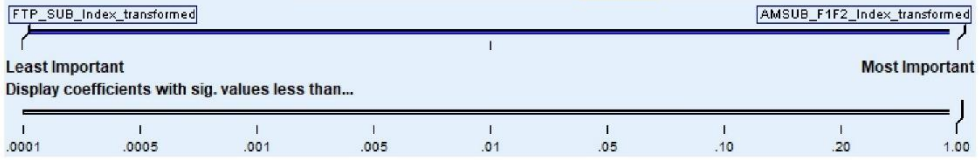

Figure 249 LECPD Third order predictors: values, significance tests, and confidence intervals for the individual model coefficients

Further to the Anova table and F-statistics, the coefficients tell us the extent to which each variable contributes to calculating the value of the predicted/criterion variable LECPD and the level of significance of the contribution. From Figure 248 and Figure 249 it can be seen that the contribution of all the predictor variables (except for the Intercept) with coefficients ranging from 0.125 To 0.489 are all significant at α= 0.5 with p-value ranging from .000 to .011. The Intercept with a coefficient β_0=0.075and p-value = .844 is not significant at α= 0.05, although the intercept is not significant, it has to be taken into consideration when calculating the value of the LECPD using the deterministic model. It can also be seen that the variable for AMSUB_F1F2_Index which denotes 'Overall Level of Achievement Motivation' which has the greatest effect on LECPD is not only the most important predictor of level of engagement with CPD (IP=0.592) among the second-order variables, but is also makes the largest contribution when calculating the deterministic value of level of engagement. As AMSUB_F1F2_Index has the highest coefficients (β_2=0.489, P-value=.000) of all the predictors of Level of engagement with CPD.

In line with the Equation 92, the equation that denotes the regression model for prediction of LECPD on the basis of Third-order dimension of motivation is as shown in Equation 96 the version of this equation that contains only significant effects or coefficients is as shown in Equation 97. Depending

on the context of use, equations representative of regression models are used with or without insignificant components as such both are presented:

$$Y = f(X_{T1}, X_{T2}, X_{T3})$$

$$Y = 0.075 + 0.489X_{T1} + 0.339X_{T2} + 0.125\ X_{T3}$$

where

Y is the dependent variable= LECPD Combined

X_{T1}, X_{T2}, X_{T3}, are the third-order independent variables

X_{T1} = AMSUB_F1F2_Index which denotes 'Overall Level of Achievement Motivation'

X_{T2}= ZTP_F1F2 which denotes 'Zimbardo Time Perspective Combined Value' indicative of the overall resultant of Zimbardo Time Perspective

X_{T3}= FTP_SUB denotative of 'Combined value of Future Time Perspective using Factor analysis Index (Based on rotated)'

Equation 96 LECPD Third-order predictors: Multiple regression model including Predictors with non-significant effects

$$Y = f(X_{T1}, X_{T2}, X_{T3})$$

$$Y = 0.489X_{T1} + 0.339X_{T2} + 0.125\ X_{T3}$$

where

Y is the dependent variable= LECPD Combined

X_{T1}, X_{T2}, X_{T3}, are the third-order independent variables

X_{T1} = AMSUB_F1F2_Index which denotes 'Overall Level of Achievement Motivation'

X_{T2}= ZTP_F1F2 which denotes 'Zimbardo Time Perspective Combined Value' indicative of the overall resultant of Zimbardo Time Perspective

X_{T3}= FTP_SUB denotative of 'Combined value of Future Time Perspective using Factor analysis Index (Based on rotated)'

Equation 97 LECPD Third-order predictors: Multiple regression model for only predictors with significant effects

11.1.4 Summary

The Predictors of Level of engagement with CPD were determined using multiple regression, this was carried out using the Automatic Linear Model feature of SPSS. The regression analysis was carried out within First-order, Second-order and Third-order subsets of variables from the identified dimensions of motivation that are postulated to affect the Level of engagement with CPD. Figure 250 Show the predictors of engagement with CPD within each subset.

Ranking in descending order of importance (with 1 being most important)	First-order predictors:	Second-order	Third-order
1	AM- Affinity of Challenge	'Achievement motivation in the context concerted effort	'Overall Level of Achievement Motivation'
2	Am- Affinity for approval and competitiveness	'Extent of Measurability/Amotivation'	SDM Combined value on basis of perceived level of Autonomy indicative of the overall resultant of Self Determined motivation
3	Future oriented Zimbardo Time perspective Inventory	Future Time Perspective Focused on Opportunities	'Combined value of Future Time Perspective using Factor analysis Index (Based on rotated)'
4	Extremely opened opportunities Future Time Perspective	'Positive dimensions of Zimbardo time perspective	
5	Amotivation		
6	Am - Avoidance of Task		
7	Intrinsic Motivation Towards Accomplishment of task		
8	Intrinsic Motivation to experience stimulation		

Figure 250 Predictors of Level of Engagement with CPD

The summary models for predicting level of engagement with CPD based on subsets (tiers) of motivation variables as shown in Figure 251 was examined in order to confirm or reject the relevant Hypothesis. Hypothesis stating that: 'First-order variables are better at predicting and modelling level

of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation'.

In selecting the best model for predicting the Level of engagement with CPD the F-statistics of all the models as shown in Figure 251 were examined and found to be adequate and significant indicating the utility of all the models. Following this, the accuracy of the model and extent of information loss was examined. As shown in Figure 251 the predictive model based on first-order variables has the highest Adjusted R squared at 35.4% indicative of the highest accuracy, and most negative information Criterion at -294.775 indicative of the least information loss and as such best fit. It can thus be concluded that the best model for predicting level of engagement with CPD is the model based First-order variables, in so doing confirming the Hypothesis.

Model	First-Order	Second-Order	Third
Adjusted R Squared	35.4%	28.7%	26.7%
Information criterion (AIC)	-294.775	-275.501	-270.005
F-ratio	17.337	24.979	29.957
Significance of F Value, F value	.010 , 6.779	.032, 4.653	.011, 6.582

Figure 251 Model Summaries for Level of engagement with CPD

An overview of all the hypothesis examined and indication as to whether they are confirmed or rejected is presented in the Figure 252.

Overall		Sub –hypothesis					
		First-Order		Second Order		Third Order	
Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status
There are predictors of LECPD among first-order variables, Second-order variables and Third order variables of the identified and emergent dimensions of motivation.	**Confirmed**	There are Predictors of LECPD among first-order variables of identified and emergent dimensions of motivation	**Confirmed**	There are Predictors of LECPD among Second-order variables of identified and emergent dimensions of motivation	**Confirmed**	There are Predictors of LECPD among Third-order variables of identified and emergent dimensions of motivation	**Confirmed**
Different dimensions of motivation have different level of effect on level of engagement with CPD.	**Confirmed**	Compared to other first order dimensions of motivation, Affinity for Challenge form of Achievement motivation (AM_F5_Index) has a greater	**Confirmed**	Compared to other Second order dimensions of motivation, 'Achievement motivation in the context of concerted effort' (AMSUB_F1	**Confirmed**	Compared to other Third order dimensions of motivation, Resultant Achievement motivation (AMSUB_F1F2_Index) has a greater effect on LECPD	**Confirmed**

		effect on LECPD.		_Index) has a greater effect on LECPD			
The suitability of models for predicting Level of engagement with CPD is different for the different tiers of motivation variables	**Confirmed**	First-order variables are better at predicting and modelling level of engagement with CPD than Second order and Third-order variables of identified and emergent dimensions of motivation	**Confirmed**	Second-order variables are better at predicting and modelling level of engagement with CPD than Second order and Third-order variables of identified and emergent dimensions of motivation	Rejected	Third-order variables are better at predicting and modelling level of engagement with CPD than Second order and Third-order variables of identified and emergent dimensions of motivation	Rejected

Figure 252 Overview of Hypothesis for Level of engagement with CPD

The Figure 253 contains a summary of the multiple regression models for Level of engagement with different aspects of CPD on the basis of First-order Predictors.

Model	First-Order	Second-Order	Third-Order
With Only Significant	$Y = 1.100 + 0.194X_{F1} - 0.165X_{F2} + 0.317 X_{F3} + 0.131 X_{F4} + 0.098X_{F5} + 0.133 X_{F6} - 0.166 X_{F7} + 0.160 X_{8}$	$Y = 0.406X_{S1} + 0.132X_{S2} + 0.142 X_{S3} + 0.260 X_{S4}$	$Y = 0.489X_{T1} + 0.339X_{T2} + 0.125 X_{T3}$
With Non-Significant Components	All factors are significant	$Y = 0.249 + 0.406X_{S1} + 0.132X_{S2} + 0.142 X_{S3} + 0.260 X_{S4}$	$Y = 0.075 + 0.489X_{T1} + 0.339X_{T2} + 0.125 X_{T3}$

Figure 253 Multiple regression Deterministic models for Level of engagement with CPD

11.2 Predictors of Level of Engagement with Aspects of CPD.

In order to test the hypothesis stating that: 1) There are Predictors of level of engagement with the Plan, Action, Result and Reflection aspects of CPD among first-order variables of the identified and emergent dimensions of motivation. 2) Different dimensions of motivation have different levels of effect on level of engagement with the Plan, Action, Result and Reflection aspects of CPD. 3) Level of engagement with Results aspect of CPD is better predicted and modelled by First order variables of identified and emergent dimensions of motivation than Level of engagement with other aspects of CPD. They are tested as follows.

11.2.1 First-order predictors (Base value predictors) of the Plan Aspect of CPD

Linear Regression was carried out to test the hypothesis stating that: 1) There are Predictors of Level of engagement with the Plan aspect of CPD among first-order variables of identified and emergent dimensions of motivation and 2) Compared to other first order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Plan aspect of CPD.

Linear regression was carried out using SPSS Automatic linear modelling feature with a Forward stepwise model selection method. The entry and removal criteria was on the basis of F Statistics, including variables/effects with p-value less than 0.05 and removing variable/effects with p-value greater than 0.1.

In carrying out the forward stepwise regression, first-order variables across different dimensions of motivations (as shown in Figure 254) were selected as possible dependent/predictor variables and included in the regression analysis, while Level of engagement with the Plan aspect of CPD was the Target/dependent/Criterion variable.

	First order variable as Dependent Variables
1	AM_F1_Index
2	AM_F2_Index
3	AM_F3_Index
4	AM_F4_Index
5	AM_F5_Index
6	AM_F6_Index
7	AM_F7_Index
8	To_Experience_Stimulation_IM_Index
9	Towards_Accomplishment_IM_Index
10	To_Know_IM_Index
11	Identified_EM_Index
12	Introjected_EM_Index
13	External_Regulation_EM_Index
14	Amotivation_Index
15	Past Negative ZTPI
16	Present Hedonistic ZTPI
17	Future ZTPI
18	Past Positive ZTPI
19	Present Fatalistic ZTPI
20	Opportunities_I_MDFTP
21	Limitations_I_MDFTP
22	Ambiguities_I_MDFTP
23	FTP_F1
24	FTP_F2
25	FTP_F3

Figure 254 Plan Aspect of CPD: First order variables included in regression analysis

In this case of regression, the variables were automatically prepared by SPSS trimming of outliers and replacement of missing variables. The outliers of note are presented in the Figure 255.

Outliers

Target: Plan combined Factors Index 0 to 5

Record ID	Plan combined Factors Index 0 to 5	Cook's Distance
469	4.42	0.093
235	5.00	0.075
216	1.71	0.065
115	2.13	0.060
457	1.89	0.048
270	1.34	0.043
247	4.52	0.039
505	5.00	0.033
45	5.00	0.029
205	1.72	0.028
105	2.62	0.027
496	2.13	0.026
71	2.66	0.025
511	4.57	0.024
99	1.78	0.022
243	1.11	0.020
234	2.52	0.019
397	4.79	0.018
195	4.38	0.018
232	5.00	0.017
202	3.14	0.016
178	4.67	0.016
251	2.36	0.015
257	4.45	0.015
503	2.48	0.015
48	3.12	0.014
301	1.89	0.014
84	5.00	0.014
246	3.89	0.013
452	1.71	0.013
483	2.00	0.013
516	4.11	0.012
473	1.96	0.012
81	4.83	0.012
27	3.25	0.012

Records with large Cook's distance values are highly influential in the model computations. Such records may distort the model accuracy.

Figure 255 Plan First order predictors: Outliers

It is important to examine that the assumption of normality is conformed with, the Histogram and Q-Q plots in Figure 256 and Figure 257 shows conformation to the assumption of normality [287].

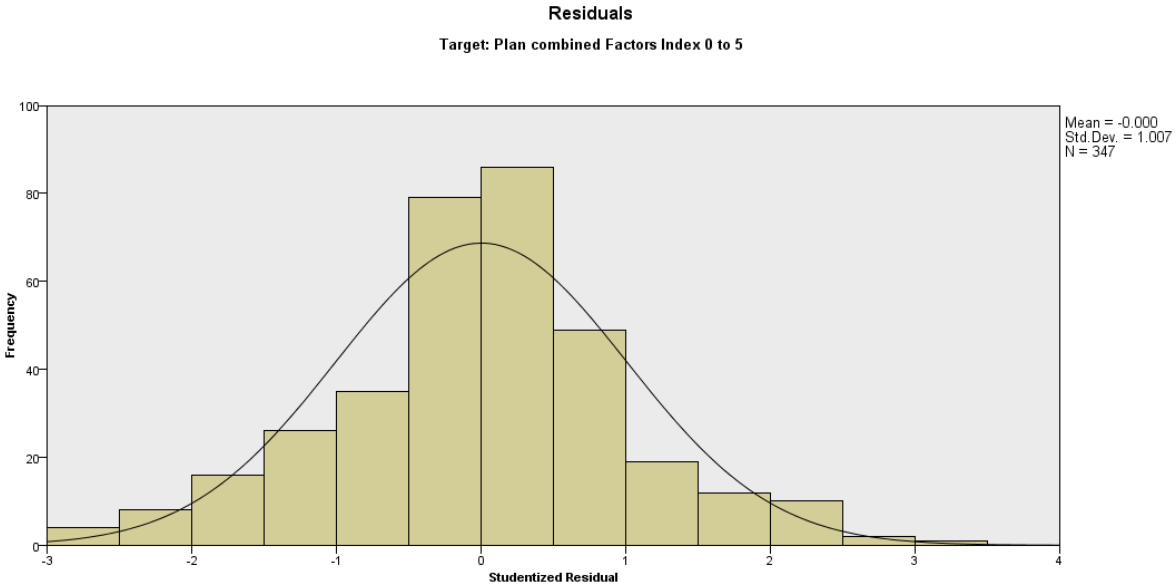

Figure 256 Plan Aspect CPD First order predictors: Histogram of Studentized residuals

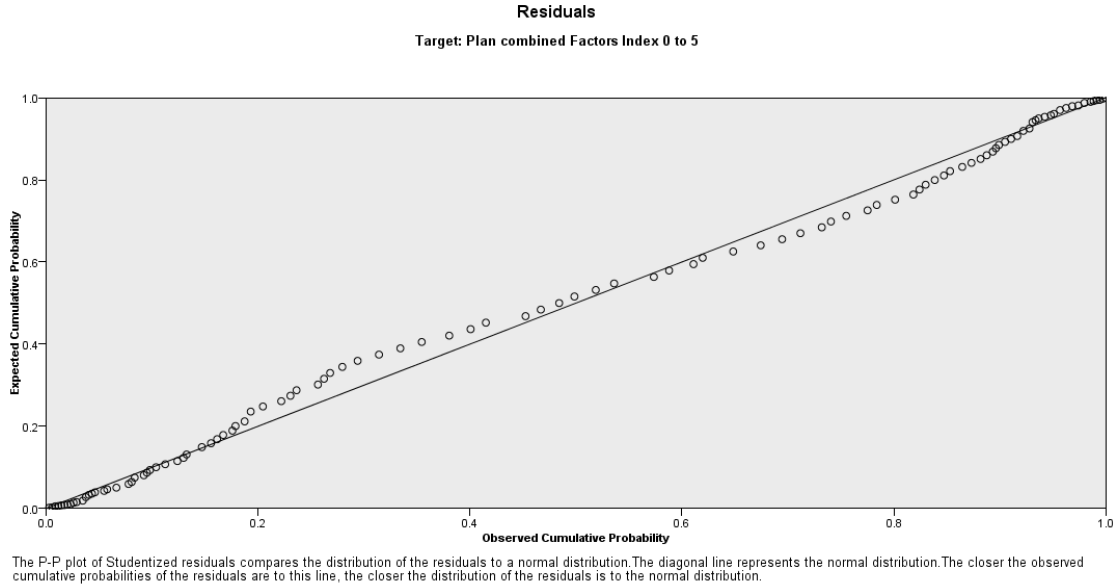

Figure 257 Plan Aspect of CPD First order predictors: P-P plot of Studentized residuals

It can be seen from the slop of the Probability-Probability plot in Figure 257 shows that the variability of the residuals are similar to the variability of a normal distribution, implying that it meets the underlying assumption.

The forward stepwise regression yields 11 iterations of models before selecting the best model. The selection of model was principal based on the utility of the model using the F-Statistic Criterion by evaluating significance of the F-Value [285]. Nevertheless, taking into consideration the predictive power of the model using the R-squared value, and the quality of model by using Akaike information criterion (AIC) which evaluates relative quality of models on basis of the quantity of information lost by the model [288, 289, 290, 218] .

Figure 258 illustrates the different iterations of models gone through and shows that the best model in terms of a combination of the above-mentioned condition is model 11 with a F-Value = 5.059, which is a significant F value at α=0.05 with a p-value = .025 showing the utility of the model.

Model Building Summary

Target: Plan combined Factors Index 0 to 5

		Step									
		2	3	4	5	6	7	8	9	10	11
Significance of F Value		.000	.000	.006	.021	.016	.001	.009	.029	.016	.025
Effect	To_Experience_Stimulation_IM_Index_transformed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	AM_F5_Index_transformed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	FTP_F2_Index5_transformed		✓	✓	✓	✓	✓	✓	✓	✓	✓
	AM_F7_Index_transformed			✓	✓	✓	✓	✓	✓	✓	✓
	Towards_Accomplishment_IM_Index_transformed				✓	✓	✓	✓	✓	✓	✓
	AM_F2_Index_transformed					✓	✓	✓	✓	✓	✓
	Future_I_ZTPI_transformed						✓	✓	✓	✓	✓
	AM_F1_Index_transformed							✓	✓	✓	✓
	Opportunities_I_MDFTP_transformed								✓	✓	✓
	Amotivation_Index_transformed									✓	✓
	Introjected_EM_Index_transformed										✓

The model building method is Forward Stepwise using the F Statistic criterion.
A checkmark means the effect is in the model at this step.

Figure 258 Plan Aspect of CPD Regression Analysis: Model Building/selection Summary

The selected model as shown in the Figure 259 has an AIC of -338.983 which shows a good level of information retention, the more negative the AIC the better the result [288]. An R-squared (Coefficient of determination) value 0.358 which shows a comparatively high level of predictive ability or accuracy of the model at 35.8%. The interpretation of R Squared is context specific, particularly in the context

of behaviour related research where R squared equal to or greater than 10% is considered acceptable given the over determined nature of human behaviour and motivation [291, 292, 293, 294, 218].

Model Summary

Target	Plan combined Factors Index 0 to 5
Automatic Data Preparation	On
Model Selection Method	Forward Stepwise
Information Criterion	-338.983

The information criterion is used to compare to models. Models with smaller information criterion values fit better.

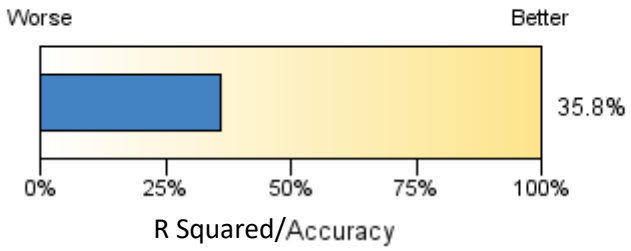

Figure 259 Plan Aspect of CPD Model Summary: AIC and R Squared

The predictors from selected iteration as shown Figure 258 had 11 first-order variables along the three main dimensions of motivation that are of relevance to this study. Along the Source dimension Self determined motivation: 1) 'To_Experience_Stimulation_IM_Index' denotative of Intrinsic motivation towards stimulation , 2) 'Towards_Accomplishment_IM_Index' denotative of Intrinsic motivation towards accomplishment, 3) 'Introjected_EM_Index' denotative of Introjected type of Extrinsic Motivation, and 4) 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined motivation/amotivation'. Along the Intensity Dimension – achievement motivation: 5) 'AM_F1_Index' denotative of 'Achievement motivation in the context of Avoidance of Task', 6) 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', 7) AM_F5_Index denotative of 'Achievement Motivation in the context of Affinity of Challenge', and 8) AM_F7_Index denotative of 'Dislike of Failure' which is indicative of ' achievement motivation in the context of an extent of intolerance for failure, with concerted effort to prevent failure through hard work'. Along Time

Perspective dimension: 9) 'Future ZTPI' denotative of 'Future oriented Zimbardo Time perspective', 10) 'FTP_F2' that is denotative of 'extremely opened future time perspective' and 11) Opportunities_I_MDFTP denotative of 'Opportunities Multidimensional Time Perspective'. Thus, confirming the hypothesis that states that, there are Predictors of the Plan Aspect of CPD among first-order variables of identified and emergent dimensions of motivation.

The level of importance is a relative value that ranges between 0 and 1 for each variable but whose sum for all the variables in the model never exceeds one [295]. Figure 260 shows the ranking of the variables in terms of importance.

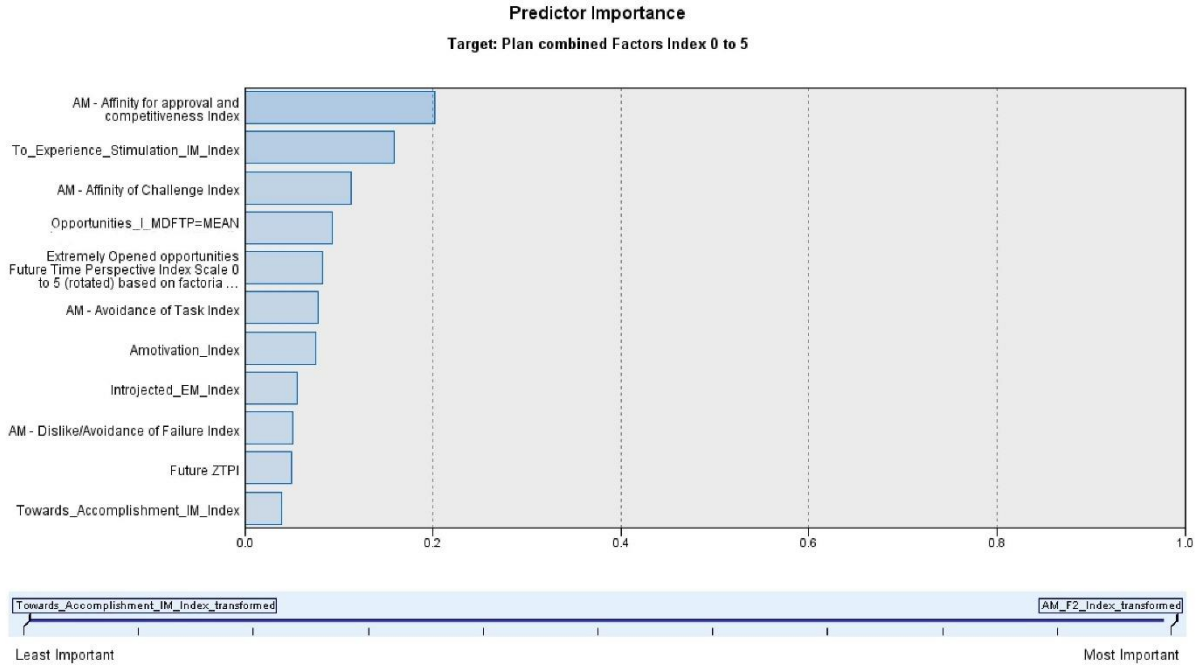

Figure 260 Level of Engagement with Plan aspects of CPD First-order predictors: Predictors important

In terms of level of importance, the most important of the predictor variables (as shown in Figure 260) was the variable 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness' at a relative importance level of 0.2 while the least important predictor was 'Towards_Accomplishment_IM_Index' denotative of 'Intrinsic motivation towards accomplishment' at a relative importance level of 0.004. Showing that an individual's Affinity for approval and competitiveness is the most important factor in predicting/determining the extent to which the individual would engage with the Planning Aspect of CPD, and has the greatest effect on the individual's level of engagement with the Planning Aspect of CPD. While the individual's Intrinsic motivation towards accomplishment is the least important factor in predicting/determining the extent

to which the individual would engage with the planning Aspect of CPD and has the least effect on the individual's level of engagement with the planning aspect of CPD. In so doing, confirming the hypothesis that states that, compared to other first order dimensions of motivation, 'Affinity for approval and competitiveness' form of Achievement motivation (AM_F2_Index) has a greater effect on Level of engagement with the Plan aspect of CPD.

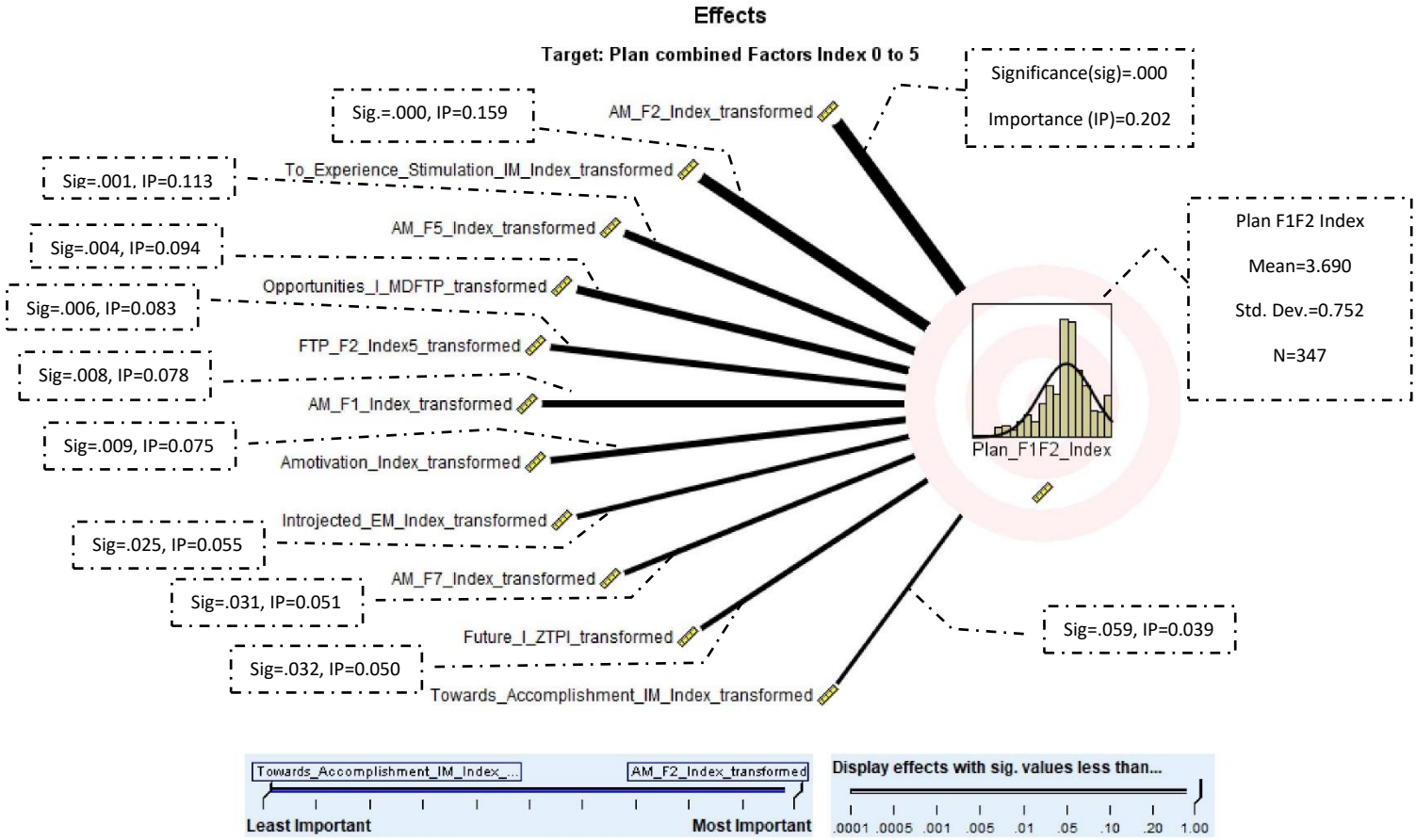

Figure 261 Illustration of regression models: Effects of Predictor variable on Level of engagement with Plan aspect of CPD in descending order

Figure 261 goes further to illustrate the effect of the individual predictor variables on the level of engagement with Plan aspect CPD in descending order of importance. While illustrating the effect significance of each predictor variable employing the thickness of the lines, with thicker lines symbolising a predictor of Level of engagement with Plan aspect of CPD with higher significant effect. As shown in Figure 261 all the predictor effects (except that for Predictor 'Towards_Accomplishment_IM') are significant at $\alpha = 0.05$ with p-value ranging between .000 to .032,

but have different levels of importance in terms of effect ranging from 0.202 to 0.050. The Predictor Towards_Accomplishment_IM is not significant at α = 0.05 with p-value= .059 and IP=0.039.

Figure 262 on the other hand contains the results of the ANOVA further providing details of the model effects illustrated by Figure 261, including the Sum of squares indicating that the data is well represented by the model and the F – statistics indicating the utility of the model.

Effects

Target: Plan combined Factors Index 0 to 5

Source	Sum of Squares	df	Mean Square	F	Sig.	Importance
Corrected Model ▼	73.941	11	6.722	18.522	.000	
AM_F2_Index_transformed	6.731	1	6.731	18.546	.000	0.202
To_Experience_Stimulation_IM_Index_transformed	5.303	1	5.303	14.612	.000	0.159
AM_F5_Index_transformed	3.772	1	3.772	10.394	.001	0.113
Opportunities_I_MDFTP_transformed	3.116	1	3.116	8.586	.004	0.094
FTP_F2_Index5_transformed	2.754	1	2.754	7.588	.006	0.083
AM_F1_Index_transformed	2.602	1	2.602	7.169	.008	0.078
Amotivation_Index_transformed	2.514	1	2.514	6.928	.009	0.075
Introjected_EM_Index_transformed	1.836	1	1.836	5.059	.025	0.055
AM_F7_Index_transformed	1.712	1	1.712	4.718	.031	0.051
Future_I_ZTPI_transformed	1.675	1	1.675	4.615	.032	0.050
Towards_Accomplishment_IM_Index_transformed	1.307	1	1.307	3.602	.059	0.039
Residual	121.580	335	0.363			
Corrected Total	195.521	346				

Figure 262 Level of engagement with Plan aspect of CPD First-order predictors: ANOVA table indicating the effects and nature of relationship between variables in the model

The global F statistic of the entire model with F-ration 18.522 and 11 degrees of freedom, is found to be highly significant at α = 0.05 with p-value= .000 as shown in Figure 262. The large F-ratio indicating

that a linear model is more appropriate for the data than a non-linear model. The significance of the F-statistics further implies that at least one of the coefficients for the parameters predicting Level of engagement with the Plan Aspect of CPD in the models is non-zero, which tells us that there is at least a linear relationship between the variables in the model. Connoting that the model merits further consideration and is useful for further prediction and that the model predicts the Level of engagement with the Plan Aspect of CPD(P-LECPD) reasonably well [282]. To further evaluate how well the model predicts the level of engagement with CPD, a plot of the predicted value of P-LECPD against the observed value is produced as shown in Figure 263 .

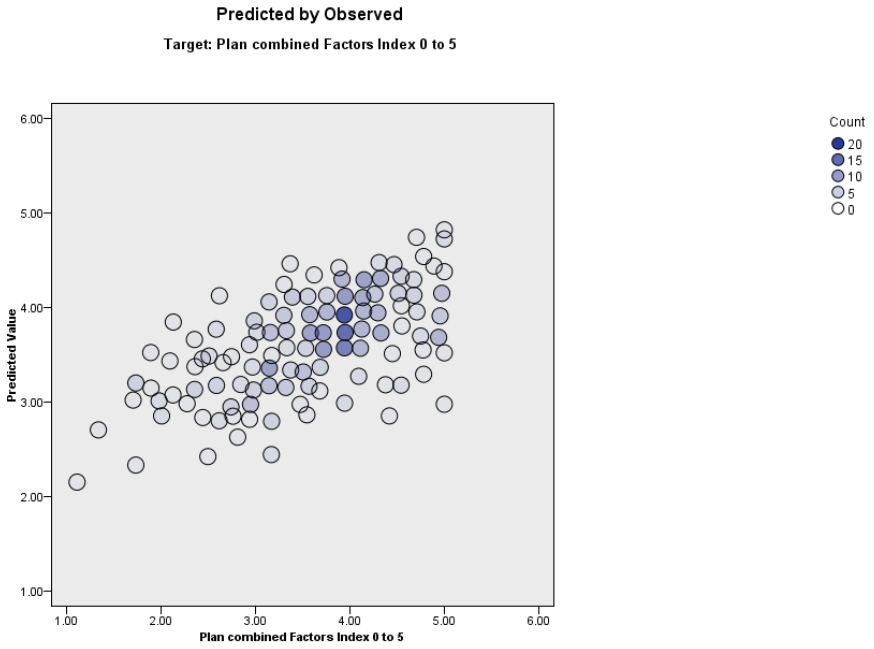

Figure 263 Plan Aspect of CPD First-order predictors: Predicted Vs observed value of Plan Aspect of CPD

Figure 263 is a scatterplot of predicted value versus observed value of P-LECPD. Observed value imply the original computed value of P-LECPD. It can be seen from Figure 263 that a 45 degree line can be drawn through the middle of the points on the plot, which indicates that the target variable is well predicted by the model.

It can also be seen from Figure 262 that all the individual predictors (except for 'Towards_Accomplishment_IM') with F-ratio ranging from 18.546 to 4.615 are also found to be significant at α = 0.05 with p-value ranging from .000 to .032 (Figure 262) showing that there is a linear relationship between the Criterion variable and each of the predictor variables (except for

'Towards_Accomplishment_IM'). 'Towards_Accomplishment_IM' has a F-ratio of 3.602 but is not significant at α = 0.05 with a p-value = .59. Further showing that not only is the model useful in predicting the value of p-LECPD but that each of the parameters (except for 'Towards_Accomplishment_IM') are useful to that effect. Figure 264 below sheds further light on the linear relationship between the individual predictor variables and P-LECPD.

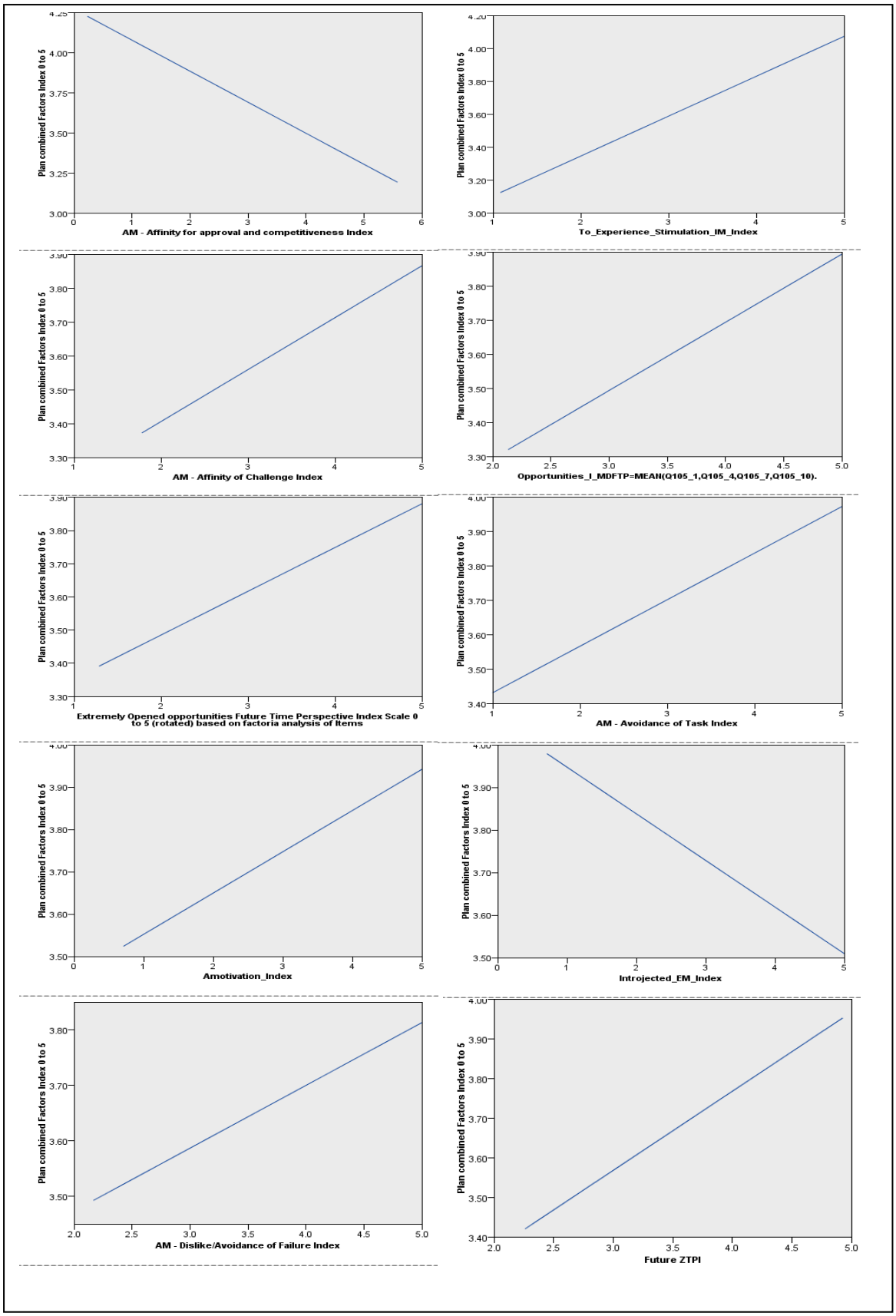

Figure 264 P-LECPD First order predictors: Estimate means Chart for significant effects (p< 0.5)

It can be seen from Figure 264 that some of the predictor variables have a direct relationship with the P-LECPD while some have an inverse relationship with LECPD; Indicating that some parameters will positively contribute to the overall engagement with plan aspect of CPD while some parameter would negatively contribute to the level of engagement with plan aspect of CPD. This is bound to be reflected in the coefficients (β) of the regression parameter as shown in Figure 265.

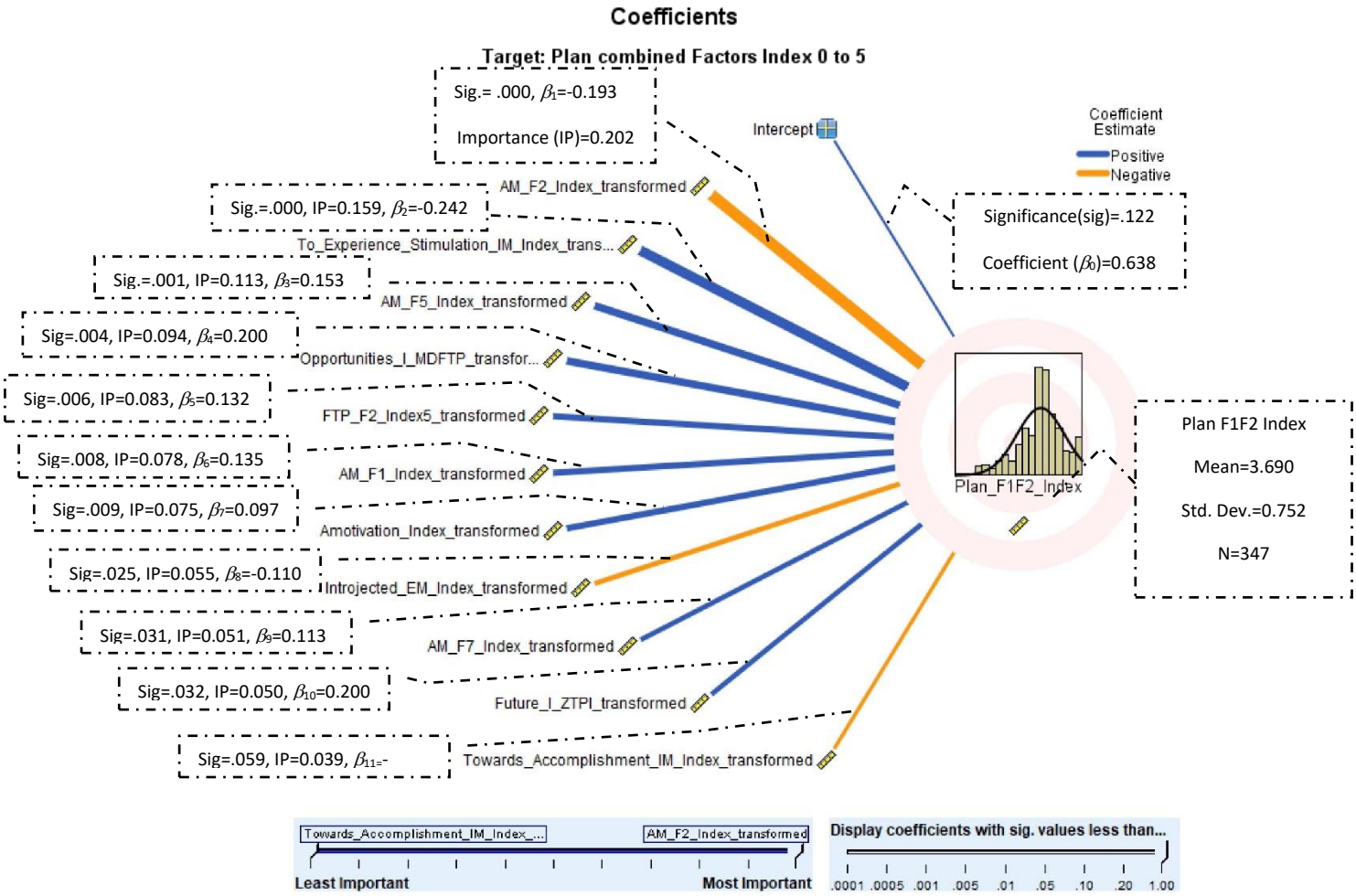

Figure 265 Illustration of regression models: the coefficients of the predictor variables including intercept

Figure 265 is a model illustrating the coefficients of the predictor variables relative to the criterion variable and to each other; as such it is a diagrammatic illustration of the model for predicting P-LECPD. The width of the lines illustrates the level of the coefficient significance of the predictor variables while the colour indicates the sign of the coefficient in terms of its relationship with or contribution to the predicted value of the target/criterion variable P-LECPD i.e. direct (positive) or

inverse (negative). While Figure 266 provides (ranked in order of importance) some of the information reflected in the illustration in Figure 265 such as coefficient, significance, importance of each predictor variable and additional information such as the standard error, t statistics and confidence interval which shed more light on the nature of the predictive.

Coefficients

Target: Plan combined Factors Index 0 to 5

Model Term	Coefficient ▼	Std.Error	t	Sig.	95% Confidence Interval		Importance
					Lower	Upper	
Intercept	0.638	0.412	1.550	.122	-0.172	1.448	
AM_F2_Index_transformed	-0.193	0.045	-4.306	.000	-0.282	-0.105	0.202
To_Experience_Stimulation_IM_Index_transformed	0.242	0.063	3.823	.000	0.118	0.367	0.159
AM_F5_Index_transformed	0.153	0.048	3.224	.001	0.060	0.247	0.113
Opportunities_I_MDFTP_transformed	0.200	0.068	2.930	.004	0.066	0.334	0.094
FTP_F2_Index5_transformed	0.132	0.048	2.755	.006	0.038	0.226	0.083
AM_F1_Index_transformed	0.135	0.050	2.678	.008	0.036	0.235	0.078
Amotivation_Index_transformed	0.097	0.037	2.632	.009	0.025	0.170	0.075
Introjected_EM_Index_transformed	-0.110	0.049	-2.249	.025	-0.205	-0.014	0.055
AM_F7_Index_transformed	0.113	0.052	2.172	.031	0.011	0.216	0.051
Future_I_ZTPI_transformed	0.200	0.093	2.148	.032	0.017	0.382	0.050
Towards_Accomplishment_IM_Index_transformed	-0.134	0.071	-1.898	.059	-0.273	0.005	0.039

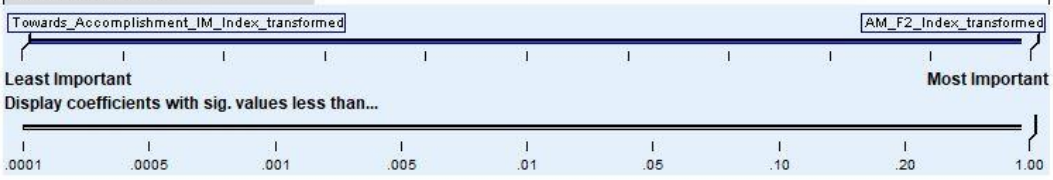

Figure 266 P-LECPD First-order predictors: values, significance tests, and confidence intervals for the individual model coefficients

Further to the Anova table and F-statistics, the coefficients tell us the extent to which each variable contributes to calculating the value of the predicted/criterion variable P-LECPD and the level of significance of the contribution. From Figure 265 and Figure 266 it can be seen that the contribution of all the predictor variable (except for 'Towards_Accomplishment_IM') with coefficient range from -0.193 To 0.242 are all significant at α= 0.05 with p-value ranging from .000 to .032. The variable

'Towards_Accomplishment_IM' with Coefficient $\beta_{8=}$-0.134 and P-Value=.059 is not Significant α= 0.05; in addition to that the Intercept with Coefficient β_0= 0.638 p-value = .122 is not significant at α= 0.05. Although the variable 'Towards_Accomplishment_IM' and the intercept is not significant it has to be taken into consideration when calculating the value of the P-LECPD using the deterministic model.

It can be seen that the variable for 'To_Experience_Stimulation_IM_Index' denotative of Intrinsic motivation towards stimulation makes the largest positive contribution when calculating the deterministic value of level of engagement with Plan aspect of CPD as it has the highest Coefficient β_2=0.242, P-Value=.000). It is interesting that 'To_Experience_Stimulation_IM_Index' with IP=0.159 and β_2=0.242 makes a greater contribution to the deterministic value than AM_F2_Index which is the most important first-order predictor of level of engagement with plan aspect of CPD with IP=0.202, β_1=-0.193. It is also further interesting that the most important predictors AM_F2_Index also makes the most negative contribution to the deterministic value with β_1=-0.193 indicative of an inverse relationship.

In line with the Equation 92, the equation that denotes the regression model for prediction of P-LECPD on the basis of First-order dimension of motivation is as shown in Equation 98; the version of this equation that contains only significant effects or coefficients is as shown in Equation 99. Depending on the context of use, equations representative of regression models are used with or without insignificant components as such both are presented:

$$Y_p = f(X_{PF1}, X_{PF2}, X_{PF3}, X_{PF4}, X_{PF5}, X_{PF6}, X_{PF7}, X_{PF8}, X_{PF9}, X_{PF10}, X_{PF11})$$

$$Y_p = 0.638 - 0.193X_{PF1} + 0.242X_{PF2} + 0.153X_{PF3} + 0.200X_{PF4} + 0.132X_{PF5} + 0.135X_{PF6} + 0.097X_{PF7} - 0.110X_{PF8} + 0.113X_{PF9} + 0.200X_{PF10} - 0.134X_{PF11}$$

where

Y_p is the dependent variable= P-LECPD

$X_{PF1}, X_{PF2}, X_{PF3}, X_{PF4}, X_{PF5}, X_{PF6}, X_{PF7}, X_{PF8}, X_{PF9}, X_{PF10}, X_{PF11}$, are the First-order independent variables

X_{PF1} = 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness',

X_{PF2} = 'To_Experience_Stimulation_IM_Index' denotative of Intrinsic motivation towards stimulation,

X_{PF3} = 'AM_F5_Index' denotative of 'Achievement Motivation in the context of Affinity of Challenge',

X_{PF4} = 'Opportunities_I_MDFTP' denotative of 'Opportunities Multidimensional Time Perspective',

X_{PF5} = 'FTP_F2' that is denotative of 'extremely opened future time perspective',

X_{PF6} = 'AM_F1_Index' denotative of 'Achievement motivation in the context of Avoidance of Task',

X_{PF7} = 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined motivation/amotivation',

X_{PF8} = 'Introjected_EM_Index' denotative of Introjected type of Extrinsic Motivation,

X_{PF9} = 'AM_F7_Index' denotative of 'Dislike of Failure' which is indicative of 'an extent of intolerance for failure, with concerted effort to prevent failure through hard work ',

X_{PF10} = 'Future ZTPI' denotative of 'Future oriented Zimbardo Time perspective',

X_{PF11} =. 'Towards_Accomplishment_IM_Index' denotative of Intrinsic motivation towards accomplishment.

Equation 98 P-LECPD First-order predictors: Multiple regression model including Predictors with non-significant effects

$$Y_p = f(X_{PF1}, X_{PF2}, X_{PF3}, X_{PF4}, X_{PF5}, X_{PF6}, X_{PF7}, X_{PF8}, X_{PF9}, X_{PF10}, X_{PF11})$$

$$Y_p = -0.193X_{PF1} + 0.242X_{PF2} + 0.153X_{PF3} + 0.200X_{PF4} + 0.132X_{PF5} + 0.135X_{PF6} + 0.097X_{PF7} - 0.110X_{PF8} + 0.113X_{PF9} + 0.200X_{PF10}$$

where

Y_p is the dependent variable= P-LECPD

$X_{PF1}, X_{PF2}, X_{PF3}, X_{PF4}, X_{PF5}, X_{PF6}, X_{PF7}, X_{PF8}, X_{PF9}, X_{PF10}, X_{PF11}$, are the First-order independent variables

X_{PF1} = 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness',

X_{PF2} = 'To_Experience_Stimulation_IM_Index' denotative of Intrinsic motivation towards stimulation,

X_{PF3} = 'AM_F5_Index' denotative of 'Achievement Motivation in the context of Affinity of Challenge',

X_{PF4} = 'Opportunities_I_MDFTP' denotative of 'Opportunities Multidimensional Time Perspective',

X_{PF5} = 'FTP_F2' that is denotative of 'extremely opened future time perspective',

X_{PF6} = 'AM_F1_Index' denotative of 'Achievement motivation in the context of Avoidance of Task',

X_{PF7} = 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined motivation/amotivation',

X_{PF8} = 'Introjected_EM_Index' denotative of Introjected type of Extrinsic Motivation,

X_{PF9} = 'AM_F7_Index' denotative of 'Dislike of Failure' which is indicative of 'an extent of intolerance for failure, with concerted effort to prevent failure through hard work ',

X_{PF10} = 'Future ZTPI' denotative of 'Future oriented Zimbardo Time perspective'.

Equation 99 P-LECPD First-order predictors: Multiple regression model for only predictors with significant effects

11.2.2 First-order predictors (Base value predictors) of the Action Aspect of CPD

Linear Regression was carried out to test the hypothesis stating that: 1) There are Predictors of level of engagement with the Action aspect of CPD among first-order variables of identified and emergent dimensions of motivation and 2) Compared to other first order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Action aspect of CPD.

Linear regression was carried out using SPSS Automatic linear modelling feature with a Forward stepwise model selection method. The entry and removal criteria were on the basis of F Statistics, including variables/effects with p-value less than 0.05 and removing variable/effects with p-value greater than 0.1.

In carrying out the forward stepwise regression first-order variables across different dimensions of motivations (as shown in Figure 267) were selected as possible dependent/predictor variables and included in the regression analysis, while Level of engagement with the Action aspect of CPD was the Target/dependent/Criterion variable.

	First order variable as Dependent Variables
1	AM_F1_Index
2	AM_F2_Index
3	AM_F3_Index
4	AM_F4_Index
5	AM_F5_Index
6	AM_F6_Index
7	AM_F7_Index
8	To_Experience_Stimulation_IM_Index
9	Towards_Accomplishment_IM_Index
10	To_Know_IM_Index
11	Identified_EM_Index
12	Introjected_EM_Index
13	External_Regulation_EM_Index
14	Amotivation_Index
15	Past Negative ZTPI
16	Present Hedonistic ZTPI
17	Future ZTPI
18	Past Positive ZTPI
19	Present Fatalistic ZTPI
20	Opportunities_I_MDFTP
21	Limitations_I_MDFTP
22	Ambiguities_I_MDFTP
23	FTP_F1
24	FTP_F2
25	FTP_F3

Figure 267 Action Aspect of CPD: First order variables included in regression analysis

In this particular case of regression, the variables were automatically prepared by SPSS trimming of outliers and replacement of missing variables. The outliers of note are presented in the Figure 268.

Outliers

Target: Action_F1_Index=Actions_for_CPD_Activities

Record ID	Action_F1_Index=Actions_for_CPD_Activities	Cook's Distance
469	5.00	0.061
235	4.16	0.059
201	1.40	0.058
252	1.59	0.046
205	1.20	0.037
227	5.00	0.035
254	5.00	0.032
232	5.00	0.028
496	1.95	0.027
176	5.00	0.026
98	1.76	0.025
115	2.03	0.025
500	1.88	0.025
215	1.50	0.024
74	5.00	0.023
105	1.79	0.021
457	1.00	0.021
512	4.62	0.021
505	4.58	0.020
99	1.42	0.019
243	1.62	0.018
120	1.40	0.016
509	4.60	0.016
249	4.41	0.015
194	4.62	0.014
202	2.13	0.014
102	1.00	0.014
171	5.00	0.013
46	4.00	0.012
191	5.00	0.012
216	1.00	0.012

Records with large Cook's distance values are highly influential in the model computations. Such records may distort the model accuracy.

Figure 268 Action First order predictors: Outliers

It is important to examine that the assumption of normality is conformed with the Histogram and Q-Q plots in Figure 269 and Figure 270 shows conformation to the assumption of normality [287].

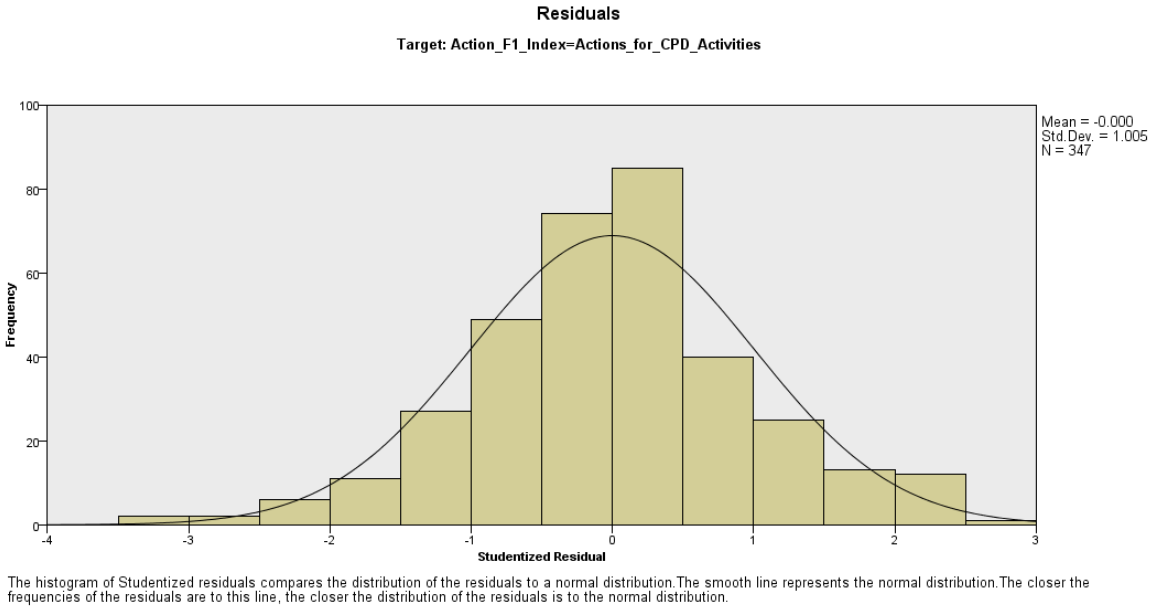

Figure 269 Action Aspect CPD First order predictors: Histogram of Studentized residuals

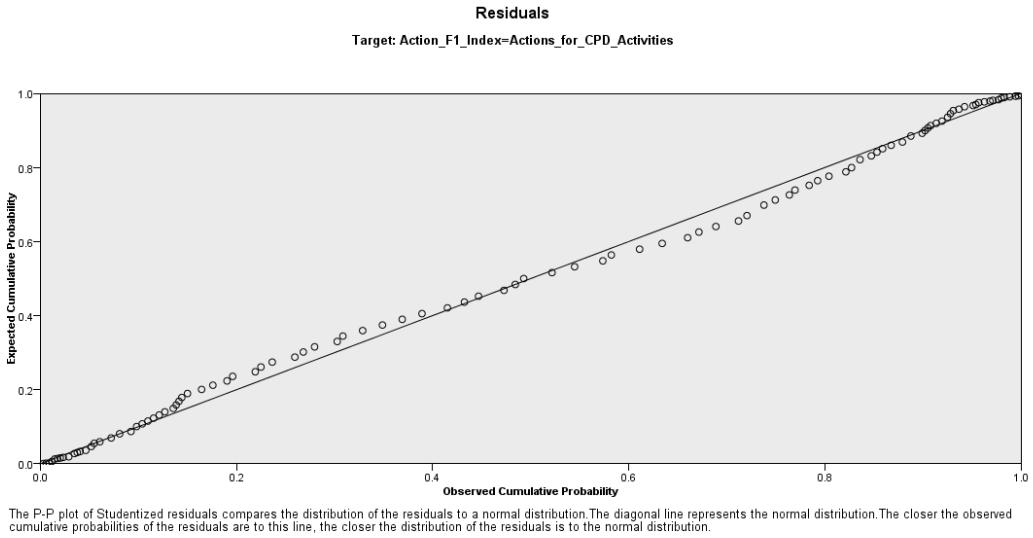

Figure 270 Action Aspect of CPD First order predictors: P-P plot of Studentized residuals

It can be seen from the slop of the Probability-Probability plot in Figure 270 shows that the variability of the residuals are similar to the variability of a normal distribution, implying that it meets the underlying assumption.

The forward stepwise regression yields 8 iterations of models before selecting the best model. The selection of models was principally based on the utility of the model using the F-Statistic Criterion by evaluating significance of the F-Value [285]. Nevertheless, taking into consideration the predictive power of the model using the R-squared value, and the quality of model by using Akaike information criterion (AIC) which evaluates relative quality of models on basis of the quantity of information lost by the model [288, 289, 290, 218] .

Figure 271 illustrates the different iterations of models gone through and shows that the best model in terms of a combination of the above-mentioned condition is model 8 with a F-Value = 4.383, which is a significant F value at α=0.05 with a p-value = .037 showing the utility of the model.

Model Building Summary

Target: Action_F1_Index=Actions_for_CPD_Activities

		Step							
		1	2	3	4	5	6	7	8
Significance of F Value		.000	.000	.001	.015	.002	.027	.033	.037
Effect	AM_F2_Index_transformed	✓	✓	✓	✓	✓	✓	✓	✓
	AM_F6_Index_transformed		✓	✓	✓	✓	✓	✓	✓
	To_Experience_Stimulation_IM_Index_transformed			✓	✓	✓	✓	✓	✓
	Amotivation_Index_transformed				✓	✓	✓	✓	✓
	AM_F1_Index_transformed					✓	✓	✓	✓
	FTP_F2_Index5_transformed						✓	✓	✓
	AM_F7_Index_transformed							✓	✓
	Past_I_Positive_ZTPI_transformed								✓

The model building method is Forward Stepwise using the F Statistic criterion.
A checkmark means the effect is in the model at this step.

Figure 271 Action Aspect of CPD Regression Analysis: Model Building/selection Summary

The selected model as shown in the Figure 272 has an AIC of -175.733 which shows a good level of information retention, the more negative the AIC the better the result [288]. An R-squared (Coefficient of determination) value 0.373 which shows a comparatively high level of predictive ability or accuracy of the model at 37.3%. The interpretation of R Squared is context specific, especially in the context of

behaviour related research where R squared equals to or greater than 10% is considered acceptable given the over determined nature of human behaviour and motivation [291, 292, 293, 294, 218].

Model Summary

Target	Action_F1_Index=Actions_for_CPD_Activities
Automatic Data Preparation	On
Model Selection Method	Forward Stepwise
Information Criterion	-175.733

The information criterion is used to compare to models. Models with smaller information criterion values fit better.

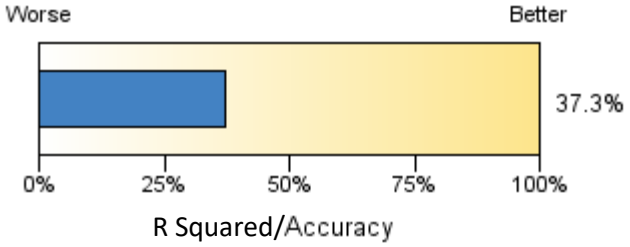

Figure 272 Action Aspect of CPD Model Summary: AIC and R Squared

The predictors from selected iterations as shown Figure 271 had 8 first-order variables along the three main dimensions of motivation that are of relevance to this study. Along the Source dimension Self determined motivation: 1) 'To_Experience_Stimulation_IM_Index' denotative of Intrinsic motivation towards stimulation , and 2) 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined motivation/amotivation'. Along the Intensity Dimension – achievement motivation: 3) 'AM_F1_Index' denotative of 'Achievement motivation in the context of Avoidance of Task', 4) 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', 5) 'AM_F6_Index' denotative achievement motivation focused on a desire to plan or adequate preparation ('Affinity for Planning') and 6) AM_F7_Index denotative of 'Dislike of Failure' which is indicative of 'an extent of intolerance for failure, with concerted effort to prevent failure through hard work'. Along Time Perspective dimension: 7) 'FTP_F2' that is denotative of 'extremely opened future time perspective' and 8) Past_I_Postive_ZTPI denotative of 'Past Positive dimension of Zimbardo time Perspective implying a

positive sentimental attitude to past forgone'. Thus, confirming the hypothesis that states that, there are Predictors of the Action Aspect of CPD among first-order variable of identified and emergent dimensions of motivation.

The level of importance is a relative value that ranges between 0 and 1 for each variable but whose sum for all the variables in the model never exceeds one [295]. Figure 273 shows the ranking of the variables in terms of importance.

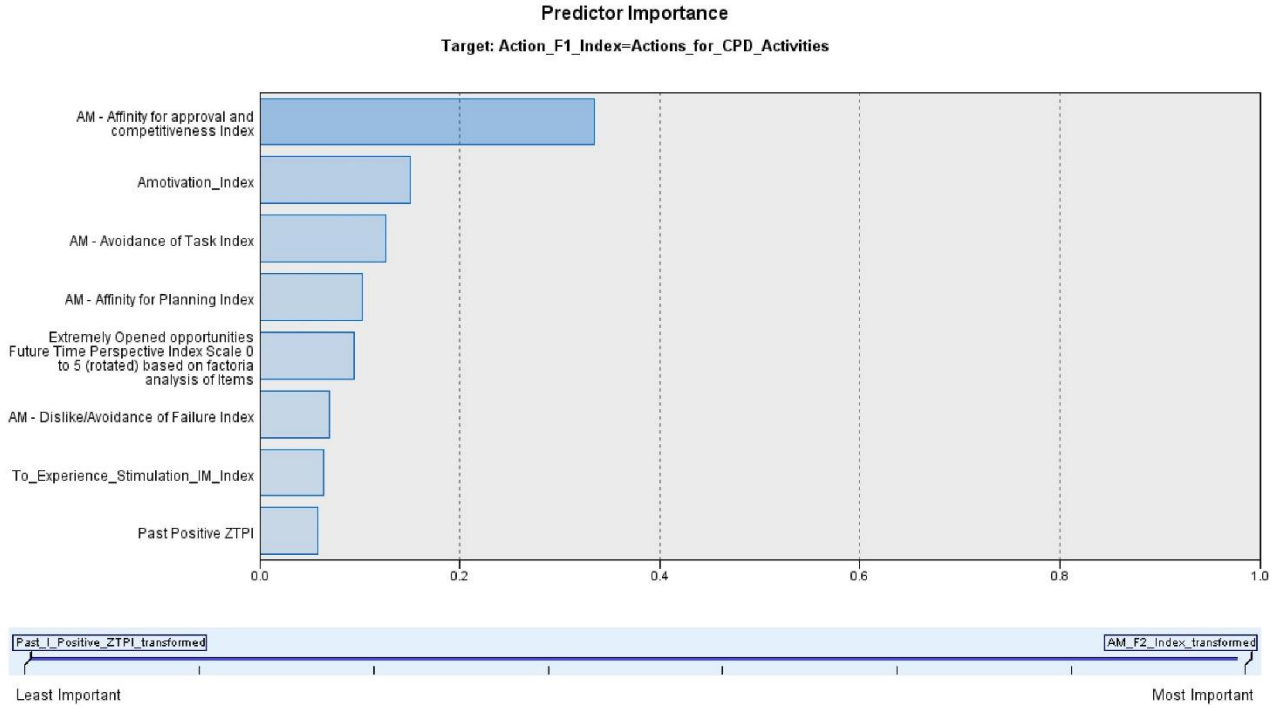

Figure 273 Level of Engagement with Action aspects of CPD First-order predictors: Predictors important

In terms of level of importance, the most important of the predictor variables (as shown in Figure 273) was the variable 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness' at a relative importance level of 0.33 while the least important predictor was 'Past_I_Postive_ZTPI' denotative of 'Past Positive dimension of Zimbardo time Perspective implying a positive sentimental attitude to past forgone' at a relative importance level of 0.06. Showing that an individual's Affinity for approval and competitiveness is the most important factor in predicting/determining the extent to which the individual would engage with the Action Aspect of CPD, and has the greatest effect on the individual's level of engagement with the Action Aspect of CPD. While the individual's positive sentimental attitude to past forgone is the least important factor in predicting/determining the extent to which the individual would engage with the

action Aspect of CPD and has the least effect on the individual's level of engagement with the Action aspect of CPD. In so doing confirming the hypothesis that states that, compared to other first order dimensions of motivation, 'Affinity for approval and competitiveness' form of Achievement motivation (AM_F2_Index) has a greater effect on Level of engagement with the Action aspect of CPD.

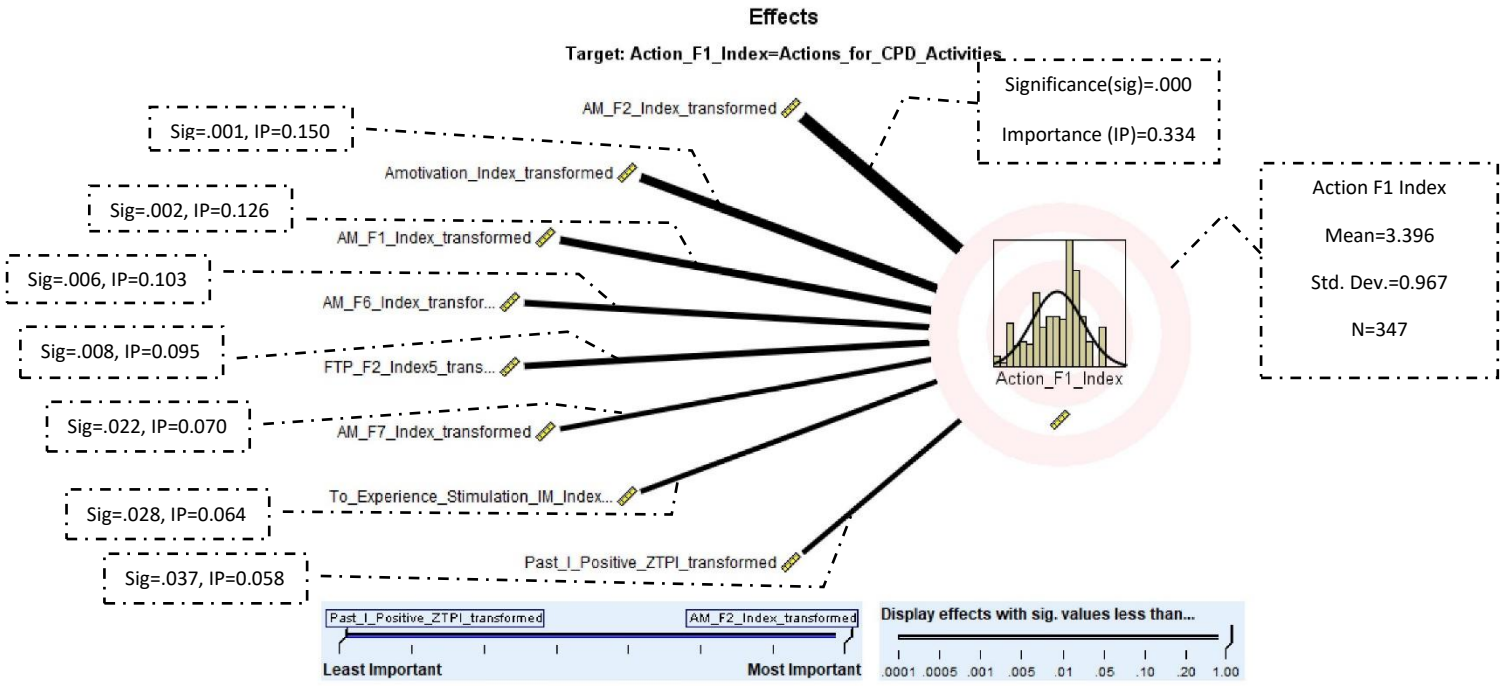

Figure 274 Illustration of regression models: Effects of Predictor variable on Level of engagement with Action aspect of CPD in descending order

Figure 274 goes further to illustrate the effect of the individual predictor variables on the level of engagement with Action aspect CPD in descending order of importance. While illustrating the significance of the effect of each predictor variable employing the thickness of the lines, with thicker lines symbolising a predictor of Level of engagement with Action aspect of CPD with higher significant effect. As shown in Figure 274 all the predictor effects are significant at $\alpha = 0.05$ with p-value ranging between .000 to .037, but have different levels of importance in terms of effect ranging from 0.058 to 0.334.

Figure 275 on the other hand, contains the results of the ANOVA; further providing details of the model effects illustrated by Figure 275, including the Sum of squares indicating that the data is well represented by the model and the F – statistics indicating the utility of the model.

Effects

Target: Action_F1_Index=Actions_for_CPD_Activities

Source	Sum of Squares	df	Mean Square	F	Sig.	Importance
Corrected Model ▼	125.277	8	15.660	26.700	.000	
AM_F2_Index_transformed	14.870	1	14.870	25.353	.000	0.334
Amotivation_Index_transformed	6.667	1	6.667	11.367	.001	0.150
AM_F1_Index_transformed	5.620	1	5.620	9.582	.002	0.126
AM_F6_Index_transformed	4.575	1	4.575	7.801	.006	0.103
FTP_F2_Index5_transformed	4.207	1	4.207	7.173	.008	0.095
AM_F7_Index_transformed	3.103	1	3.103	5.291	.022	0.070
To_Experience_Stimulation_IM_Index_transformed	2.845	1	2.845	4.851	.028	0.064
Past_I_Positive_ZTPI_transformed	2.570	1	2.570	4.383	.037	0.058
Residual	198.240	338	0.587			
Corrected Total	323.516	346				

Figure 275 Level of engagement with Action aspect of CPD First-order predictors: ANOVA table indicating the effects and nature of relationship between variables in the model

The global F statistic of the entire model with F-ration 26.700 and 8 degrees of freedom, is found to be highly significant at $\alpha = 0.05$ with p-value= .000 as shown in Figure 275. The large F-ratio indicating that a linear model is more appropriate for the data than a non-linear model. The significance of the F-statistics further implies that at least one of the coefficients for the parameters predicting Level of engagement with the Action Aspect of CPD in the models is non-zero. This indicates that there is at least a linear relationship between the variables in the model, connoting that the model merits further consideration and is useful for further prediction and that the model predicts the Level of engagement with the Action Aspect of CPD(A-LECPD) reasonably well [282]. To further evaluate how well the model predicts the level of engagement with CPD, a plot of the predicted value of A-LECPD against the observed value is produced as show in Figure 276 .

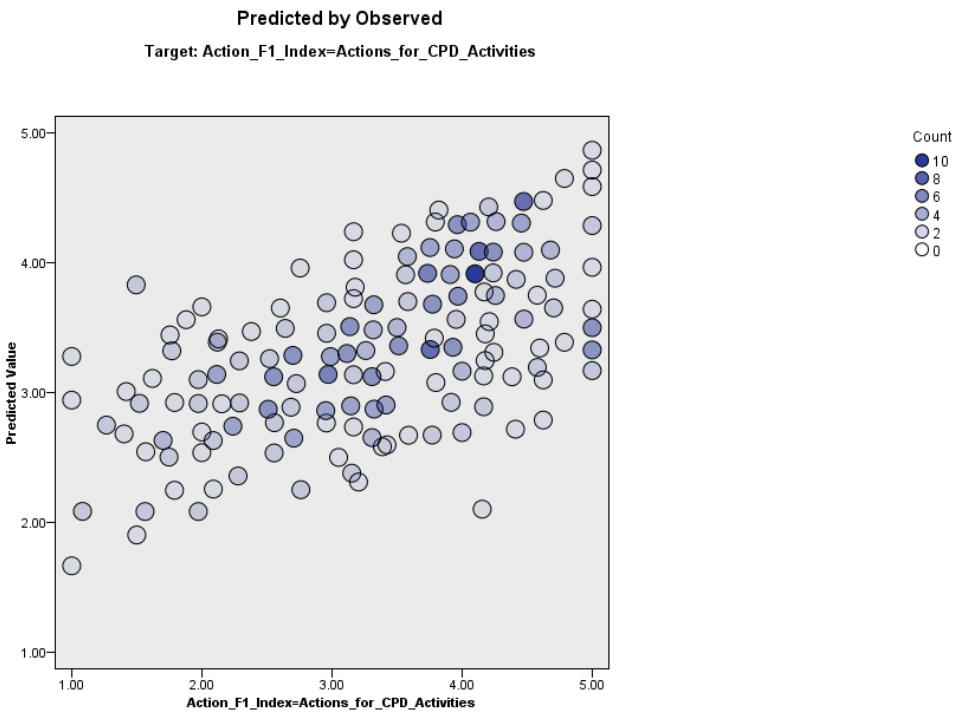

Figure 276 Action Aspect of CPD First-order predictors: Predicted Vs observed value of Action Aspect of CPD

Figure 276 is a scatterplot of predicted value versus observed value of A-LECPD. Observed value imply the original computed value of A-LECPD. It can be seen from Figure 276 that a 45 degree line can be drawn through the middle of the points on the plot, which indicates that the target variable is well predicted by the model.

It can also be seen from Figure 275 that all the individual predictors with F-ratio ranging from 25.353 to 4.383 are also found to be significant at $\alpha = 0.05$ with p-value ranging from .000 to .037 (Figure 275) showing that there is a linear relationship between the Criterion variable and each of the predictor variables. Further showing that not only is the model useful in predicting the value of A-LECPD but that each of the parameters are useful to that effect. Figure 277 below sheds further light on the linear relationship between the individual predictor variables and A-LECPD.

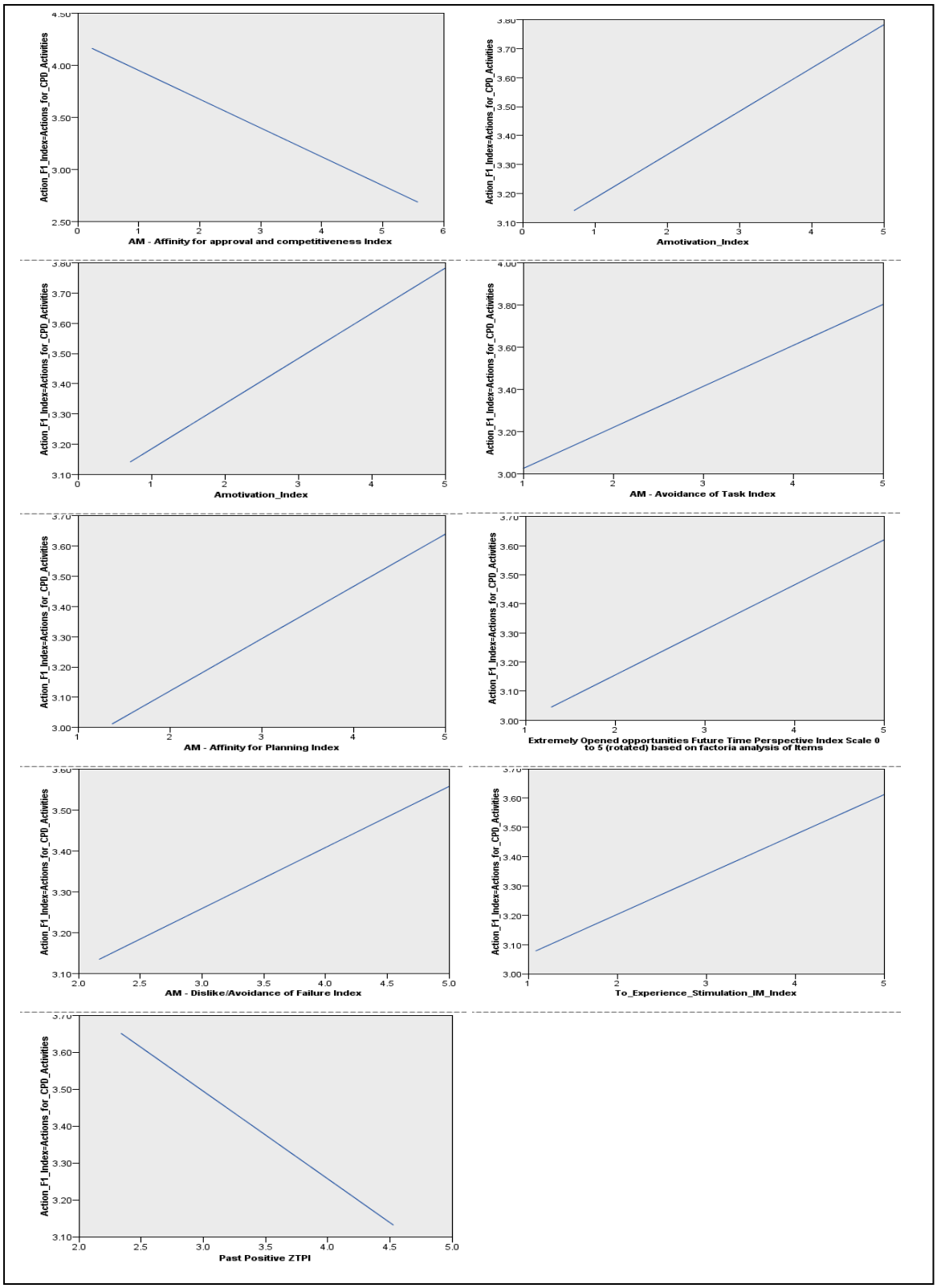

Figure 277 A-LECPD First order predictors: Estimate means Chart for significant effects (p< 0.5)

It can be seen from Figure 277 that some of the predictor variables have a direct relationship with the A-LECPD while some have an inverse relationship with LECPD; Indicating that some parameters will positively contribute to the overall engagement with Action aspect of CPD while some parameters would negatively contribute to the level of engagement with Action aspect of CPD. This is reflected in the coefficients (β) of the regression parameter as shown in Figure 278.

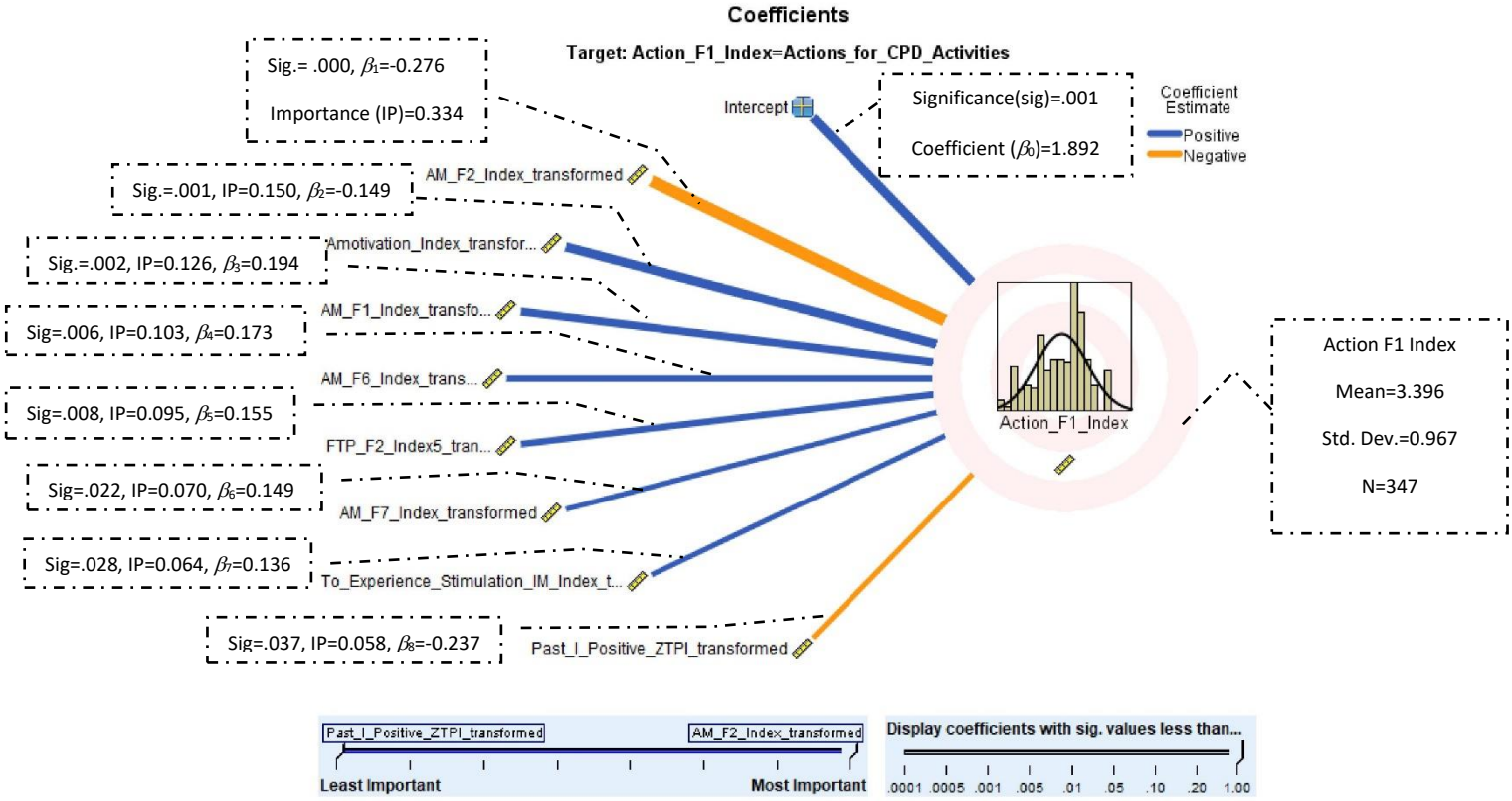

Figure 278 Illustration of regression models: the coefficients of the predictor variables including intercept

Figure 278 is a model illustrating the coefficients of the predictor variables relative to the criterion variable and to each other; as such it is a diagrammatic illustration of the model for predicting A-LECPD. The width of the lines illustrates the level of the coefficient significance of the predictor variables while the colour indicates the sign of the coefficient in terms of its relationship with or contribution to the predicted value of the target/criterion variable A-LECPD i.e. direct (positive) or inverse (negative) While Figure 279 provides (ranked in order of importance) some of the information reflected in the illustration in Figure 278 such as coefficient, significance, importance of each predictor variable and additional information such as the standard error, t statistics and confidence interval which shed more light on the nature of the predictive.

Coefficients

Target: Action_F1_Index=Actions_for_CPD_Activities

Model Term	Coefficient ▼	Std.Error	t	Sig.	95% Confidence Interval		Importance
					Lower	Upper	
Intercept	1.892	0.566	3.343	.001	0.779	3.005	
AM_F2_Index_transformed	-0.276	0.055	-5.035	.000	-0.384	-0.168	0.334
Amotivation_Index_transformed	0.149	0.044	3.372	.001	0.062	0.237	0.150
AM_F1_Index_transformed	0.194	0.063	3.096	.002	0.071	0.318	0.126
AM_F6_Index_transformed	0.173	0.062	2.793	.006	0.051	0.295	0.103
FTP_F2_Index5_transformed	0.155	0.058	2.678	.008	0.041	0.269	0.095
AM_F7_Index_transformed	0.149	0.065	2.300	.022	0.022	0.277	0.070
To_Experience_Stimulation_IM_Index_transformed	0.136	0.062	2.203	.028	0.015	0.258	0.064
Past_I_Positive_ZTPI_transformed	-0.237	0.113	-2.093	.037	-0.460	-0.014	0.058

Figure 279 A-LECPD First-order predictors: values, significance tests, and confidence intervals for the individual model coefficients

Further to the Anova table and F-statistics the coefficients tell us the extent to which each variable contributes to calculating the value of the predicted/criterion variable A-LECPD and the level of significance of the contribution. From Figure 278 and Figure 279 it can be seen that the contribution of all the predictor variable with coefficient range from -0.276 To 0.194 are all significant at α= 0.05 with p-value ranging from .000 to .037. The Intercept with Coefficient β_0= 1.892 p-value = .001 is also highly significant at α= 0.05.

It can also be seen that the variable for 'AM_F1_Index' denotative of 'Achievement motivation in the context of Avoidance of Task' makes the largest positive contribution when calculating the deterministic value of level of engagement with Action aspect of CPD as it has the highest Coefficient β_2=0.194, P-Value=.002). It is interesting that 'AM_F1_Index' with IP=0.126 and β_2=0.194 makes a greater contribution to the deterministic value than AM_F2_Index which is the most important first-order predictor of level of engagement with Action aspect of CPD with IP=0.334, β_1=-0.276. It is also further interesting that the most important predictors AM_F2_Index also makes the most negative contribution to the deterministic value with β_1=-0.276 indicative of an inverse relationship.

In line with the Equation 92 the equation that denotes the regression model for prediction of A-LECPD on the basis of First-order dimension of motivation is as shown in Equation 100, all the effects or coefficients in the equation are significant.

$$Y_A = f(X_{AF1}, X_{AF2}, X_{AF3}, X_{AF4}, X_{AF5}, X_{AF6}, X_{AF7}, X_{AF8})$$

$$Y_A = 1.892 - 0.276X_{AF1} + 0.149X_{AF2} + 0.194X_{AF3} + 0.173X_{AF4} + 0.155X_{AF5} + 0.149X_{AF6} + 0.136X_{AF7} - 0.237X_{AF8}$$

where

Y_A is the dependent variable= A-LECPD

$X_{AF1}, X_{AF2}, X_{AF3}, X_{AF4}, X_{AF5}, X_{AF6}, X_{AF7}, X_{AF8}$ are the First-order independent variables

X_{AF1} = 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness',

X_{AF2} = 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined motivation/amotivation',

X_{AF3} = 'AM_F1_Index' denotative of 'Achievement motivation in the context of Avoidance of Task',

X_{AF4} = 'AM_F6_Index' denotative achievement motivation focused on a desire to plan or adequate preparation ('Affinity for Planning'),

X_{AF5} = 'FTP_F2' that is denotative of 'extremely opened future time

Equation 100 A-LECPD First-order predictors: Multiple regression model

11.2.3 First-order predictors (Base value predictors) of the Result Aspect of CPD

Linear Regression was carried out to test the hypothesis stating that: 1) There are Predictors of level of engagement with the Result aspect of CPD among first-order variables of identified and emergent dimensions of motivation and 2) Compared to other first order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Result aspect of CPD.

Linear regression was carried out using SPSS Automatic linear modelling feature with a Forward stepwise model selection method. The entry and removal criteria were on the bases of F Statistics, including variables/effects with p-value less than 0.05 and removing variable/effects with p-value greater than 0.1.

In carrying out the forward stepwise regression first-order variables across different dimensions of motivations (as shown in Figure 280) were selected as possible dependent/predictor variables and included in the regression analysis, while Level of engagement with the Result aspect of CPD was the Target/dependent/Criterion variable.

	First order variable as Dependent Variables
1	AM_F1_Index
2	AM_F2_Index
3	AM_F3_Index
4	AM_F4_Index
5	AM_F5_Index
6	AM_F6_Index
7	AM_F7_Index
8	To_Experience_Stimulation_IM_Index
9	Towards_Accomplishment_IM_Index
10	To_Know_IM_Index
11	Identified_EM_Index
12	Introjected_EM_Index
13	External_Regulation_EM_Index
14	Amotivation_Index
15	Past Negative ZTPI
16	Present Hedonistic ZTPI
17	Future ZTPI
18	Past Positive ZTPI
19	Present Fatalistic ZTPI
20	Opportunities_I_MDFTP
21	Limitations_I_MDFTP
22	Ambiguities_I_MDFTP
23	FTP_F1
24	FTP_F2
25	FTP_F3

Figure 280 Result Aspect of CPD: First order variables included in regression analysis

In this case of regression, the variables were automatically prepared by SPSS Trimming of outliers and replacement of missing variables. The outliers of note are presented in the Figure 281.

Outliers

Target: Result Combined Index 0 to 5

Record ID	Result Combined Index 0 to 5	Cook's Distance
418	1.80	0.075
220	5.00	0.042
201	1.97	0.038
218	5.00	0.036
174	1.00	0.034
459	1.00	0.029
36	4.22	0.028
262	3.77	0.024
270	1.00	0.020
232	4.59	0.020
474	2.23	0.019
241	2.51	0.016
34	4.00	0.014
179	4.45	0.013
529	4.04	0.013
415	1.83	0.013
237	2.86	0.012
497	3.10	0.012
224	1.97	0.012

Records with large Cook's distance values are highly influential in the model computations. Such records may distort the model accuracy.

Figure 281 Result First order predictors: Outliers

It is important to examine that the assumption of normality is conformed with, the Histogram and Q-Q plots in Figure 282 and Figure 283 shows conformation to the assumption of normality [287].

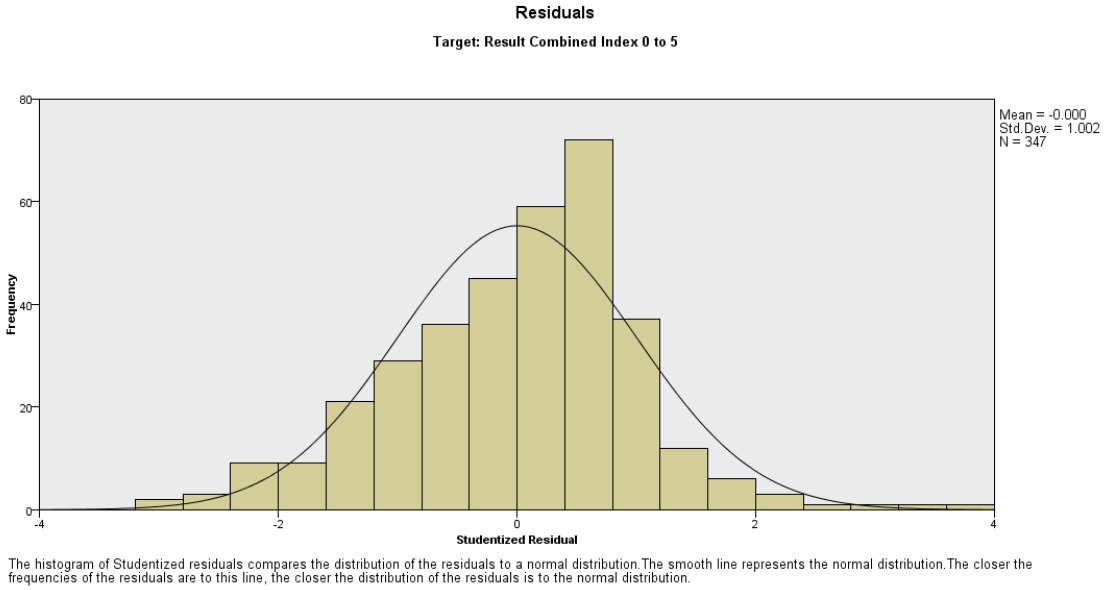

Figure 282 Result Aspect CPD First order predictors: Histogram of Studentized residuals

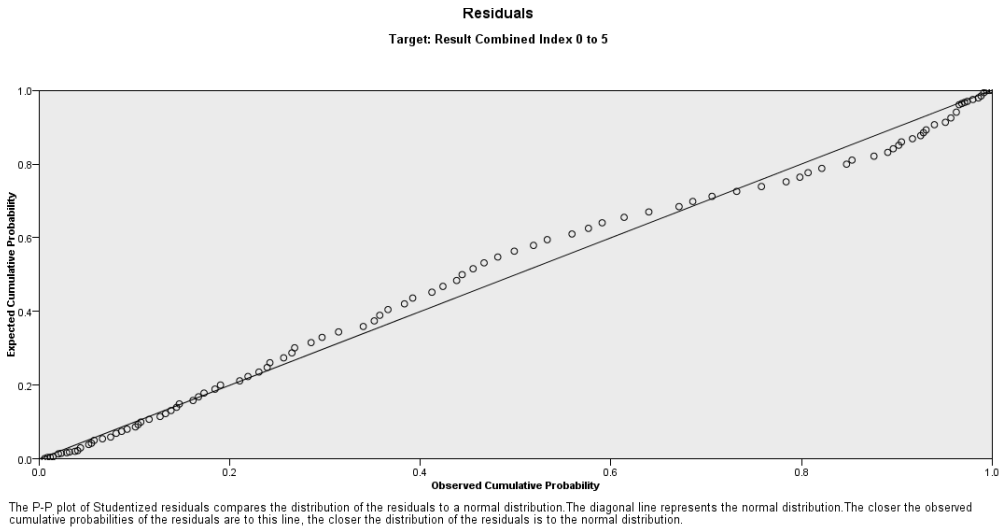

Figure 283 Result Aspect of CPD First order predictors: P-P plot of Studentized residuals

It can be seen from the slop of the Probability-Probability plot in Figure 283 shows that the variability of the residuals are similar to the variability of a normal distribution, implying that it meets the underlying assumptions.

The forward stepwise regression yields 4 iterations of models before selecting the best model. The selection of model was principal based on the utility of the model using the F-Statistic Criterion by

evaluating significance of the F-Value [285]. Nevertheless, taking into consideration the predictive power of the model using the RT-squared value, and the quality of model by using Akaike information criterion (AIC) which evaluates relative quality of models on basis of the quantity of information lost by the model [288, 289, 290, 218] .

Figure 284 illustrates the different iterations of models gone through and shows that the best model in terms of a combination of the above-mentioned conditions is model 4 with a F-Value = 5.561, which is a significant F value at α=0.05 with a p-value = .019 showing the utility of the model.

Model Building Summary

Target: Result Combined Index 0 to 5

		Step			
		1	2	3	4
Significance of F Value		.000	.000	.000	.019
Effect	AM_F2_Index_transformed	✓	✓	✓	✓
	AM_F6_Index_transformed		✓	✓	✓
	Amotivation_Index_transformed			✓	✓
	Identified_EM_Index_transformed				✓

The model building method is Forward Stepwise using the F Statistic criterion.
A checkmark means the effect is in the model at this step.

Figure 284 Result Aspect of CPD Regression Analysis: Model Building/selection Summary

The selected model as shown in the Figure 285 has an AIC of -368.186 which shows a good level of information retention, the more negative the AIC the better the result [288]. An RT-squared (Coefficient of determination) value 0.437which shows a comparatively high level of predictive ability or accuracy of the model at 43.7%. The interpretation of R Squared is context specific, especially in the context of behaviour related research where R squared equals to or greater than 10% is considered acceptable given the over determined nature of human behaviour and motivation [291, 292, 293, 294, 218].

Model Summary

Target	Result Combined Index 0 to 5
Automatic Data Preparation	On
Model Selection Method	Forward Stepwise
Information Criterion	-368.186

The information criterion is used to compare to models.
Models with smaller information criterion values fit better.

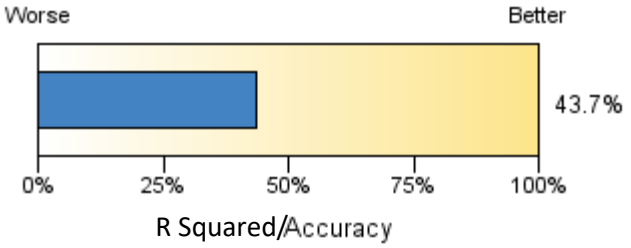

Figure 285 Result Aspect of CPD Model Summary: AIC and R Squared

The predictors from selected iteration as shown Figure 284 had 4 first-order variables along the three main dimensions of motivation that are of relevance to this study. Along the Source dimension Self determined motivation: 1) 'Identified_EM_Index' denotative of 'Identified Extrinsic motivation' and 2) 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined motivation/amotivation'. Along the Intensity Dimension – achievement motivation: 3) 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', 4) 'AM_F6_Index' denotative achievement motivation focused on a desire to plan or adequate preparation ('Affinity for Planning'). Thus, confirming the hypothesis that states that, there are Predictors of the Result Aspect of CPD among first-order variables of identified and emergent dimensions of motivation (Source and Intensity).

The level of importance is a relative value that ranges between 0 and 1 for each variable but whose sum for all the variables in the model never exceeds one [295]. Figure 286 shows the ranking of the variables in terms of importance.

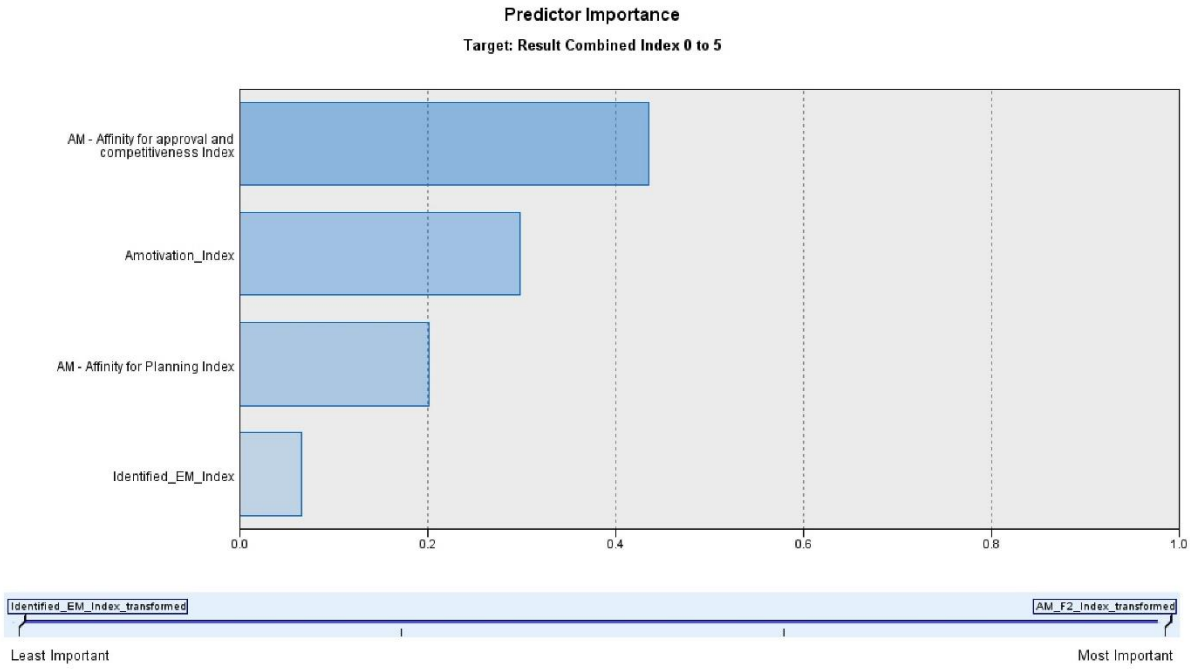

Figure 286 Level of Engagement with Result aspects of CPD First-order predictors: Predictors important

In terms of level of importance, the most important of the predictor variables (as shown in Figure 286) was the variable 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness' at a relative importance level of 0.43 while the least important predictor was 'Identified_EM_Index' denotative of 'Identified Extrinsic motivation' at a relative importance level of 0.07. Showing that an individual's Affinity for approval and competitiveness is the most important factor in predicting/determining the extent to which the individual would engage with the Result Aspect of CPD, and has the greatest effect on the individual's level of engagement with the Result Aspect of CPD. While the individual's Identified Extrinsic Motivation is the least important factor in predicting/determining the extent to which the individual would engage with the Result Aspect of CPD and has the least effect on the individual's level of engagement with the Result aspect of CPD. In so doing confirming the hypothesis that states that, compared to other first order dimensions of motivation, 'Affinity for approval and competitiveness' form of Achievement motivation (AM_F2_Index) has a greater effect on Level of engagement with the Result aspect of CPD.

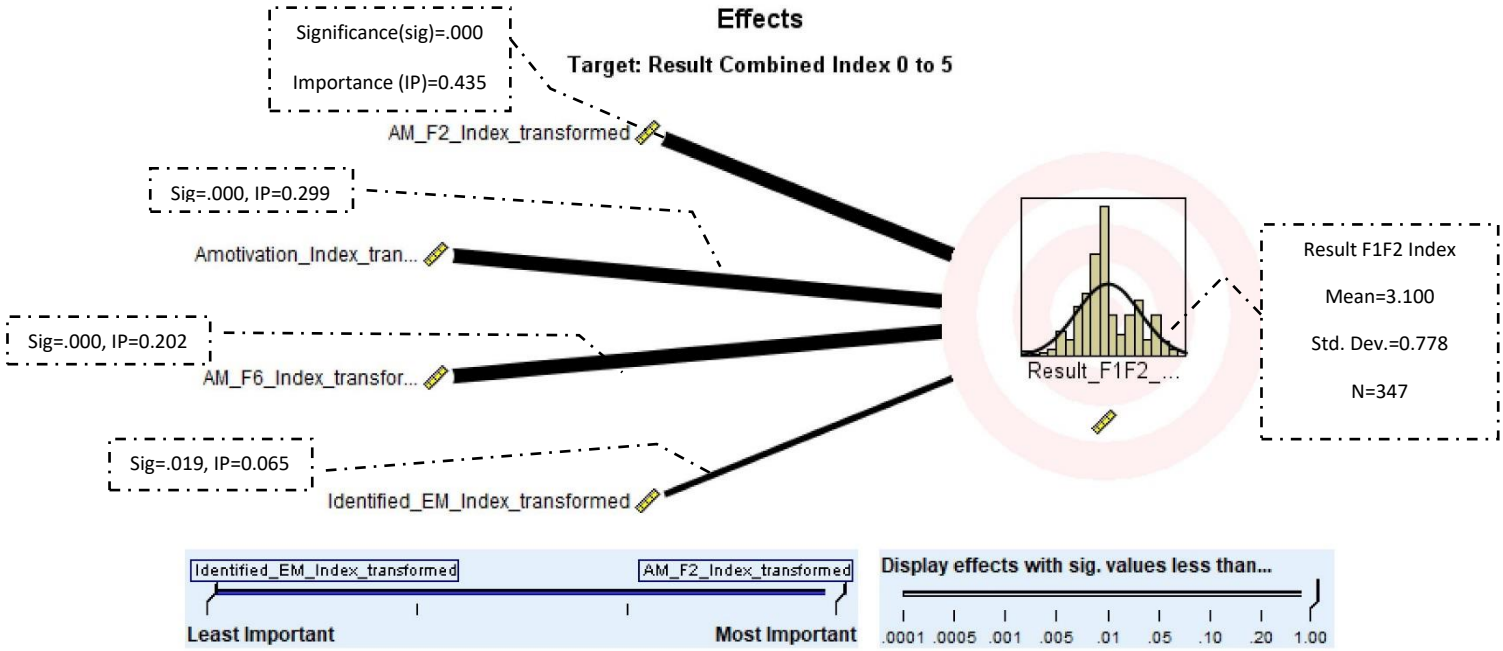

Figure 287 Illustration of regression models: Effects of Predictor variable on Level of engagement with Result aspect of CPD in descending order

Figure 287 goes further to illustrate the effect of the individual predictor variables on the level of engagement with Result aspect CPD in descending order of importance. While illustrating the effect significance of each predictor variable employing the thickness of the lines, with thicker lines symbolising a predictor of Level of engagement with Result aspect of CPD with higher significant effect. As shown in Figure 287 all the predictor effects are significant at $\alpha = 0.05$ with p-value ranging between .000 to .019, but have different levels of importance in terms of effect ranging from 0.065 to 0.435.

Figure 288 on the other hand, contains the results of the ANOVA further providing details of the model effects illustrated by Figure 288, including the sum of squares indicating that the data is well represented by the model and the F – statistics indicating the utility of the model.

Effects

Target: Result Combined Index 0 to 5

Source	Sum of Squares	df	Mean Square	F	Sig.	Importance
Corrected Model ▼	93.023	4	23.256	68.198	.000	
AM_F2_Index_transformed	12.662	1	12.662	37.132	.000	0.435
Amotivation_Index_transformed	8.692	1	8.692	25.491	.000	0.299
AM_F6_Index_transformed	5.869	1	5.869	17.212	.000	0.202
Identified_EM_Index_transformed	1.896	1	1.896	5.561	.019	0.065
Residual	116.623	342	0.341			
Corrected Total	209.646	346				

Figure 288 Level of engagement with Result aspect of CPD First-order predictors: ANOVA table indicating the effects and nature of relationship between variables in the model

The global F statistic of the entire model with F-ration 68.198 and 4 degrees of freedom, is found to be highly significant at $\alpha = 0.05$ with p-value= .000 as shown in Figure 288. The large F-ratio indicating that a linear model is more appropriate for the data than a non-linear model. The significance of the F-statistics further implies that at least one of the coefficients for the parameters predicting Level of engagement with the Result Aspect of CPD in the models is non-zero. This indicates that there is at least a linear relationship between the variables in the model, connoting that the model merits further consideration and is useful for further prediction and that the model predicts the Level of engagement with the Result Aspect of CPD(RT-LECPD) reasonably well [282]. To further evaluate how well the model predicts the level of engagement with CPD, a plot of the predicted value of RT-LECPD against the observed value is produced as show in Figure 289.

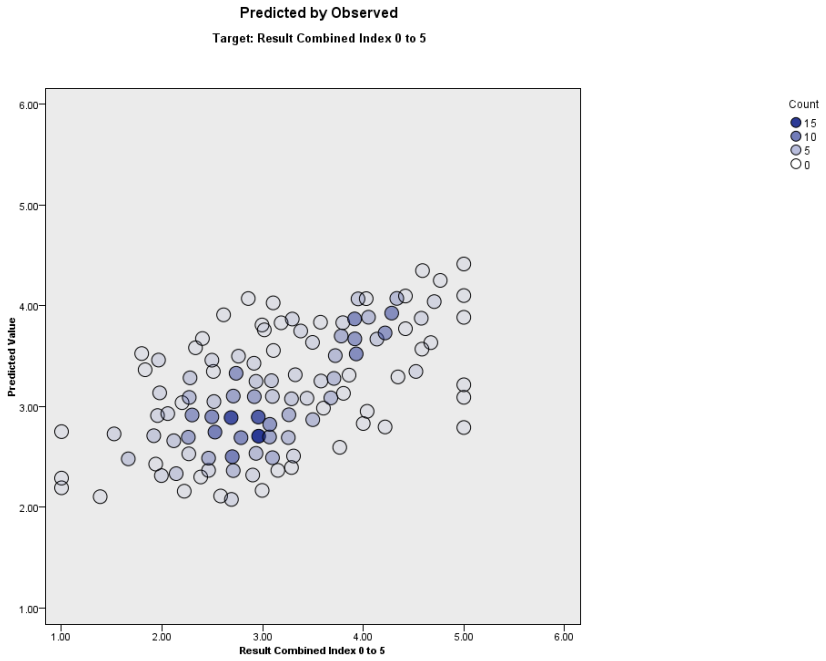

Figure 289 Result Aspect of CPD First-order predictors: Predicted Vs observed value of Result Aspect of CPD

Figure 289 is a scatterplot of predicted value versus observed value of RT-LECPD. Observed value imply the original computed value of RT-LECPD. It can be seen from Figure 289 that a 45 degree line can be drawn through the middle of the points on the plot, which indicates that the target variable is well predicted by the model.

It can also be seen from Figure 288 that all the individual predictors with F-ratio ranging from 37.132 to 5.561 are also found to be significant at $\alpha = 0.05$ with p-value ranging from .000 to .019 (Figure 288) showing that there is a linear relationship between the Criterion variable and each of the predictor variables. Further showing that not only is the model useful in predicting the value of RT-LECPD but that each of the parameters are useful to that effect. Figure 289 below sheds further light on the linear relationship between the individual predictor variables and RT-LECPD.

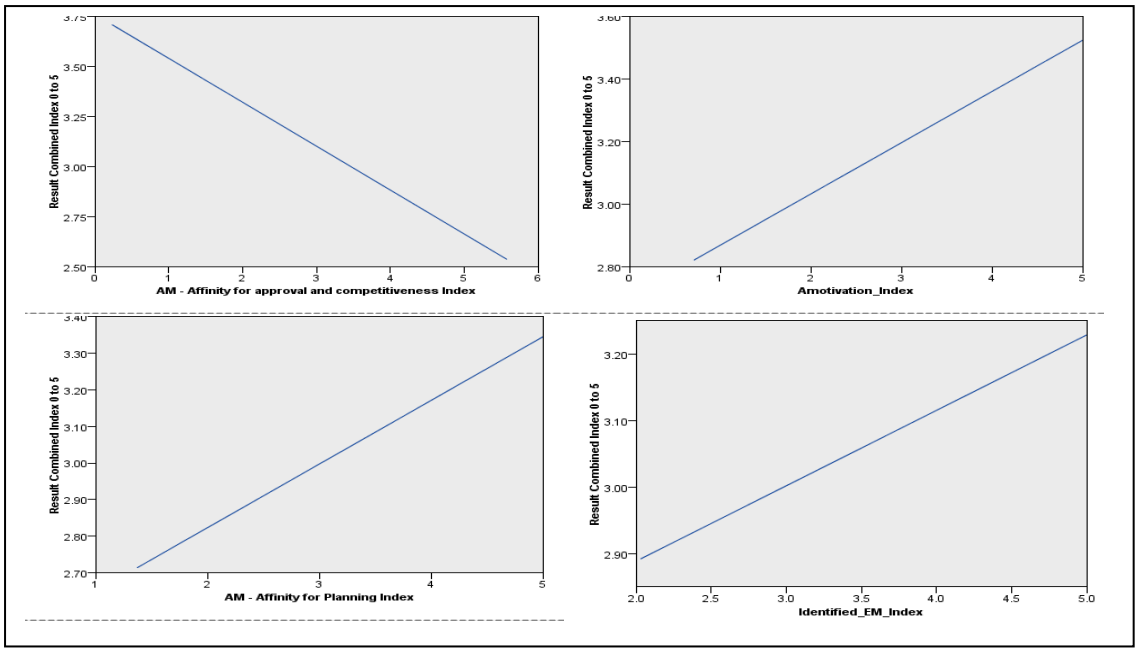

Figure 290 RT-LECPD First order predictors: Estimate means Chart for significant effects (p< 0.5)

It can be seen from Figure 290 that some of the predictor variables have a direct relationship with the RT-LECPD while some have an inverse relationship with LECPD; Indicating that some parameters will positively contribute to the overall engagement with Result aspect of CPD while some parameters would negatively contribute to the level of engagement with Result aspect of CPD. This is reflected in the coefficients (β) of the regression parameter as shown in Figure 290.

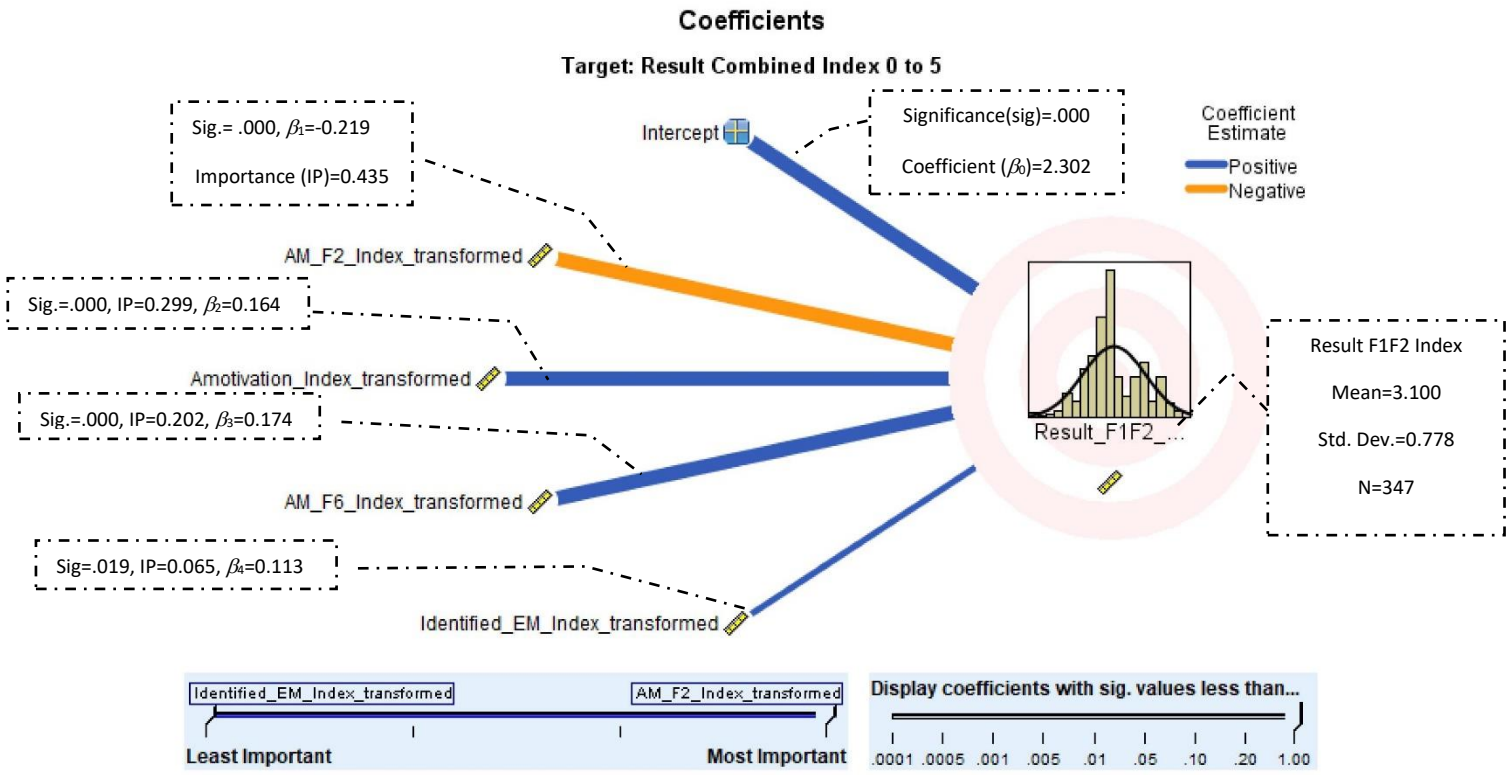

Figure 291 Illustration of regression models: the coefficients of the predictor variables including intercept

Figure 291 is a model illustrating the coefficients of the predictor variables relative to the criterion variable and to each other; as such it is a diagrammatic illustration of the model for predicting RT-LECPD. The width of the lines illustrates the level of the coefficient significance of the predictor variables while the colour indicates the sign of the coefficient in terms of its relationship with or contribution to the predicted value of the target/criterion variable RT-LECPD i.e. direct (positive) or inverse (negative) While Figure 291 provides (ranked in order of importance) some of the information reflected in the illustration in Figure 292 such as coefficient, significance, importance of each predictor variable and additional information such as the standard error, t statistics and confidence interval which shed more light on the nature of the predictive.

Coefficients

Target: Result Combined Index 0 to 5

Model Term	Coefficient ▼	Std.Error	t	Sig.	95% Confidence Interval		Importance
					Lower	Upper	
Intercept	2.302	0.289	7.957	.000	1.733	2.870	
AM_F2_Index_transformed	-0.219	0.036	-6.094	.000	-0.290	-0.148	0.435
Amotivation_Index_transformed	0.164	0.032	5.049	.000	0.100	0.228	0.299
AM_F6_Index_transformed	0.174	0.042	4.149	.000	0.091	0.256	0.202
Identified_EM_Index_transformed	0.113	0.048	2.358	.019	0.019	0.208	0.065

Figure 292 RT-LECPD First-order predictors: values, significance tests, and confidence intervals for the individual model coefficients

Further to the Anova table and F-statistics the coefficients tell us the extent to which each variable contributes to calculating the value of the predicted/criterion variable RT-LECPD and the level of significance of the contribution. From Figure 291 and Figure 292 it can be seen that the contribution of all the predictor variable with coefficient range from -0.219 To 0.174 are all significant at α= 0.05 with p-value ranging from .000 to .019. The Intercept with Coefficient β_0= 2.302 p-value = .000 is also highly significant at α= 0.05.

It can also be seen that the variable for 'AM_F6_Index' denotative achievement motivation focused on a desire to plan or adequate preparation ('Affinity for Planning') makes the largest positive contribution when calculating the deterministic value of level of engagement with Result aspect of CPD as it has the highest Coefficient β_3=0.174, P-Value=.000). It is interesting that 'AM_F6_Index' with IP=0.202 and β_3=0.174 makes a greater contribution to the deterministic value than AM_F2_Index which is the most important first-order predictor of level of engagement with Result aspect of CPD with IP=0.435, β_1=-0.219 . It is also further interesting that the most important predictors AM_F2_Index also makes the most negative contribution to the deterministic value with β_1=-0.219 indicative of an inverse relationship.

In line with the Equation 92 the equation that denotes the regression model for prediction of RT-LECPD on the basis of First-order dimension of motivation is as shown in Equation 101 R-LECPD First-order predictors: Multiple regression model, all the effects or coefficients in the equation are significant.

$$Y_{RT} = f(X_{RTF1}, X_{RTF2}, X_{RTF3}, X_{RTF4},)$$

$$Y_{RT} = 2.302 - 0.219X_{RT1} + 0.164X_{RTF2} + 0.174X_{RTF3} + 0.113X_{RTF4}$$

where

Y_{RT} is the dependent variable= RT-LECPD

$X_{RTF1}, X_{RTF2}, X_{RTF3}, X_{RTF4},$ are the First-order independent variables

X_{RTF1} = 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness',

X_{RTF2} = 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined motivation/amotivation',

X_{RTF3} = 'AM_F6_Index' denotative achievement motivation focused on a desire to plan or adequate preparation ('Affinity for Planning'),

X_{RTF4} = 'Identified_EM_Index' denotative of 'Identified Extrinsic motivation'

Equation 101 R-LECPD First-order predictors: Multiple regression model

11.2.4 First-order predictors (Base value predictors) of the Reflection Aspect of CPD

Linear Regression was carried out to test the hypothesis stating that: 1) There are Predictors of level of engagement with the Reflection aspect of CPD among first-order variables of identified and emergent dimensions of motivation and 2) Compared to other first order dimensions of motivation, 'AM_F5_Index denotative of 'Achievement Motivation in the context of Affinity of Challenge', has a greater effect on Level of engagement with the Reflection aspect of CPD.

Linear regression was carried out using SPSS Automatic linear modelling feature with a Forward stepwise model selection method. The entry and removal criteria was on the basis of F Statistics, including variables/effects with P-value less than 0.05 and removing variable/effects with P-value greater than 0.1.

In carrying out the forward stepwise regression first-order variables across different dimensions of motivations (as shown in Figure 293) were selected as possible dependent/predictor variables and included in the regression analysis, while Level of engagement with the Reflection aspect of CPD was the Target/dependent/Criterion variable.

	First order variable as Dependent Variables
1	AM_F1_Index
2	AM_F2_Index
3	AM_F3_Index
4	AM_F4_Index
5	AM_F5_Index
6	AM_F6_Index
7	AM_F7_Index
8	To_Experience_Stimulation_IM_Index
9	Towards_Accomplishment_IM_Index
10	To_Know_IM_Index
11	Identified_EM_Index
12	Introjected_EM_Index
13	External_Regulation_EM_Index
14	Amotivation_Index
15	Past Negative ZTPI
16	Present Hedonistic ZTPI
17	Future ZTPI
18	Past Positive ZTPI
19	Present Fatalistic ZTPI
20	Opportunities_I_MDFTP
21	Limitations_I_MDFTP
22	Ambiguities_I_MDFTP
23	FTP_F1
24	FTP_F2
25	FTP_F3

Figure 293 Reflection Aspect of CPD: First order variables included in regression analysis

In this case of regression, the variables were automatically prepared by SPSS Trimming of outliers and replacement of missing variables. The outliers of note are presented in the Figure 294.

Outliers

Target: Reflection Combined Factors

Record ID	Reflection Combined Factors	Cook's Distance
235	4.90	0.131
71	2.01	0.083
469	1.00	0.064
369	1.54	0.053
225	2.25	0.052
120	4.31	0.044
202	1.93	0.044
32	2.15	0.032
241	5.00	0.031
219	1.67	0.026
218	5.00	0.026
301	1.14	0.020
212	1.78	0.019
512	3.78	0.018

Records with large Cook's distance values are highly influential in the model computations. Such records may distort the model accuracy.

Figure 294 Reflection First order predictors: Outliers

it is important to examine that the assumption of normality is conformed with, the Histogram and Q-Q plots in Figure 295 and Figure 296 shows conformation to the assumption of normality [287].

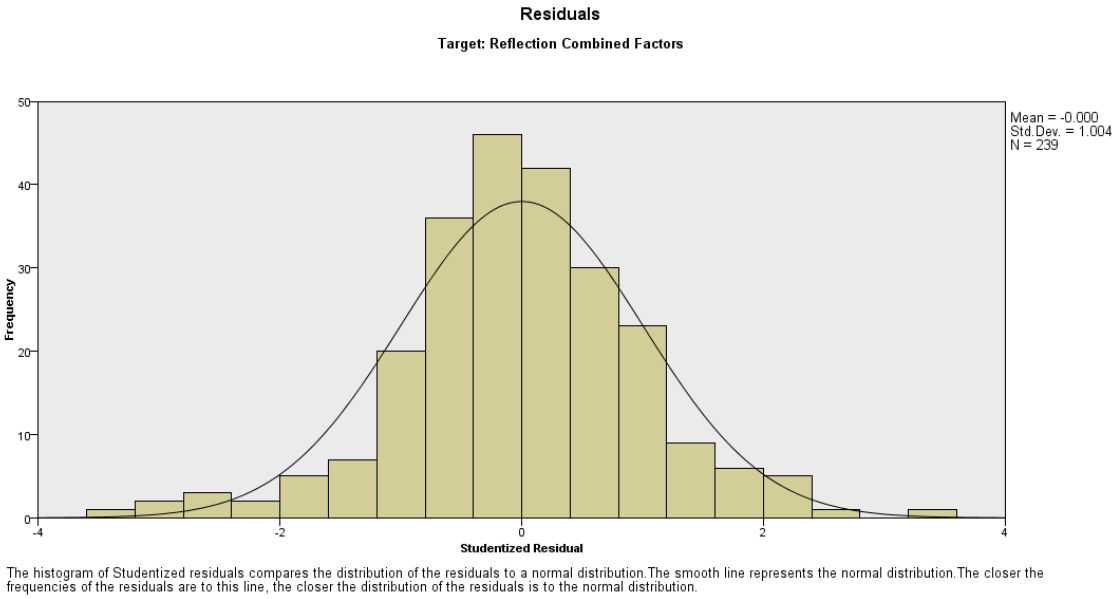

Figure 295 Reflection Aspect CPD First order predictors: Histogram of Studentized residuals

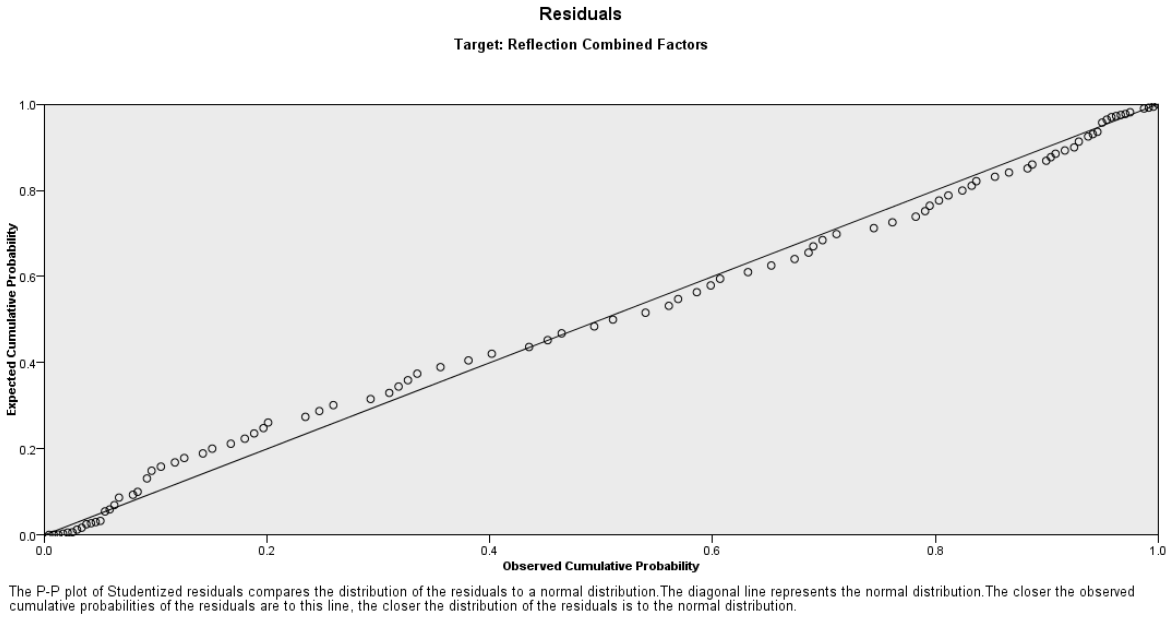

Figure 296 Reflection Aspect of CPD First order predictors: RF-P plot of Studentized residuals

It can be seen from the slop of the Probability-Probability plot in Figure 296 shows that the variability of the residuals are similar to the variability of a normal distribution, implying that it meets the underlying assumption.

The forward stepwise regression yields 6 iterations of models before selecting the best model. The selection of Models was principally based on the utility of the model using the F-Statistic Criterion by evaluating significance of the F-Value [285]. Nevertheless taking into consideration the predictive power of the model using the R-squared value, and the quality of model by using Akaike information criterion (AIC) which evaluates relative quality of models on basis of the quantity of information lost by the model [288, 289, 290, 218] .

Figure 297 illustrates the different iteration of model gone through and shows that the best model in terms of a combination of the above-mentioned condition is model 6 with a F-Value = 4.416, which is a significant F value at α=0.05 with a P-value = .037 showing the utility of the model.

Model Building Summary

Target: Reflection Combined Factors

		Step					
		1	2	3	4	5	6
Significance of F Value		.000	.000	.001	.001	.044	.037
Effect	To_Experience_Stimulation_IM_Index_transformed	✓	✓	✓	✓	✓	✓
	FTP_F2_Index5_transformed		✓	✓	✓	✓	✓
	AM_F5_Index_transformed			✓	✓	✓	✓
	AM_F2_Index_transformed				✓	✓	✓
	Opportunities_I_MDFTP_transformed					✓	✓
	Amotivation_Index_transformed						✓

The model building method is Forward Stepwise using the F Statistic criterion.
A checkmark means the effect is in the model at this step.

Figure 297 Reflection Aspect of CPD Regression Analysis: Model Building/selection Summary

The selected model as shown in the Figure 298 has an AIC of -182.719 which shows a good level of information retention, the more negative the AIC the better the result [288]. An R-squared (Coefficient of determination) value 0.277 which shows a comparatively high level of predictive ability or accuracy of the model at 27.7%. The interpretation of R Squared is context specific, especially in the context of

behaviour related research where R squared equals to or greater than 10% is considered acceptable given the over determined nature of human behaviour and motivation [291, 292, 293, 294, 218].

Model Summary

Target	Reflection Combined Factors
Automatic Data Preparation	On
Model Selection Method	Forward Stepwise
Information Criterion	-182.719

The information criterion is used to compare to models.
Models with smaller information criterion values fit better.

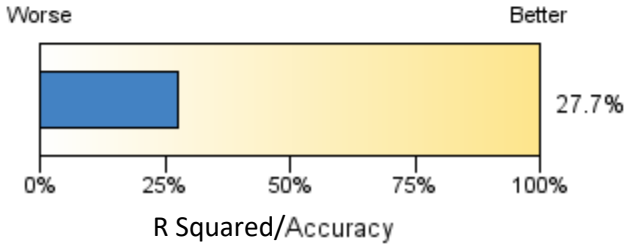

Figure 298 Reflection Aspect of CPD Model Summary: AIC and R Squared

The predictors from selected iteration as shown Figure 297 had 6 first-order variables along the three main dimensions of motivation that are of relevant to this study. Along the Source dimension Self determined motivation: 1) 'To_Experience_Stimulation_IM_Index' denotative of Intrinsic motivation towards stimulation, and 2) 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-determined motivation/amotivation'. Along the Intensity Dimension – achievement motivation: 3) 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness' and 4) AM_F5_Index denotative of 'Achievement Motivation in the context of Affinity of Challenge'. Along Time Perspective dimension: 5) 'FTP_F2' that is denotative of 'extremely opened future time perspective' and 6) Opportunities_I_MDFTP denotative of 'Opportunities Multidimensional Time Perspective'. Thus, confirming the hypothesis that states that, there are Predictors of the Reflection Aspect of CPD among first-order variable of identified and emergent dimensions of motivation.

The level of importance is a relative value that ranges between 0 and 1 for each variable but whose sum for all the variables in the model never exceeds one [295]. Figure 299 shows the ranking of the variables in terms of importance.

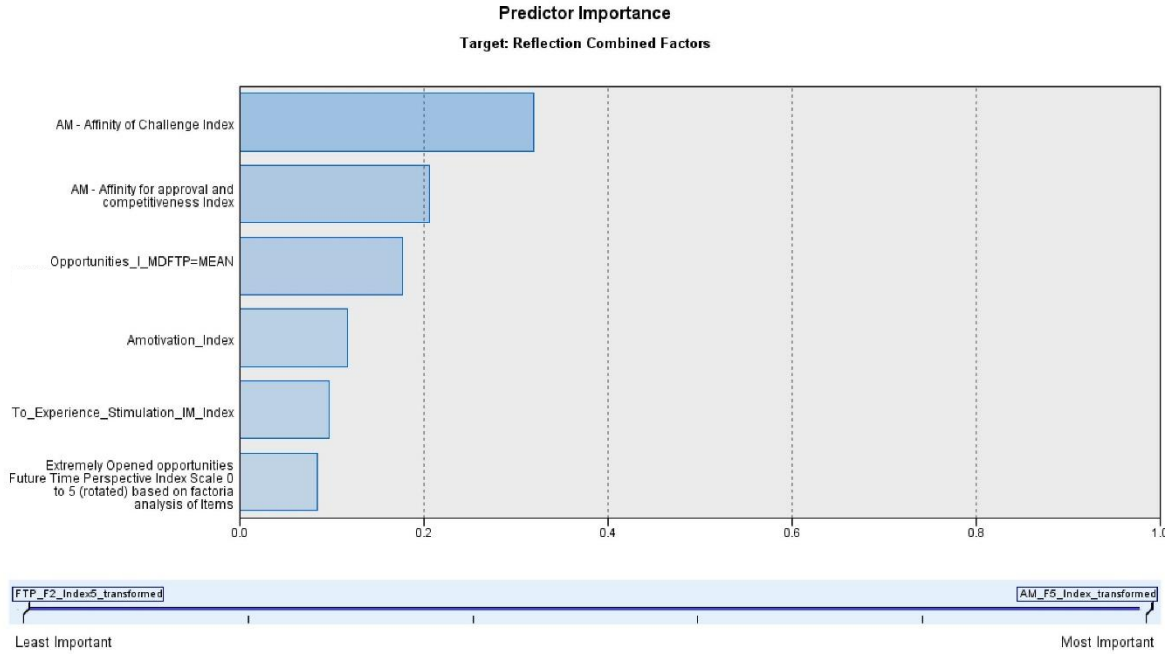

Figure 299 Level of Engagement with Reflection aspects of CPD First-order predictors: Predictors important

In terms of level of importance, the most important of the predictor variables (as shown in Figure 299) was the variable 'AM_F5_Index denotative of 'Achievement Motivation in the context of Affinity of Challenge' at a relative importance level of 0.32 while the least important predictor was 'Opportunities_I_MDFTP' denotative of 'Opportunities Multidimensional Time Perspective'. at a relative importance level of 0.08. Showing that an individual's Affinity of Challenge is the most important factor in predicting/determining the extent to which the individual would engage with the Reflection Aspect of CPD, and has the greatest effect on the individual's level of engagement with the Reflection Aspect of CPD. While the individual's Opportunities focused Multidimensional Time Perspective is the least important factor in predicting/determining the extent to which the individual would engage with the Reflection Aspect of CPD and has the least effect on the individual's level of engagement with the Reflection aspect of CPD. In so doing confirming the hypothesis that states that, compared to other first order dimensions of motivation, 'Affinity of Challenge' form of Achievement motivation (AM_F5_Index) has a greater effect on Level of engagement with the Reflection aspect of CPD.

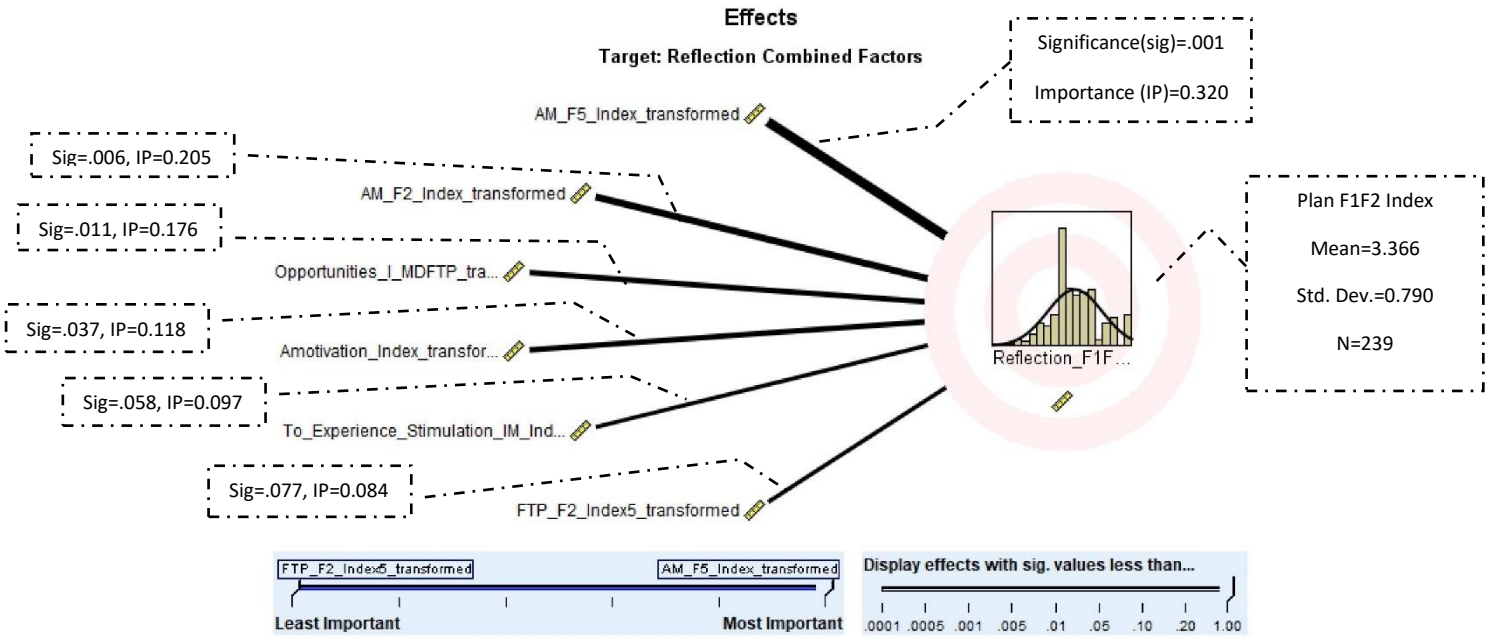

Figure 300 Illustration of regression models: Effects of Predictor variable on Level of engagement with Reflection aspect of CPD in descending order

Figure 300 goes further to illustrate the effect of the individual predictor variables on the level of engagement with Reflection aspect CPD in descending order of importance. While illustrating the effect significance of each predictor variable employing the thickness of the lines, with thicker lines symbolising a predictor of Level of engagement with Reflection aspect of CPD with higher significant effect. As shown in Figure 300 all the predictor effects (except that for Predictor 'To_Experience_Stimulation_IM_Index' and 'FTP_F2') are significant at α = 0.05 with P-value ranging between .001 to .037, but have different levels of importance in terms of effect ranging from 0.118 to 0.320. The Predictor 'To_Experience_Stimulation_IM_Index' is not significant at α = 0.05 with P-value= .058 and IP=0.097. The Predictor 'FTP_F2' is also not significant at α = 0.05 with P-value= .077 and IP=0.084.

Figure 301 on the other hand, contains the results of the ANOVA further providing details of the model effects illustrated by Figure 300, including the Sum of squares indicating that the data is well represented by the model and the F – statistics indicating the utility of the model.

Effects

Target: Reflection Combined Factors

Source	Sum of Squares	df	Mean Square	F	Sig.	Importance
Corrected Model ▼	43.843	6	7.307	16.188	.000	
AM_F5_Index_transformed	5.420	1	5.420	12.008	.001	0.320
AM_F2_Index_transformed	3.484	1	3.484	7.718	.006	0.205
Opportunities_I_MDFTP_ transformed	2.993	1	2.993	6.630	.011	0.176
Amotivation_Index_transformed	1.993	1	1.993	4.416	.037	0.118
To_Experience_Stimulation_IM_ Index_transformed	1.643	1	1.643	3.640	.058	0.097
FTP_F2_Index5_transformed	1.427	1	1.427	3.161	.077	0.084
Residual	104.725	232	0.451			
Corrected Total	148.568	238				

Figure 301 Level of engagement with Reflection aspect of CPD First-order predictors: ANOVA table indicating the effects and nature of relationship between variables in the model

The global F statistic of the entire model with F-ration 16.188 and 6 degrees of freedom, is found to be highly significant at $\alpha = 0.05$ with P-value= .000 as shown in Figure 301. The large F-ratio indicating that a linear model is more appropriate for the data than a non-linear model. The significance of the F-statistics further implies that at least one of the coefficients for the parameters predicting Level of engagement with the Reflection Aspect of CPD in the models is non-zero. This indicates that there is at least a linear relationship between the variables in the model, connoting that the model merits further consideration and is useful for further prediction and that the model predicts the Level of engagement with the Reflection Aspect of CPD(RF-LECPD) reasonably well [282]. To further evaluate how well the model predicts the level of engagement with CPD, a plot of the predicted value of RF-LECPD against the observed value is produced as show in Figure 302.

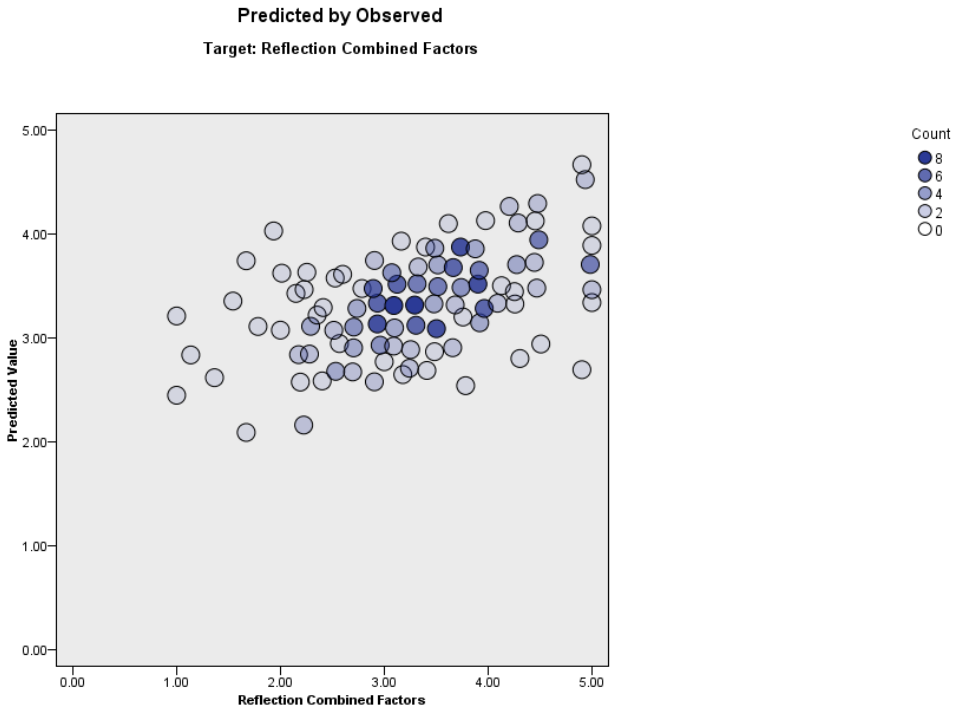

Figure 302 Reflection Aspect of CPD First-order predictors: Predicted Vs observed value of Reflection Aspect of CPD

Figure 302 is a scatterplot of predicted value versus observed value of RF-LECPD. Observed value implies the original computed value of RF-LECPD. It can be seen from Figure 302 that a 45 degree line can be drawn through the middle of the points on the plot, which indicates that the target variable is well predicted by the model.

It can also be seen from Figure 301 that all the individual predictors (except for 'To_Experience_Stimulation_IM_Index' and 'FTP_F2') with F-ratio ranging from 18.546 to 4.615 are also found to be significant at α = 0.05 with P-value ranging from .000 to .037 (Figure 301) showing that there is a linear relationship between the Criterion variable and each of the predictor variables (except for 'To_Experience_Stimulation_IM_Index' and 'FTP_F2'). 'To_Experience_Stimulation_IM_Index' has a F-ratio of 3.640 but is not significant at α = 0.05 with a P-value = .58, and 'FTP_F2' has a F-ratio of 3.161 but is not significant at α = 0.05 with a P-value = .77. Further showing that not only is the model useful in predicting the value of RF-LECPD but that each of the parameters (except for 'To_Experience_Stimulation_IM_Index' and 'FTP_F2') are useful to that effect. Figure 303 below sheds further light on the linear relationship between the individual predictor variables and RF-LECPD.

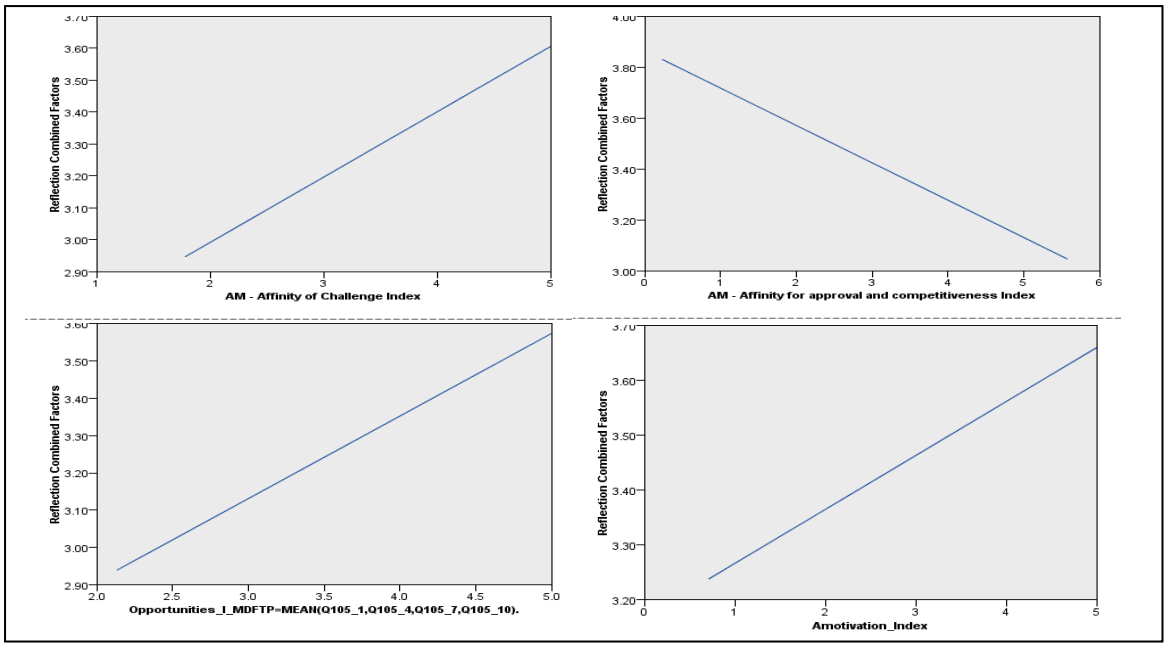

Figure 303 RF-LECPD First order predictors: Estimate means Chart for significant effects (p< 0.5)

It can be seen from Figure 303 that some of the predictor variables have a direct relationship with the RF-LECPD while some have an inverse relationship with LECPD; Indicating that some parameters will positively contribute to the overall engagement with Reflection aspect of CPD while some parameters would negatively contribute to the level of engagement with Reflection aspect of CPD. This is reflected in the coefficients (β) of the regression parameter as shown in Figure 304.

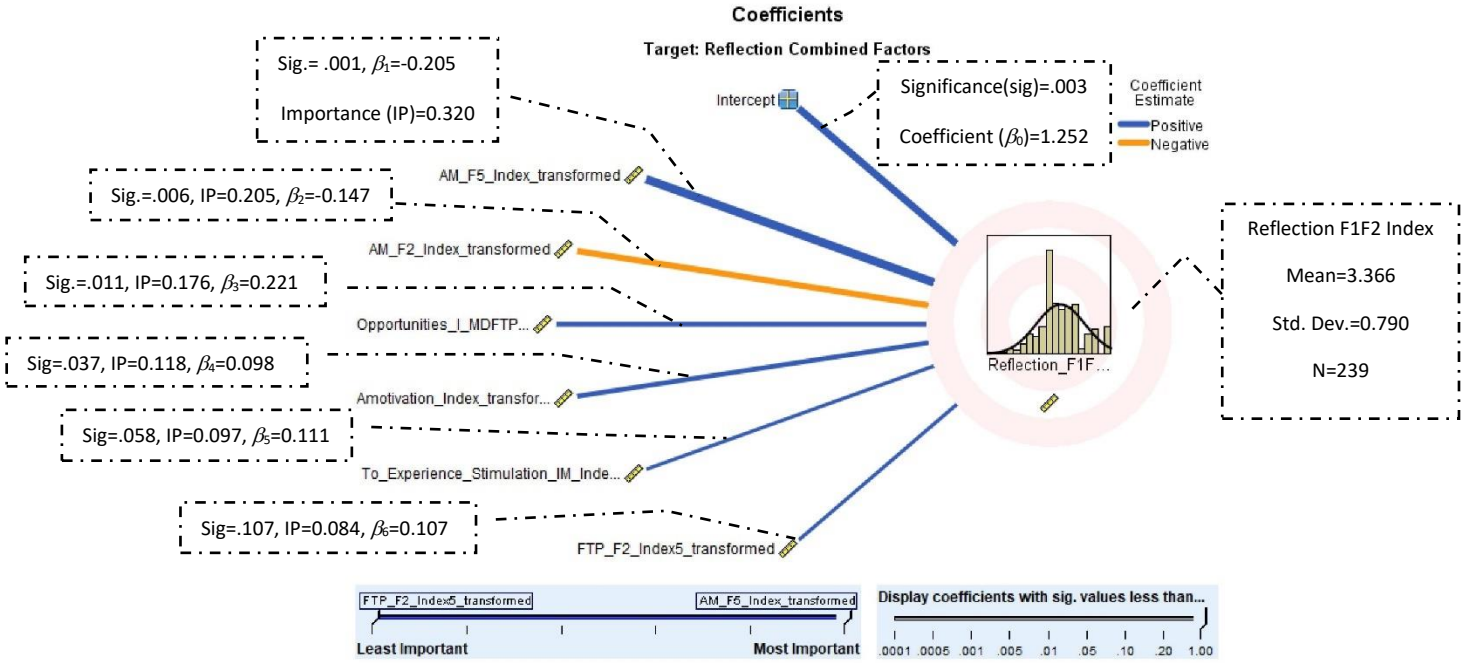

Figure 304 Illustration of regression models: the coefficients of the predictor variables including intercept

Figure 304 is a model illustrating the coefficients of the predictor variables relative to the criterion variable and to each other; as such it is a diagrammatic illustration of the model for predicting RF-LECPD. The width of the lines illustrates the level of the coefficient significance of the predictor variables while the colour indicates the sign of the coefficient in terms of its relationship with or contribution to the predicted value of the target/criterion variable RF-LECPD i.e. direct (positive) or inverse (negative) While Figure 305 provides (ranked in order of importance) some of the information reflected in the illustration in Figure 304 such as coefficient, significance, importance of each predictor variable and additional information such as the standard error, t statistics and confidence interval which shed more light on the nature of the predictive.

Coefficients

Target: Reflection Combined Factors

Model Term	Coefficient ▼	Std.Error	t	Sig.	95% Confidence Interval		Importance
					Lower	Upper	
Intercept	1.252	0.424	2.951	.003	0.416	2.088	
AM_F5_Index_transformed	0.205	0.059	3.465	.001	0.088	0.321	0.320
AM_F2_Index_transformed	-0.147	0.053	-2.778	.006	-0.251	-0.043	0.205
Opportunities_I_MDFTP_ transformed	0.221	0.086	2.575	.011	0.052	0.390	0.176
Amotivation_Index_transformed	0.098	0.047	2.101	.037	0.006	0.191	0.118
To_Experience_Stimulation_IM_ Index_transformed	0.111	0.058	1.908	.058	-0.004	0.225	0.097
FTP_F2_Index5_transformed	0.107	0.060	1.778	.077	-0.012	0.226	0.084

Figure 305 RF-LECPD First-order predictors: values, significance tests, and confidence intervals for the individual model coefficients

Further to the Anova table and F-statistics the coefficients tell us the extent to which each variable contributes to calculating the value of the predicted/criterion variable RF-LECPD and the level of significance of the contribution. From Figure 304 and Figure 305 it can be seen that the contribution of all the predictor variable (except for 'To_Experience_Stimulation_IM_Index' and 'FTP_F2') with coefficient range from -0.147 To 0.221 are all significant at α= 0.05 with P-value ranging from .001 to .037. The variable 'To_Experience_Stimulation_IM_Index' with Coefficient β_5=-0.111 and P-Value=.058 is not Significant α= 0.05; in addition to that the variable 'FTP_F2' with Coefficient β_6= 0.107 P-value = .077 is not significant at α= 0.05. Although the variables 'To_Experience_Stimulation_IM_Index' and 'FTP_F2' are not significant it has to be taken into consideration when calculating the value of the RF-LECPD using the deterministic model.

It can be seen that the variable for 'Opportunities_I_MDFTP' denotative of 'Opportunities Multidimensional Time Perspective' makes the largest positive contribution when calculating the deterministic value of level of engagement with Reflection aspect of CPD as it has the highest Coefficient β_2=0.221, P-Value=.011). It is interesting that 'Opportunities_I_MDFTP' with IP=0.176 and β_2=0.221 makes a greater contribution to the deterministic value than AM_F5_Index which is the most important first-order predictor of level of engagement with Reflection aspect of CPD with IP=0.320, β_1=-0.205 .

In line with the Equation 92 the equation that denotes the regression model for prediction of RF-LECPD on the basis of First-order dimension of motivation is as shown in Equation 102; the version of this equation that contains only significant effects or coefficients is as shown in Equation 103. Depending on the context of use, equations representative of regression models are used with or without insignificant components as such both are presented:

$$Y_{RF} = f(X_{RFF1}, X_{RFF2}, X_{RFF3}, X_{RFF4}, X_{RFF5}, X_{RFF6})$$

$$Y_{RF} = 1.252 + 0.205X_{RFF1} - 0.147X_{RFF2} + 0.221X_{RFF3} + 0.098X_{RFF4} + 0.111X_{RFF5} + 0.107X_{RFF6}$$

where

Y_{RFF} is the dependent variable= RFF-LECPD

$X_{RFF1}, X_{RFF2}, X_{RFF3}, X_{RFF4}, X_{RFF5}, X_{RFF6}$ are the First-order independent variables

X_{RFF1} = 'AM_F5_Index' denotative of 'Achievement Motivation in the context of Affinity of Challenge',

X_{RFF2} = 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness',

X_{RFF3} = 'Opportunities_I_MDFTP' denotative of 'Opportunities Multidimensional Time Perspective',

X_{RFF4} = 'Amotivation_Index' denotative of 'Ability of Instrument to measure motivation (amotivation)/Extent of Measurability of self-

Equation 102 RF-LECPD First-order predictors: Multiple regression model including Predictors with non-significant effects

$$Y_{RF} = f(X_{RFF1}, X_{RFF2}, X_{RFF3}, X_{RFF4},)$$

$$Y_{RF} = 1.252 + 0.205X_{RFF1} - 0.147X_{RFF2} + 0.221X_{RFF3} + 0.098X_{RFF4}$$

where

Y_{RFF} is the dependent variable= RF-LECPD

$X_{RFF1}, X_{RFF2}, X_{RFF3}, X_{RFF4}$ are the First-order independent variables

X_{RFF1} = 'AM_F5_Index' denotative of 'Achievement Motivation in the context of Affinity of Challenge',

X_{RFF2} = 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness',

X_{RFF3} = 'Opportunities_I_MDFTP' denotative of 'Opportunities

Equation 103 RF-LECPD First-order predictors: Multiple regression model for only predictors with significant effects

11.2.5 Summary

The Predictors of Level of engagement with the Plan, Action, Result and Reflection aspects of CPD were respectively determined using multiple regression, this was carried out using the Automatic Linear Model feature of SPSS. The regression analysis was carried out within First-order subsets of variables from the identified dimensions of motivation that are postulated to affect the Level of engagement with the different aspects of CPD. Figure 306 First-order Predictors of Level of Engagement with Aspects of CPD Show the predictors of engagement with CPD within each subset.

Ranking in descending order of importance (with 1 being most important)	Plan	Action	Result	Reflection
1	AM_F2_Index	AM_F2_Index	AM_F2_Index	AM_F5_Index
2	To_Experience_ Stimulation_IM	Amotivation_ Index	Amotivation_ Index	AM_F2_Index
3	AM_F5_Index	AM_F1_Index	AM_F6_Index	Opportunities_I _MDFTP
4	Opportunities_I _MDFTP	AM_F6_Index	Identified_EM_Index	Amotivation_ Index
5	FTP_F2_Index5	FTP_F2_Index5		To_Experience_ Stimulation_IM
6	AM_F1_Index	AM_F7_Index		FTP_F2_Index5
7	Amotivation_ Index	To_Experience_ Stimulation_IM		
8	Introjected_EM _Index	Past_I_Positive _ZTPI		
9	AM_F7_Index			
10	Future_I_ZTPI			

11	Towards_ Accomplishment_IM

Figure 306 First-order Predictors of Level of Engagement with Aspects of CPD

The summary models for predicting level of engagement with different aspects CPD based on by the First-order Variables of motivation as shown in Figure 307 was examined in order to confirm or reject the relevant Hypothesis. Hypothesis stating that: Level of engagement with Results aspect of CPD is better predicted and modelled by First order variables of identified and emergent dimensions of motivation than Level of engagement with other aspects of CPD.

In selecting the best modelled aspect of CPD for predicting the Level of engagement with different aspects of CPD, the F-statistics of all the models as shown in Figure 307 were examined and found to be adequate and significant, indicating the utility of all the models. Following this, the accuracy of the model and extent of information loss was examined. As shown in Figure 307 the predictive model based on first-order variables has the highest Adjusted R squared at 35.8% indicative of the highest accuracy, and most negative information Criterion at -338.983 indicative of the least information loss and as such best fit. It can thus be concluded that the best model for predicting level of engagement with CPD is the model based First-order variables, in so doing confirming the Hypothesis.

Model	Plan	Action	Result	Reflection
Adjusted R Squared	35.8%	37.3%	43.7%	27.7%
Information criterion (AIC)	-338.983	-175.733	-368.186	-182.719
F-statistics	18.522	26.700	68.198	16.188
Significance of F Statistic, F value	.025, 5.059	.037, 4.383	.019, 5.561	.037, 4.416

Figure 307 Model Summaries for Level of engagement with Aspects of CPD

An overview of all the hypothesis examined and indication as to whether they are confirmed or rejected is presented in the Figure 308.

Overall	Sub –hypothesis			
	Plan	Action	Result	Reflection

Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	status
There are Predictors of level of engagement with the Plan, Action, Result and Reflection aspects of CPD among first-order variables of the identified and emergent dimensions of motivation.	**Confirmed**	There are Predictors of level of engagement with the Plan aspect of CPD among first-order variables of identified and emergent dimensions of motivation	**Confirmed**	There are Predictors of level of engagement with the Action aspect of CPD among first-order variables of identified and emergent dimensions of motivation	**Confirmed**	There are Predictors of level of engagement with the Result aspect of CPD among first-order variables of identified and emergent dimensions of motivation	**Confirmed**	There are Predictors of level of engagement with the Reflection aspect of CPD among first-order variables of identified and emergent dimensions of motivation	**Confirmed**
Different dimensions of motivation have different	**Confirmed**	Compared to other first	**Confirmed**	Compared to other first order dimensio	**Confirmed**	Compared to other first	**Confirmed**	Compared to other first	**Confirmed**

level of effect on level of engagement with the Plan, Action, Result and Reflection aspects of CPD respectively.	order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Plan aspect of CPD.	ns of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Action aspect of CPD.	order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Result	order dimensions of motivation, 'AM_F5_Index denotative of 'Achievement Motivation in the context of Affinity of Challenge' has a greater effect on Level of engagement with the Reflection

						aspect of CPD.		aspect of CPD.	
The suitability of models based on First-order motivation variables for predicting Level of engagement is different for different aspects of CPD.	**Confirmed**	Level of engagement with Plan aspect of CPD is better predicted and modelled by First order variables of identified and emergent dimensions of motivation than Level of engagement with other aspects of CPD.	Rejected	Level of engagement with Action aspect of CPD is better predicted and modelled by First order variables of identified and emergent dimensions of motivation than Level of engagement with other aspects of CPD.	Rejected	Level of engagement with Results aspect of CPD is better predicted and modelled by First order variables of identified and emergent dimensions of motivation than Level of engagement with other	**Confirmed**	Level of engagement with Reflection aspect of CPD is better predicted and modelled by First order variables of identified and emergent dimensions of motivation than Level of engagement	Rejected

			aspects of CPD.	with other aspects of CPD.

Figure 308 Overview of Hypothesis for level of engagement with aspects of CPD

The Figure 309 contains a summary of the multiple regression models for Level of engagement with different aspects of CPD on the basis of First-order Predictors.

Model	Plan	Action	Result	Reflection
With Only Significant	Y_p = -0.193X_{PF1} + 0.242X_{PF2} + 0.153X_{PF3} + 0.200X_{PF4} + 0.132X_{PF5} + 0.135X_{PF6} + 0.097X_{PF7} – 0.110X_{PF8} + 0.113X_{PF9} + 0.200X_{PF10}	Y_A = *1.892* – 0.276X_{AF1} + 0.149X_{AF2} + 0.194X_{AF3} + 0.173X_{AF4} + 0.155X_{AF5} + 0.149X_{AF6} + 0.136X_{AF7} – 0.237X_{AF8}	Y_{RT} = *2.302* – 0.219X_{RT1} + 0.164X_{RTF2} + 0.174X_{RTF3} + 0.113X_{RTF4}	Y_{RF} = *1.252* + 0.205X_{RFF1} - 0.147X_{RFF2} + 0.221X_{RFF3} + 0.098X_{RFF4}
With Non-Significant Components	Y_p = *0.638* – 0.193X_{PF1} + 0.242X_{PF2} + 0.153X_{PF3} + 0.200X_{PF4} + 0.132X_{PF5} + 0.135X_{PF6} + 0.097X_{PF7} – 0.110X_{PF8} + 0.113X_{PF9} + 0.200X_{PF10} – 0.134X_{PF11}			Y_{RF} = *1.252* + 0.205X_{RFF1} - 0.147X_{RFF2} + 0.221X_{RFF3} + 0.098X_{RFF4} + 0.111X_{RFF5} + 0.107X_{RFF6}

Figure 309 Multiple regression Deterministic models for Level of engagement with different aspects of CPD on the basis of First-order Predictors

Chapter Summary

The chapter showed the predictors of engagement with CPD where identified among aforementioned variables representative of the different dimension of motivations. showing that motivation and its many dimensions can be effective predictors of engagement with CPD.

The chapter establishing the key predictor of engagement with CPD enabling the prediction of level engagement with CPD and clearer understanding of the interaction between motivation and engagement with CPD. To this effect multiple regression analysis was carried out taking into cognizance the levels of variables representative of the dimensions of motivation. The result of this analysis shed crucial light on the variables of motivation that most effectively allows for clear understanding of the behaviour of individuals in the context of engaging with CPD and to predict the extent to which individual can plausibly engage with CPD. The implication of this can range from development of 'bespoke approaches for individuals to change behaviour in the context of motivation to effectively engage with CPD', to establishment of 'a foundation on which tools and policy for evaluating and promoting engagement with CPD for institutions, universities and industries'.

11.3 Inference from Predictors of Engagement with CPD

Overview

The examination of the findings of the regression analysis and the evaluation of predictors of engagement with CPD brings to mind Atkinson postulations about the Level of achievement motivation and its relationship with persistence in goal-related tasks (as presented in Chapter 4.3). Atkinson theory interpreted in the context of CPD implies that those high in achievement motivation require low probability of success to continue to engage with developmental activity and that success negatively impacts on their continued Engagement with CPD (the converse being the case for those low in achievement motivation). Using this as an interpretative lens would help shed light on the result of the regression analysis carried out to determine the predictors of LECPD especially when Looking at findings related to the Achievement Motivation variables 'AM_F2_Index' and 'AM_F5_Index' and Self-determined motivation variables 'Towards_Accomplishment_IM_Index' and 'To_experience_stimulation_IM'.

The achievement motivation variables 'AM_F2_Index' and 'AM_F5_Index' are noteworthy based on the regression analysis looking at Predictors of Level of Engagement with CPD. AM_F2_Index is denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', and AM_F5_Index is denotative of 'Achievement Motivation in the context of Affinity of Challenge'. Individuals with Achievement motivation focused on ‘Affinity for Approval and Competitiveness’ see a drop off in their level of engagement on achieving success when engaged in goal-related tasks. While Individuals with achievement motivation focused on ‘Challenge’ do not see a drop-off in their level of engagement on achieving success when engaged in goal-related tasks. The resulting difference is because, unlike a motive towards ‘approval and competitiveness’, a motive towards ‘challenge’ is difficult to overcome as challenges are constantly evolving. As such, those individuals are constantly in the state of a low probability of success which in turn results in continuous engagement with developmental activity in this case of CPD. [162, 104, 9, 90].

Further to this, the Self determined Motivation variables 'Towards_Accomplishment_IM_Index' and 'To_experience_stimulation_IM' are noteworthy based on the regression analysis looking at Predictors of Level of Engagement with CPD. The variable 'To_experience_stimulation_IM' is denotative of intrinsic motivation to experience stimulation and, the variable 'Towards_Accomplishment_IM_Index' is denotative of Intrinsic motivation towards accomplishment.

A somewhat similar understanding can be developed as an individual can continuously experience stimulation while accomplishments have an endpoint. Once a task or goal is accomplished, the associated motive rapidly dissipates. Those with intrinsic motivation directed towards experiencing stimulation have a higher potential to continuously engage with developmental activity than those whose intrinsic motivation is directed towards accomplishment.

In so doing, this section argues that to encourage engagement with CPD, one must urge learners to focus on challenges that they seek to overcome and plausible solutions to said challenges rather than focus on the approval of others or competing with others. Also, learners should focus on the stimulus experienced while engaging with development activity, rather than the associated sense of accomplishment.

11.3.1 Insights from the Coefficients of the Predictors

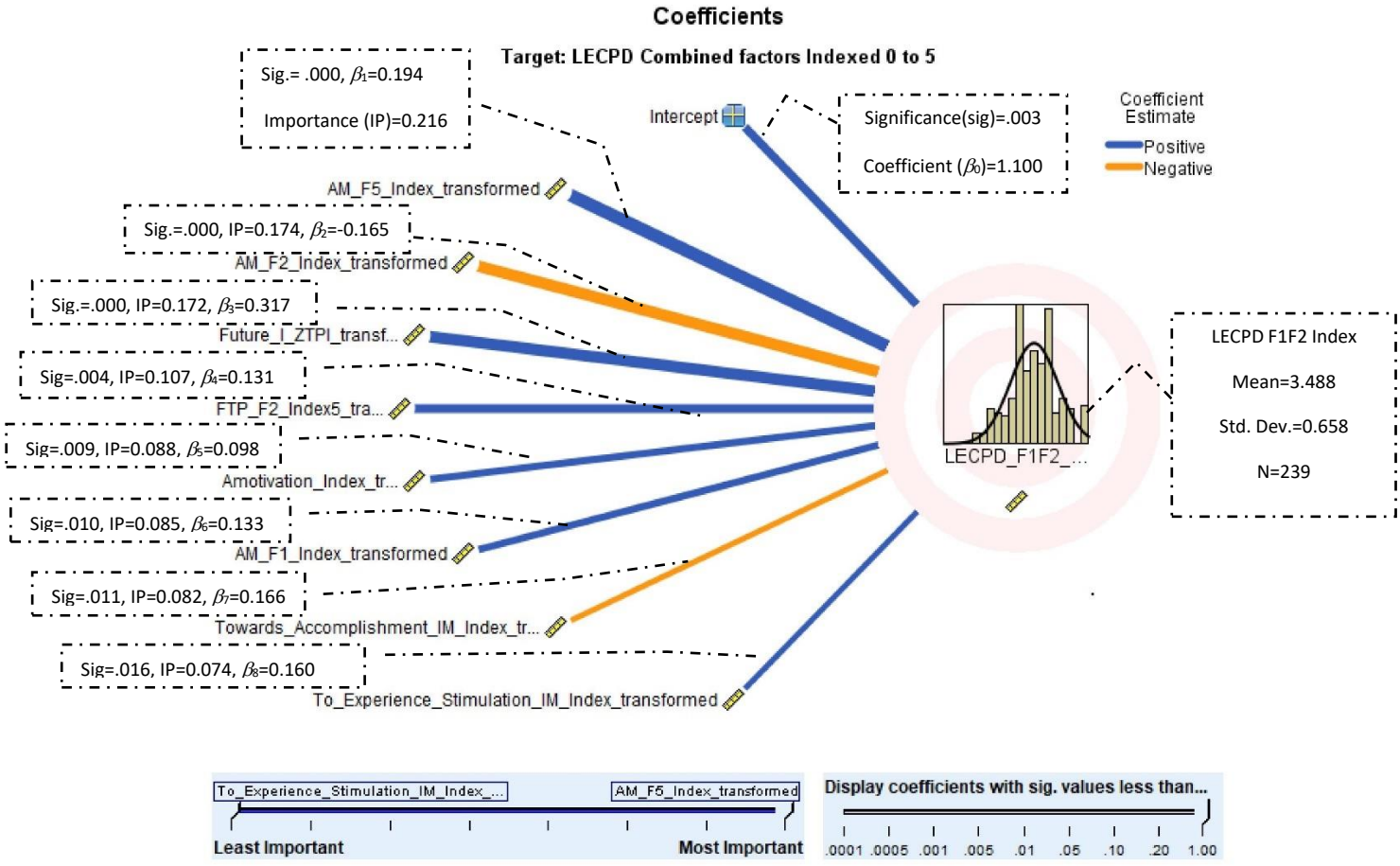

Figure 310 Illustration of regression models: the coefficients of the predictor variables including intercepts

The regression Coefficient (as Shown in Figure 310) provides some exciting results warranting further scrutiny, especially when looking at the fact that some of the predictor variables have negative coefficients indicating that they negatively contribute to the predicted value of CPD. In carrying out this further exploration and interpretation of the findings, it would be of particular interest to examine the dichotomy between the coefficients of a pair of Achievement motivation variables and a pair of Intrinsic motivation variables and what they tell us about engagement with CPD. The achievement motivation of related variables AM_F2_Index' and 'AM_F5_Index' are considered on the one hand, and the Intrinsic self-determination variables and To_experience_stimulation_IM are considered on the other.

' AM_F2_Index' and 'Towards_Accomplishment_IM_Index'

The achievement motivation related variables' AM_F2_Index' and the 'Towards_Accomplishment_IM_Index' have negative regression coefficients, indicating that both have a negative influence on the value of the predicted variable. The similarity in the contribution of both variables is noteworthy and in line with theoretical expectations. This is noteworthy as even though they are measured on different scales, they measure constructs with underlying conceptual similarity, be it from different dimensional perspectives.

The variable for affinity towards ‘Approval and Competitiveness’ is indicative of the achievement motivation of individuals focused towards exogenous approval or/and being perceived to be better than others at achieving a set goal, task or aspiration [1, 2, 3, 4] While the Intrinsic motivation towards accomplishment is focused on endogenous motivation that is geared towards being seen as having accomplished a set goal, task or aspiration [180, 81, 183, 181]. When considering these variables, it might appear contradictory that they contribute negatively to the predicted level of engagement with CPD, particularly when it is taken into cognisance that the converse is the case for 'AM_F5_Index' another achievement motivation variable. It begs the questions; how does a subject's view towards ‘Competitiveness’ or motivation towards ‘approval and competitiveness’ load differently on LECPD from the subject’s motivation towards ‘Challenge’? How does a subject’s motivation towards ‘accomplishment’ load differently on LECPD from the subject's motivation towards ‘Challenge’? A bit of a more in-depth look into this yields exciting patterns that make the result seem quite intuitive especially when the result is considered in light of Atkinson's and Weber's conceptualisations of achievement motivation through the lens of the probability of success (P_s) [154, 107, 90].

Lenses of Evaluation

Atkinson postulated that those who have a high level of achievement motivation often engage more with developmental activity, and was more persistent and thrived more when there is a low probability of success. Atkinson postulated that for those high in achievement motivation succeeding at a goal-related task or developmental activity reduced the likelihood and persistence of engagement because once success is achieved, the associated motivation dissipates. Atkinson postulated that those high in Achievement Motivation required a constant injection of an element of challenge to succeed. Those that wanted to encourage said individuals to engage with learning and developmental activity continuously had to continually increase the level of the difficulty of goal-related tasks or developmental activities in a manner commensurate to the increase in ability [154, 107, 90]. Ensuring the optimal level of challenge can also be looked at in the context of Vygotsky zone of proximal development. Through this lens, the process of achieving a commensurate amount of difficulties can be considered as analogous to keeping those with high Level of achievement-motivation in their respective zone of proximal development [59, 68, 69].

'AM_F2_Index' Vs 'AM_F5_Index'

When these ideas are brought into play, and these lenses are used to delve into the current conceptualisation of predictors of Level of engagement with CPD as presented in this study, the findings become quite interesting. It can be observed when comparing the predictor variable 'AM_F2_Index' to the predictor variable 'AM_F5_Index' that both predictors of Level of engagement with CPD make significant (at P>0.5) contribution however the later contributes positively (β=0.194, P=.000), while the former contributes negatively(β=-0.165, P=.000).

When examining the variable 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for 'approval and competitiveness', the need for 'Competitiveness and Approval' in this context are forms of achievement motivation that can easily be satisfied. This is especially so, in a situation where an individual with a high level of 'AM_F2_Index' is seen to have achieved, be better than others, be victorious over others or receives approval from others for their achievement. In the CPD context, that means if the individual in question gets the acknowledgement or approval to have succeeded at academic pursuit or to be better than others, they become satisfied and their sources of motivation dissipate. As such, the 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness' is quite easily satisfied.

On the other hand, the affinity for Challenge ('AM_F5_Index' denotative 'Achievement Motivation in the context of Affinity of Challenge') is much more difficult to satisfy, because challenges are always continually evolving. Challenges continuously evolve with the overcoming of one challenge or achievement of goals and task related to one challenge often yielding to more challenges or tasks and objectives related to the said challenge. As such the motivation to engage in learning activities (in this context Continuous Professional Development) is continuously refreshed because the goals or tasks associated with challenges are never truly exhausted, and there is a constant reduced probability of success due to evolving nature of Challenges. If this is examined in the context of getting learners to improve engagement with CPD, they would be advised to:

1. view or direct their motivation towards engaging with CPD away from the idea of being better than or approved by others and
2. Focus it more on the challenges they are trying to solve.

On the one hand, If Individuals focus more on the challenges that they are trying to solve this would positively contribute to engaging with continuous professional development. On the other hand, if they concentrate on 'Competitiveness and Approval', which in the long run, results in the dissipation of associated motivation once approval has been received, this will negatively affect their engagement with CPD.

'Towards_Accomplishment_IM_Index' Vs 'To_experience_stimulation_IM'

Extending this line of thought to other notable predictors of engagement with CPD such as 'Towards_Accomplishment_IM_Index' and 'To_experience_stimulation_IM'; It can be observed when comparing the predictor variable 'Towards_Accomplishment_IM_Index' to the predictor variable 'To_experience_stimulation_IM' that both predictors of Level of engagement with CPD make significant (at P>0.5) contribution however the later contributes positively (0.160, P=.016) while the former contributes negatively(-0.166, P=.011). 'To_experience_stimulation_IM' has a positive coefficient (0.160, P=.016) in relationship to Level of engagement with CPD, so positively contributes to the predicted value of Level of engagement with CPD. As such, if advice is going to be given based on the findings, individuals that want to engage with continuous professional development would be advised that:

1) Avoid focusing on the accomplishment of stated goal or task or on the notion of being seen as accomplished.

2) They should, however, focus on achieving stimulation through and during the process of engagement with Continuous Professional Development activities.

This advice is appropriate because the motivation towards accomplishment in the context of CPD can be relatively more straightforward to satisfy and in the long run, means that impetus to satisfy the motivation towards engaging with continuous professional development dissipates and thus the level of engagement. Conversely, the Intrinsic motivation towards stimulation can be renewed continuously, as stimulation can often be found in related activities; hence resulting in further engagement or continuous engagement with professional development.

The results of the regression analysis looking at the predictors of engagement with CPD is not only in-depth and correct, it offers both insight into the theoretical prediction of Level of engagement with CPD and also in providing practical advice on engagement with Continuous Professional Development. It also acts as a sort of signpost for aspects that might need to be further evaluated using ethnographic research methods. The contribution of the variables to the predicted value of the level of engagement with CPD gives good insight as explained above, however essential insight is also provided by examining the relative importance of the individual variables in predicting and explaining the variations in the predicted level of engagement with CPD.

11.3.2 Insights from the Relative importance of the Predictors

The relative importance of the predictor variables and the effect they have on the predicted value of LECPD is crucial in understanding LECPD. The importance of the predictor variables is ranked based on the predictor variables sensitivity measure in relations to the criterion/predicted variable. It is denotive of the reduction in the variance of the predicted variable attributable to each predictor variable [304]

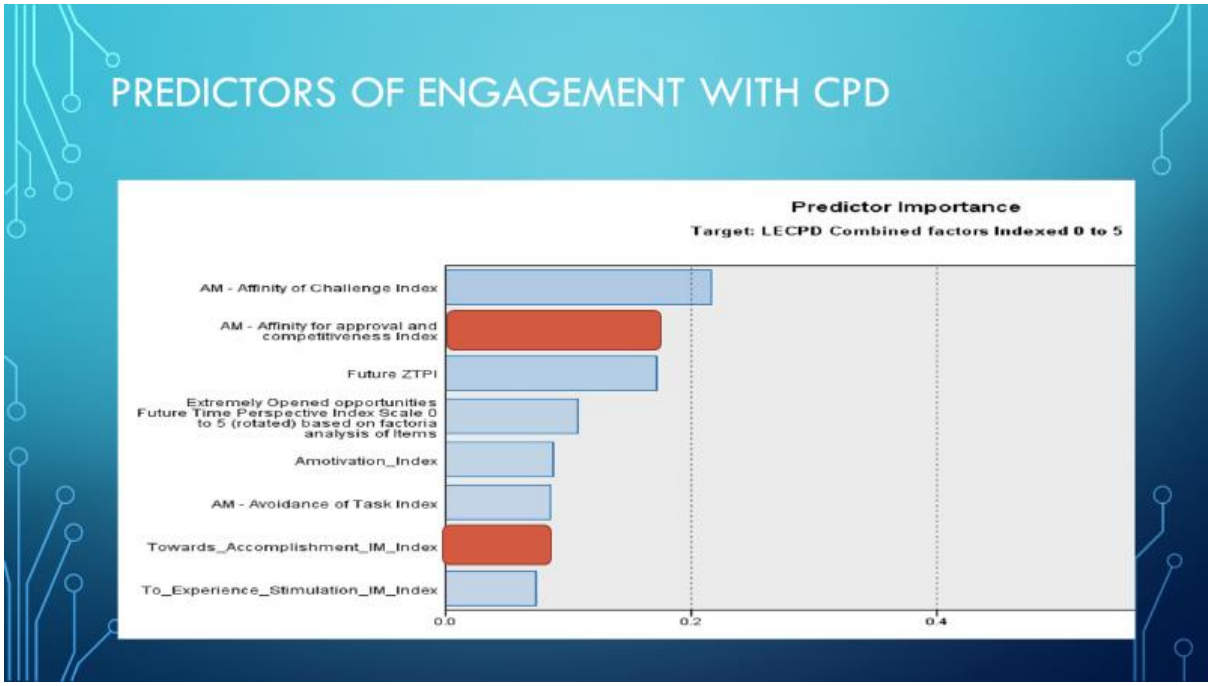

Figure 311 Level of importance of Predictors of CPD

AM_F5_Index

From the results of the regression analysis, the most crucial predictor of Level of engagement with CPD is AM_F5_Index (as shown in Figure 311) which contributes positively to the predicted value of CPD. This result is in line with theoretical expectations and quite intuitive. It can be inferred from the results that, those who have a high affinity for 'Challenge' will continuously seek out challenges and as a consequence would continually seek how to develop; and are more focused on solutions to problems and challenges that they are facing. These challenges are regularly present as the challenges (or goal and tasks related to challenges) are continually evolving and as the extent to which an individual can amalgamate motivation around said challenges is the highest predictor of engagement with CPD.

'To_experience_stimulation_IM

From the results, the least important predictor is the 'To_experience_stimulation_IM'. The result shows that experiencing stimulation is important in predicting engagement with CPD and contributes positively to the expected value of CPD. However, it has the least effect on engagement with CPD among the variables that are seen to be active predictors and affect the level of engagement with CPD. This result is again in line with theoretical expectations and is also interesting as it shows that even though, the intrinsic motivation to experience stimulation is

essential and can affect how much a person engages it is not the most crucial factor. It can be further be inferred that, though it must be taken into cognisance in the development of continuous professional development activity it should not be the primary consideration.

'FTP_F2' and 'Future ZTPI'

The time perspective variables 'FTP_F2' and 'Future ZTPI' are important predictors that contribute positively to the predicted value of LECPD (as shown in Figure 311). 'FTP_F2' is denotative of 'extremely opened future time perspective' and 'Future ZTPI' is denotative of 'Future-oriented Zimbardo Time perspective'. This result is quite intuitive, and in line with theoretical postulations, it is in line with the fact that engagement with CPD activities are future-oriented activities as such, an individual's perspective of the future and orientations towards future time is essential. It is crucial whether they are future-facing, past or present facing. The results show that the extent of an individual's future-orientation is vital in predicting the level of engagement with CPD. This result sheds further light on the understanding of engagement with CPD and its interaction with time perspective. It can be inferred from the results that it is not only about being future-oriented but the individuals' kind of future orientation; are they focused on limitation or ambiguity? Are they opened or extremely opened? The result of the regression, as indicated in Figure 311, shows that being future-oriented and the extent to which they perceive the future to be extremely opened has quite a significant impact on Level of engagement with CPD. Which again is quite intuitive and in line with postulation regarding Future time perspective and Zimbardo time perspective as detailed in Chapter 4, in that context the result is quite useful [210, 196, 204, 211, 201]. What is also quite interesting is that though the predictor variable associated the Zimbardo future time perspective (Future ZTPI) is not the most critical. However, when considering the coefficient of regression which indicates the contribution of the predictor variable to the overall predicted value of engagement with CPD, Future ZTPI has the highest coefficient inferring that it makes the most contribution to the predicted level of engagement with CPD. This result makes a lot of sense and infers that even though variability in the value of "Future ZTPI" may not be the most important in predicting variation in Level of engagement with CPD, the "Future ZTPI" contributes immensely to calculate the numerical value of Level of engagement with CPD.

Target	LECPD Combined factors Indexed 0 to 5
Automatic Data Preparation	On
Model Selection Method	Forward Stepwise
Information Criterion	-294.775

The information criterion is used to compare to models. Models with smaller information criterion values fit better.

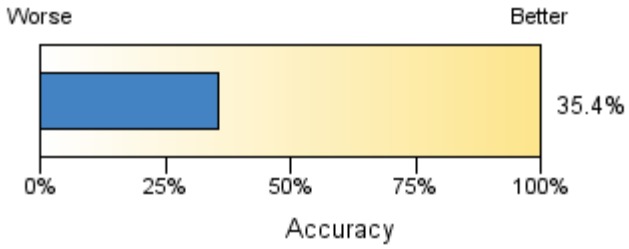

Figure 312 Regression model Summary

11.3.3 Section Summary

Overall results are quite intuitive, providing insight and answers to the myriad of research questions and hypothesis. The results show that among the variables representative of the different dimensions of motivation, there are good predictors of engagement with CPD, especially when considering the overdetermined nature of motivation and behaviour [91]. The results of the regression analysis show that variables representative of the different dimensions of motivation are good predictors of engagement with CPD. The high quality of prediction is apparent from the results of the regression analysis as shown in Figure 312 with an adjusted R^2 above 30% (35.4%) indicative of a high level of accuracy, particularly for Behaviour/motivation focused research. An Information Criterion Below -290 (-294.775) which shows low information loss by the model and high information retention capacity of the model. An F-statistic of 17.337, which show that the utility of the model is high [301, 302, 303, 299]. The dimension of motivation towards engagement with CPD and associated subsets were: 35.4% accurate in predicting the level of engagement with CPD; 35.8% accurate in Predicting engagement with plan aspects of CPD; 37.3% accurate in Predicting engagement with Action aspects of CPD; 43.7% accurate in Predicting engagement with Result aspects of CPD; 27.7% accurate in Predicting engagement with Result aspects of CPD. Upon consideration of all the inferences outlined in this section, a reasonable conclusion can be drawn

that, predictors of engagement to CPD have successfully been identified and the stated research questions have been answered, and hypothesis tested; thereby producing useful results, inference and information and in so doing contributing to the body of knowledge.

Chapter Twelve

12 Interpretivist Examination of CPD

Following from the preceding positivist inclined chapters that established the measure of the Level of engagement with CPD, the varying importance of CPD, the relationship between motivation towards CPD and Level of engagement with CPD, and identified the predictor of the Level of engagement with CPD among emergent and identified dimensions of motivation. This chapter intends to shed light on the Level of engagement with CPD from an Interpretivist point of view. In so doing, presenting a different outlook on what motivates students to engage with CPD.

In exploring the nature of Engineering Students' (EES) motivation towards CPD and Level of engagement with CPD, there is a need not solely to rely only on a positivist approach, but also to incorporate an interpretivism approach to shed some light on results gleaned in preceding chapters. To that effect, this chapter serves to expatiate on engagement with CPD from an interpretive point of view. This chapter presents the result of an in-depth exploration of Level of engagement with CPD through the lens of academics and students; enabling understanding of the constructed meanings associated with CPD. The chapter seeks to present explicit knowledge of the picture of embedded norms related to CPD in the collective societal net of the academic community. To this effect, participants in Engineering departments/faculties of selected Universities in South-West Nigeria and South East England (UK) were interviewed, the response from the participant aided in understanding the said embedded norms.

12.1 Activity

12.1.1 Definition of CPD

Figure 313 Definition of CPD: Word Cloud

When asked to define Continuous Professional Development, the most common terms used by participants are as indicated in the Word Cloud, as shown in Figure 313 Definition of CPD: Word Cloud. These responses show a wide range of terms; however, these are in line with the definition of CPD adopted in this study which indicates an understanding of Continuous Professional Development among participants in institutions in North East England (NE) and SW Nigeria (SWN).

This study defines CPD as the deliberate development of professional competency (knowledge and skill) or engagement with activities promoting professional competency within the context of a specific industry towards the goal of improving productivity or innovation while still performing daily-based activities and work functions.

What do you define as Continuous Professional Development (CPD) or Professional Development (PD) activities?	
Nigeria	UK
R1- any form of activity that brings about growth	R13- training for professional development ranging from communication skill to data processing, to technical problems, to teamwork to time management
R2- any form of activity that brings about growth	R14- general skills development
R3- use of tools needed in the engineering profession for Professional development	R15- professional development
R4- training for professional development like competition	R16- continuously learning in improving themselves, including technical knowledge is wide skills
R5- training for professional development like competition, software/computer programming	R17- continuous way and progressive improvement out of training and learning
R6- anything you are interested in that would bring about development	R18- being at the top of the game of one's career
R7- software learnt for development	R19- continuously learning in improving themselves to be able to analyse their professional qualities and allow them to continue in their development in the right direction.
R8- use of software, professional workshops and seminar for development	R20- anything students gain/ learn in other to achieve purpose career-wise
R9- training for professional development like competition, software/computer programming	
R10- use of software, professional workshops and seminar/conferences for Professional development	
R11- use of software, professional workshops and seminar/conferences for professional development	
R12- use of software, professional workshops and seminar/conferences for professional development	

Figure 314 Definition of CPD: Summary of Answers

When asked to define Continuous Professional Development, the participants' answers are as indicated by the summaries in Figure 314. Overall, these definitions of CPD presented by participants help establish an understanding of the comprehension of CPD in the engineering departments and faculties at the selected universities in Nigeria and UK

Two definitions of CPD were gleaned from the responses: 1) Respondents in Nigeria stated that CPD is any form of training or activity that would bring about professional development which includes attending professional workshops and seminar/conferences, software programming, competition. 2) Respondents in the UK Stated that CPD is any form of continuous training or activity that would help to analyse their professional qualities and allow them to continue in their development in the right direction. Activities that bring about professional development (and achieve purpose career-wise); which can range from activities related to communication skills to data processing, technical

knowledge/problem, teamwork, time management, general skills and more. The first definition gleaned from respondents in Nigeria, while the second definition was gleaned from respondents in the UK. Both definitions are in line with the definition of CPD adopted in the study.

12.1.2 Student Engagement with CPD

In this study, CPD is seen as the planned professional development activities engineering students engage in outside the remit of their primary degree activity. It is also perceived as the development of industry-focused competency (Knowledge and skills) by engineering students, apart from competency development as a result of degree-related activities.

In the context of this research, an individual is said to have developed CPD as a skill when the learner develops a mind-set and ability to engage in non-degree related activities that improve their professional competency or potential. While still engaged in primary day to day activities which will, in this case, be University-prescribed, degree-related learning and development activities.

In what way do your students engage with CPD?	
Nigeria	UK
R1- use of software and going to Industry R2- use of software and going to Industry R3- use of tools needed in the engineering profession and projects R4- use of software and internship, R5- computer programming for development, competitions in robotics, IE-lab R6- competitions, use or software, certifications, joining research groups/professional bodies, attending conferences, R7- use of software R8- use of software, professional workshops, and seminar R9- use of software, professional workshops and seminar/conferences, presentation of papers R10- internship, use of software, professional workshops and seminar/conferences, presentation of papers R11- world-class conference and presentations in the conference R12- use or software, certifications, joining research groups/professional bodies, journals and articles	R13- collaborative group project, professional talk R14- undertaking projects, electrical engineering society R15- scientific society, skills workshop R16- lab-view, railway challenge, R17- projects, courses, extra-curriculum activities R18- placements in Industry, software programming: CAD, student club/ society R19- transferrable skills, technical skills: programming, student societies, R20- no activity

Figure 315 Student engagement with CPD

When asked about the student's engagement with CPD, the participants' answers are as indicated by the summaries in Figure 315. Overall, these responses presented by participants' helped to establish an understanding of the comprehension of student engagement with CPD in the engineering department at the selected universities in Nigeria and the UK.

The vast majority of participants agreed that it was reasonable to assume and theorise that students could engage with Continuous Professional Development. 100% of Nigerian participants agreed that students could and do engage with Continuous professional development, especially within the context of the outlook and definition adopted by this study in regards to student engagement with

CPD; in comparison, 87.5% of Uk participants agreed that students could and do engage with Continuous professional development. All Participants who agreed stated activities that students usually engage with (within the context of their respective institutions) which could be termed as Continuous Professional Development activities. This finding supported postulation in this study concerning student engagement with CPD, at the same time showing the relevance of the definition of CPD in the context of students adopted in this study, as presented in Chapter 2.

In this regard, an extensive list of CPD activities students engage with was identified: 1) Among participants in Nigeria, the activities that were identified as CPD activities are, internships, use of software, professional workshops and seminar/conferences, presentation of papers, certifications, joining research groups, joining professional bodies, journals and articles publication, computer programming for development, competitions in robotics, IE-lab, projects and more. 2) Among participants in the UK, the activities that were identified are: collaborative group project, professional talk, student society, lab-view, railway challenge, extra-curriculum activities, placements in Industry, software programming, CAD, student club/ society, transferrable skills, technical skills, student societies and more

12.1.2.1 Indicators of engagement With CPD Activities

What are the indicators of engagement with these activities?	
Nigeria	UK
R1- Proactiveness, R2- Proactiveness R3- interest R4- Proactiveness in solving problems R5- planning, action and results, R6- results, interest, interest-specific knowledge R7- results, time spent and competence R8- knowledge and action, participation R9- knowledge and action, participation, results R10- change in behaviour and change in practice R11- proactiveness knowledge and action, participation R12- proactiveness knowledge	R13- effort/ engagement, competence and quality, output/result, R14- change in behaviour, questions from different areas, interest R15- maturity, systematic approach R16- action and active participation R17- Level of motivation R18- engagement, competence, result R19- the result, R20- motivation, planning, intellect, reflection, result

Figure 316 Indicators of engagement with CPD Activities

When asked about Indicators of engagement With CPD Activities, the participants' answers are as indicated by the summaries in Figure 316. Overall, the Indicators of engagement With CPD activities presented by participants helped establish an understanding of the comprehension of Indicators of

engagement with CPD activities in engineering departments and faculties at the selected universities in Nigeria and the UK.

In this regard, extensive lists of Indicators of engagement with CPD activities were identified: 1) Among Participants in Nigeria the indicators that were identified are proactiveness, 'proactiveness in solving problems', knowledge, action, participation, results, time spent, competence, interest-specific knowledge, change in behaviour, change in practice, planning and more. 2) Among Participants in the UK, the indicators that were identified are effort/ engagement, 'competence and quality', output/result, 'change in behaviour', 'questions from different areas', interest, maturity, 'systematic approach', 'action and active participation', Level of motivation, competence, result, planning, intellect, reflection, intellect, and reflection and more.

12.1.2.2 Level of engagement with CPD activities

What do you think is the level of engagement with these activities?	
Nigeria	UK
R1- Very low 20% R2- Very Low, 20% R3- Low, 30% R4- Low, 30% R5- Low, 30% R6- Very Low, 20% R7- Low, 35% R8- Low, 35% R9- Medium, 40% R10- High, 60% R11- R12- Medium 50%	R13- Very Low, 20% R14- Very Low, 20% R15- Medium, 40% R16- Medium, 50% R17- Medium, 40% R18- Very Low, 10% R19- Very Low, 10-20% R20- Very Low, 10-20%

Figure 317 Level of engagement with CPD activities

When asked about Level of engagement with CPD activities in their departments, the participants' responses are as indicated by the summaries in Figure 317. Overall, the responses presented by participants helped establish an understanding of the comprehension level of student engagement with CPD in engineering departments and faculties at the selected universities in Nigeria and the UK.

In regards to the perception of students' level of engagement with CPD activities: Among Participants in Nigeria, 27.2727% of participants estimated that the extent of engagement with CPD activities is very low (20%); 27.2727% of participants estimated that the extent of engagement with CPD is low (30%); 18.1818% of participants estimated that the extent of engagement with CPD is low (35%);

9.0909% of participants estimated that the extent of engagement with CPD is medium (40%); 9.0909% of participants estimated that the extent of engagement with CPD is medium (50%); 9.0909% of participants estimated that the extent of engagement is high (60%). In summary, 72.7272% of Participants in Nigeria think that the overall level of engagement with CPD is low to Very low.

In comparison, among Participants in the UK, 37.5% of participants estimated that the level of engagement with CPD activities is very low (less than 20%), 25% of participants estimated that the level of engagement with CPD is very low (20%), 25% of participants estimated that the level of engagement with CPD is medium (40%), 12.5% of participants estimated that the level of engagement with CPD is medium (50%). In summary, 62.5% of Participants in the UK think that the overall level of engagement with CPD is very low.

12.1.3 Activities termed as CPD Activities in your institution

Given the definition of CPD presented, what are the activities termed as CPD activities in your institution?	
Nigeria	UK
R1- no specific activity saves software lab	R13- professional development, practical group-based industry-based skills, technical assignment, group work
R2- no specific activity saves software lab	R14- no specific activity
R3- no specific activity	R15- no specific activity
R4- no specific activity	R16- no specific list of activity
R5- no specific activity saves software lab, robotics and research supervisor	R17- no specific list of activity
R6- no specific activity	R18- no specific list of activity
R7- no specific activity	R19- yes there is
R8- industry-based software and internship	R20- no specific list of activity just life
R9- no specific activity	
R10- no specific activity just the internship	
R11- apart from internships, no specific activity	
R12-	

Figure 318 the activities termed as CPD activities in institutions

When asked about the activities termed as CPD activities in their institutions, the participants' answers are as indicated by the summaries in Figure 318. Overall, the responses presented by participants helped establish an understanding of the activities termed as CPD activities at the selected universities in Nigeria and the UK.

Regarding activities termed as CPD activities in institutions: Among Participants in Nigeria, 45.4545% of participants stated that there are 'no specific activities' termed as CPD activities in their institutions; 9.0909% of participants stated that there are 'no specific activities' termed as CPD activities in their institutions save ‘software lab, robotics and research supervisor'; 18.1818% of participants stated that there are 'no specific activities' termed as CPD activities in their institutions apart from 'internships'; 18.1818% of participants stated that there are 'no specific activities' termed as CPD activities in their institutions' save software lab'; 9.0909% of participants stated that 'industry-based software and internship' are termed as CPD activities in their institutions. Overall, 27.2727% of Participants in Nigeria stated that 'internships' are termed as CPD activities in their institutions', 36.3636% of Participants in Nigeria mentioned 'software', 90.9090% of Participants in Nigeria stated that there are 'no specific activities' termed as CPD activities in their institutions.

In comparison among Participants in the UK, 62.5% of participants stated that there are 'no specific activities' termed as CPD activities in their institutions; 12.5% of participants stated that there are 'no

specific activities’ termed as CPD activities in their institutions apart from ‘just life'. 12.5% of participants in the UK stated that the activities termed as CPD activities in their institutions are, 'professional development, practical group-based industry-based skills, technical assignment, group work'; 12.5% of participants stated that 'yes there' are activities termed as CPD activities in their institutions. Overall, 75% of Participants in the UK stated that there are 'no specific activities' termed as CPD activities in their institutions.

12.2 Measurement

12.2.1 Institution's CPD Strategy

What is the institution's CPD strategy?	
Nigeria	UK
R1- just internship R2- just internship R3- just internship R4- none R5- none R6- none R7- none R8- just internship R9- just internship R10- entrepreneurial skill and internship R11- R12- none	R13- embedded industrial skills, and independent study R14-none R15- none R16- none R17- York world, York futures amongst others R18- none R19- yes, there are web pages where they can go and check anything. R20- no

Figure 319 Institution's CPD strategy

When asked about the Institution's CPD strategy, the participants' responses are as indicated by the summaries in Figure 319. Overall, the responses presented by participants helped establish an understanding of the Institution's CPD strategy at the selected universities in Nigeria and the UK.

Regarding Institutions' CPD strategy: Among Participants in Nigeria, 45.4545% of respondents stated that their institution's CPD strategy revolved around 'just internship'; 45.4545% of respondents stated that their institution has no CPD strategy ('none'); 9.0909% of respondents stated that their institution's CPD strategy revolved around 'entrepreneurial skill and internship'. Overall, 63.6363% of respondents in Nigeria reported that internships were a primary component of their institution's CPD strategy; on the other hand, 45.4545% of Respondents in Nigeria stated that their institution did not have a CPD strategy for learners. It should be noted that due to the intermittent nature of Internships, this study considers internships to be a single CPD activity for students.

In comparison, among participants in the UK, 62.5% of respondents stated that their institution had no CPD strategy ('none'); 12.5% of respondents stated that their institution's CPD strategy revolved around 'York world, York futures amongst others'. 12.5% of respondents in the UK stated that 'yes' their institution had a CPD strategy and went further to indicate that 'there are web pages where they can go and check anything'; 12.5% of respondents stated that their institution's CPD policy revolved around 'embedded industrial skills and independent study'. Overall, 62.5% of respondents in the UK reported that their institutions had no institutional CPD strategy for Learners.

12.2.2 Pre-Existing Method for Measuring or Evaluating the Level of Engagement with Continuous Professional Development (LECPD)

Is there a pre-existing method for measuring or evaluating the Level of engagement with Continuous Professional Development (LECPD)?	
Nigeria	UK
R1- proper documentation and Internship report	R13- I do not know
R2- proper documentation and Internship report	R14- no
R3- proper documentation and Internship report and presentation	R15- yes
R4- proper documentation, Internship report and presentation	R16- no
R5- none	R17- no
R6- none	R18- none
R7- none	R19- yes
R8- none	R20- no
R9- none	
R10- just proper documentation, internship report and presentation	
R11-	
R12- none	

Figure 320 Pre-existing method for measuring or evaluating the LECPD

When asked about the pre-existing method for measuring or evaluating the Level of engagement with Continuous Professional Development (LECPD), the participants' responses are as indicated by the summaries in Figure 320. Overall, the responses presented by participants helped establish an understanding of pre-existing methods for measuring or evaluating Learner's LECPD at selected universities in Nigeria and the UK.

Regarding the pre-existing method for measuring or evaluating Learner's LECPD: Among Participants in Nigeria, 18.1818% of participants stated that the pre-existing method is ‘proper documentation and internship report’; 27.2727% of participants stated that the pre-existing method is ‘ proper documentation, internship report and presentation ‘; 54.5454% of participants stated that there is no pre-existing method none'. Overall, 45.4545% of participants reported that proper documentation and internship reports were a primary component of their institution's pre-existing method for measuring or evaluating Learner's LECPD, on the other hand, 54.5454% of Participants in Nigeria stated that their institution did not have a pre-existing method for measuring or evaluating Learner's LECPD. It should be noted that due to the intermittent nature of internships, this study considers internships to be a singular CPD activity for students.

In comparison, among Participants in the UK, 62.5% of participants stated that there is no pre-existing method ('none'); 12.5% of participants stated that they did not know if there was a pre-existing

method 'I do not Know', 25% of participants stated that 'yes' there are pre-existing methods. Overall, 62.5% of Participants in the UK reported that their institutions had no pre-existing method for measuring or evaluating Learner's LECPD.

When further asked about the fitness of the measure, 20 participants provided substantive responses stating that 'it is a means of putting checks in place'.

12.2.3 Parameters for Measuring LECPD

What parameters should be included in a measure of the level of engagement with CPD	
Nigeria	UK
R1- R2- R3- engagement in a project R4- engagement in a project R5- impact factor: result R6- interest, location, background R7- results, man-hour spent, competence level, R8- proficiency in industry-based software, Level of competence R9- I will not answer as I am focused on overhauling the system R10- Level of competence and result R11- R12- levels of competence and result	R13- attendance, actual input, the actual output R14- time spent R15- time spent, R16- action, reflection, record R17- R18- this is very dangerous; I think that the idea of having targets for students is too much R19- Participation in technical competitions, participation in the professional societies, self-reflection parameter R20- Level of the engagement in planning career-wise

Figure 321 Parameters for measuring LECPD

When asked about parameters for measuring the level of engagement with CPD, the participants' responses are as indicated by the summaries in Figure 321. Overall, the response presented by participants helped establish an understanding of their perceptions of parameters for measuring LECPD in the engineering departments and faculties at the selected universities in Nigeria and the UK.

In this regard, lists of potential parameters for measuring LECPD were identified by participants: 1) Among participants in Nigeria the items that were identified as parameters for measuring LECPD are, 'Level of competence and result', 'Picking up projects', Impact factor, result, interest, location, background, 'man-hour spent', 'proficiency in industry-based software', 'Level of competence' and more. 2) Among participants in the UK the items that were identified as parameters for measuring LECPD are, 'time spent', attendance, actual input, actual output, action, reflection, record,

‘participation in technical competitions’, ‘participation in the professional societies’, ‘self-reflection parameter’, ‘level of the engagement in planning career-wise’ and more.

Regarding Parameters for measuring Learner's LECPD: Among participants in Nigeria, 22.2222% of respondents stated that the parameters for measuring Learner's LECPD are ‘Level of competence and result’; 22.2222% of respondents stated that the parameters for measuring Learner's LECPD are ‘engagement in a project’; 11.1111% of respondents stated that the parameters for measuring Learner's LECPD are ‘impact factor and result’; 11.1111% of respondents stated that the parameters for measuring Learner's LECPD are ‘interest, location, background’; 11.1111% of respondents stated that the parameters for measuring Learner's LECPD are ‘results, ‘man-hour spent’, competence level’; 11.1111% of respondents stated that there the parameters for measuring Learner’s LECPD are ‘proficiency in industry-based software, Level of competence’. Overall, 55.5556% of Respondents in Nigeria reported that Level of competence/results related factors are parameters for measuring Learner's LECPD, on the other hand, 33.3333% of respondents reported that participation and engagement related factors are parameters for measuring Learner's LECPD.

In comparison, among participants in the UK, 42.8571% of respondents stated that the parameters for measuring Learner's LECPD are' time spent'; 14.2857% of respondents stated that the parameters for measuring Learner's LECPD are' attendance, actual input, actual output'. Also, 14.2857% of respondents in the UK stated that the parameters for measuring Learner's LECPD are' action, reflection, record'; 14.2857% of respondents stated that the parameters for measuring Learner's LECPD are' participation in technical competitions, participation in the professional societies, self-reflection parameter'. 14.2857% of respondents in the UK stated that the parameters for measuring Learner's LECPD are' level of the engagement in planning career-wise'; 14.2857% of respondents stated that the parameters for measuring Learner's LECPD are 'very dangerous, I think that the idea of having targets for students is too much'. Overall, 71.428% of respondents reported that action/participation related factors, including time spent, are parameters for measuring Learner's LECPD. On the other hand, 28.5714% of respondents reported that reflection related factors are parameters for measuring Learner's LECPD; 28.5714% of participants reported that planning related factors are parameters for measuring Learner's LECPD; 11.1111% of respondents reported that results related factors are parameters for measuring Learner's LECPD. The identified parameters are in line with the parameters that form the underlying premise for measurement of LECPD used in this study as detailed in Chapter 2

12.2.4 Value in having a Measure of LECPD

Figure 322 Value in having a Measure of LECPD I

When asked if there was value in measuring learner's engagement with CPD, the most common terms used by participants are as indicated in the word cloud shown in Figure 322. The Word cloud shows a wide range of terms that come together to illustrate an emphatic and unanimous agreement by participants across the board (Institution in NE England and SW Nigeria) that there is value in having a measure for the level of engagement with CPD and the said measure developed in this study; in line with the underpinning proposition that guides this study.

Do you think there is value in having a measure?	
Nigeria	UK
R1- yes, it valuable because experience changes orientation	R13-yes
R2- yes, it valuable because experience changes orientation	R14- yes
R3- yes, for development in the field	R15- yes
R4- yes, development in the field	R16- yes in encouragement
R5- yes for seriousness	R17- I do not know
R6- yes, it is valuable	R18- yes in encouragement
R7- yes, to check progress Level	R19- yes
R8- yes to check for competence	R20- yes
R9- yes, it valuable	
R10- yes, for seriousness	
R11-	
R12- Yes for seriousness	

Figure 323 Value in having a Measure of LECPD II

When asked if there was value in having a measure of learner's engagement with CPD, the participants' responses are as indicated by the summaries in Figure 323. Overall, the response presented by participants helped establish an understanding of their perceptions of the value of developing a tool for measuring learner's engagement with CPD in the engineering department and faculties at the selected universities in Nigeria and UK.

In regards to the value of a tool for measuring learner's engagement with CPD: Among participants in Nigeria, 18.1818% of respondents stated that there is value in having a measure 'because experience changes orientation'; 18.1818% of respondents stated that there is value in having a measure, as it promoted 'development in the field'; 18.1818% of respondents stated that there is value in having a measure, as it promoted and displayed 'seriousness; 18.1818% of respondents stated that there is value in having a measure, as a means to check progress level and competence. Overall, 100% of Respondents in Nigeria stated that there is value in having a measure of the level of engagement with CPD 'Yes'.

In comparison, among Participants in the UK, 25% of respondents stated that there is value in having a measure as a means of 'encouragement' of engagement with CPD; 12.5% of respondents stated that they 'do not know' if there is value in having a measure. Overall, 87.5% of all respondents in the UK stated that there is value in having a measure of the level of engagement with CPD. The position expressed by respondents concerning the value of a measure of LECPD is in line with the position that forms the underlying premise for this study and those expressed in Chapter 2.

12.2.5 Agreement with the Model of Measurement of CPD

Do you agree with the model of measurement of CPD used? If yes or no, why?	
Nigeria	UK
R1- It is adequate	R13- It is adequate
R2- It is adequate	R14- It is adequate
R3- theoretical	R15- It is adequate
R4- It is adequate	R16- It is adequate
R5- It is adequate	R17- it seems adequate
R6- It is adequate	R18- It is adequate
R7- It is adequate	R19- It is adequate
R8- It is adequate for specific skill	R20-
R9- I will look at the process, people and end product	
R10- it is adequate	
R11-	
R12- it is adequate	

Figure 324 Agreement with Model of measurement of CPD

When asked if they agree with the model of measuring learner's engagement with CPD used in the study, the participants' responses are as indicated by the summaries in Figure 324. Overall, the response presented by participants helped establish an understanding of their agreement with the model of measurement of learner's engagement with CPD in the engineering departments and faculties at the selected universities in Nigeria and the UK.

In regards to agreement with the model of measurement of learner's engagement with CPD: Among Participants in Nigeria, 9.09009% of respondents stated that the model of measurement of learner's engagement with CPD used in the study is 'adequate for specific skill'; 9.09009% of respondents stated that a Model of measurement of learner's engagement with CPD should 'look at the process, people and end product', this response is in line with the model used in this study; 9.09009% of respondents stated that the model of measurement of learner's engagement with CPD used in the study is 'theoretical' in nature. Overall, 100% of Respondents in Nigeria agreed that the underlying model used to develop the tool for measurement of the Level of Learner's engagement with CPD used in this study is adequate.

In comparison among participants in the UK, 100% of respondents in the UK agreed that the underlying model used to develop the tool for measurement of the Level of Learner's engagement with CPD used in this study is adequate.

12.3 Process

12.3.1 Steps that a Student Should Take to Develop Professionally

What do you think are the steps that a student should take to develop professionally?	
Nigeria	UK
R1- register with a professional body. R2- register with a professional body, R3-mentor, motivation, identifying area of interest R4- mentor, planning, skills for online research R5- identifying areas of interest, skills needed, mentor, planning R6- identifying areas of interest, join professional body, skills, research group attachment, seminars R7- planning., action, result, change of behaviour R8- mentor, professional body, get certification R9- interest, R10- join a professional body, R11- R12- identifying areas of interest, skills needed, attend conferences, seminars and workshops, software.	R13- identifying Industry of interest, look for a job in such Industry, acquire skill, join professional body, skills, research group attachment, seminars R14- identify goals, skills-oriented goal, achieve the goal R15- look for professional placement R16- identifying areas of interest, skills-gap analysis, develop skills in those areas R17- identifying areas of interest, skills-gap analysis, develop skills in those areas, come up with a design R18- go to placement, real work in the profession R19- identifying areas of interest, commercial awareness in relation to interest, R20- the action, the planning, the results and the reflection

Figure 325 Steps that a student should take to develop professionally

When asked about steps students should take to develop professionally, the participants' responses are as indicated by the summaries in Figure 325. Overall, the response presented by participants helped establish an understanding of their perceptions of steps students should take to develop professionally in engineering departments and faculties at the selected universities in Nigeria and the UK.

In this regard, a list of potential steps students should take to develop professionally were identified by participants: 1) Among Participants in Nigeria the items that were identified are registration with professional bodies, mentorship, motivation, identifying areas of interest, planning, skills for online research, attending conferences, seminars, workshops and more. 2) Among Participants in the UK, the items identified are identifying Industry of interest, looking for a job in such Industry, acquiring skills, 'joining professional bodies', 'research group attachment', seminars; identify goals, skills-oriented goal, 'achieve the goal'; 'look for professional placement'; 'identifying an area of interest', 'skills-gap

analysis', 'develop skills in those areas'; 'skills-gap analysis', 'develop skills in those areas', 'come up with a design'; 'commercial awareness in relation to interest', the action, the planning, 'the results and the reflection'.

Regarding steps student's should take to develop professionally: among participants in Nigeria, 18.1818% of respondents stated that steps students should take to develop professionally include registering 'with a professional body'; 45.4545% respondents stated that 'identifying the area of interest' is one of the steps a student should take to develop professionally; 36.3636% of the respondents stated that a student needs to possess 'skills' and have a mentor to develop professionally; 27.2727% of the respondents stated that students need 'planning' to be able to develop professionally; 18.1818% of the respondents stated that 'seminars' are necessary for students to develop professionally; 9.0909% of the respondents stated that 'skills for online research' is needed for a student to develop professionally; 9.0909% of the respondents stated that 'research group attachment' is needed for a student to develop professionally; 9.0909% of the respondents stated that 'action' is needed for a student to develop professionally; 9.0909% of the respondents stated that 'result', is needed for a student to develop professionally; 9.0909% of the respondents stated that 'change of behaviour', is needed for a student to develop professionally; 9.0909% of the respondents stated that 'getting certification' is needed for a student to develop professionally. Overall, 45.4545% of Respondents in Nigeria stated that joining 'Professional bodies' and identifying areas of interests, are part of the steps students should take to develop professionally.

In comparison, among participants in the UK, 37.5% of respondents stated that 'identifying the area of interest' is needed for a student to develop professionally; 37.5% of respondents implied that working in a professional setting in Industry by getting a placement is needed for a student to develop professionally. Also, 50% of respondents in the UK stated that 'acquiring skills', 'skill gap analysis', 'joining research groups' are needed for a student to develop professionally. Also, 12.5% of respondents in the UK stated that 'identifying the industry of interest' is needed for a student to develop professionally; 12.5% of respondents stated that 'identifying goals, skills-oriented goals, achieving the goal' is needed for students to develop professionally. Also, 12.5% of respondents in the UK stated that cycle of 'the action, planning, results and reflection' is needed for a student to develop professionally, 10% stated that 'seminars' are needed for a student to develop professionally. Overall, 50% of respondents in the UK stated that skills generally; in the form of acquiring skills, skill gap analysis, skills research group attachment is needed for a student to develop professionally. The

identified parameters are in line with the parameters and CPD cycle that forms the underlying premise for measurement of CPD used in this study as detailed in Chapter 2

12.3.2 Professional Development Process

What do you think a good professional development process should look like?	
Nigeria	UK
R1- identify choice area, set targets in that area by going to a professional trainer	R13- motivation, the realisation of what you can do
R2-	R14- define a goal, analyse and break it down, planning, result and reflection
R3- identify choice area, set targets in that area by going to a professional trainer	R15- status skills, research skill, presentation skills
R4- identify choice area, set targets in that area by going to professional trainer or academy	R16- tell them the importance of CPD and kickstart from the previous courses
R5- identify choice area, skills needed, what do I have, planning on how to get what I need, learning set targets in that area by going to professional trainer or academy	R17- activities that would improve the potential for more opportunities
R6- identify choice area, join the professional body of area of interest, join local research group, skills needed, learning	R18- a life-long learning process
R7- interest, creation of impact, interest creation criteria	R19- academic curriculum based on or considering career aspiration of the students, the knowledge required and smart ways of doing things
R8- identify choice area, skills needed, cost of acquiring the skills, learning set targets in that area by going to professional trainer or academy, proper evaluation	R20- the action, the planning, the results and the reflection
R9- marketable skill, current and transferable	
R10- professional ethics of the profession	
R11-	
R12- interest, knowledge-base, productivity and asset	

Figure 326: What a good professional development process should look like.

When asked about what they think a good professional development process should look like the participants' responses are as indicated by the summaries in Figure 326, overall, the response presented by participants helped establish an understanding of their perceptions on what they think a good professional development process should look like at the selected universities in Nigeria and UK.

Regarding what a good professional development process should look like, the following were identified by participants: 1) Among participants in Nigeria five sets of items that were identified as what a good professional development should look like include: a) identifying choice area, set targets

in that area by going to professional trainers, identify skills needed, identify skills possessed ('what do I have'), 'planning on how to get what skills are needed', 'join professional body of area of interest', 'join local research group' and 'learning activities'; b) interest, 'creation of impact', 'interest creation criteria', 'cost of acquiring skill' and 'proper evaluation'; c) 'marketable skills' and 'current and transferable skills'; d) 'professional ethics of the profession'; e) interest, knowledge-base, productivity and asset. 2) Among Participants in the UK, nine sets of items that were identified as what a good professional development process should look like include: a) motivation, 'realisation of what you can do'; b) 'define a goal', 'analyse and break it down', planning, result and reflection; c) status skills, research skill and presentation skills; d) tell them the importance of CPD and kickstart from the previous courses; e) activities that would improve the potential for more opportunities); f) 'life-long learning process'; g) academic curriculum based on or considering career aspiration of the students', 'the knowledge required' and 'smart ways of doing things'; h) the action, the planning, the results and the reflection; i) the action, the planning, the results and the reflection.

Regarding parameters for a good professional development process: Among participants in Nigeria, 30% of the respondents stated that for a good professional development process' one must 'identify choice area, set targets in that area by going to professional trainer'; 10% of the respondents stated that for a good professional development process' one must 'identify choice area, skills needed, what do I have, planning on how to get what I need, learning set targets in that area by going to professional trainer or academy'; 10% of the respondents stated that for a good professional development process' one must '-identify choice area, join professional body of area of interest, join local research group, skills needed, learning'; 10% of the respondents stated that for a good professional development process' one must have' interest, creation of impact, interest creation criteria'; 10% of the respondents stated that for a good professional development process' one must 'identify choice area, skills needed, cost of acquiring skill, learning set targets in that area by going to professional trainer or academy, proper evaluation'; 10% of the respondents stated that for a good professional development process' one must have 'marketable skill, current and transferable'; 10% of the respondents stated that for a good professional development process' one must have 'professional ethics of the profession'; 10% stated that for a good professional development process' one must have 'interest, knowledge-based, productivity and asset'. Overall, 60% of the respondents in Nigeria stated that identifying a choice area is required for good professional development, while 30% thinks skills are required for a good professional development process.

In comparison, among Participants in the UK, 12.5% of respondents stated that 'the action, the planning, the results and the reflection' are needed for a good professional development'; 12.5% of respondents stated that 'motivation and the realisation of what you can do' are needed for a good professional development process; 12.5% of respondents stated that 'defining a goal, analysing and breaking it down, planning, result and reflection' are needed for a good professional development process; 12.5% of respondents stated that 'status skills, research skill, presentation skills' are needed for a good professional development process; 12.5% of respondents stated that 'telling them the importance of CPD' and 'kickstarting from the previous courses' are needed for a good professional development process; 12.5% of respondents stated that 'activities that would improve the potential for more opportunities' is needed for a good professional development process; 12.5% of respondents stated that 'life-long learning process' is needed for a good professional development process; 12.5% of respondents stated that 'academic curriculum based on or considering career aspiration of the students', provision of 'knowledge required' and developing or synthesising 'smart ways of doing things' are needed for a good professional development process. Overall, 25% of respondents stated that 'planning, result and reflection' are needed for a good professional development process. The identified parameters are in line with the CPD cycle and parameters that form the underlying premise for measurement of CPD used in this study as detailed in Chapter 2

12.3.3 Process Cycle of Engagement with CPD

Using Kolb's Learning Cycle as an example, what do you think the process cycle of engagement with CPD should contain?	
Nigeria	UK
R1- observation and reflection should have to do with the result	R13-
R2- observation and reflection should have to do with the result	R14- this is a good fit, but you must have a goal
R3-	R15- this is a good fit
R4- this is a good fit	R16- this is a good fit. putting it in simple words makes it approachable for the student
R5- this is a good fit but working with peers should be inserted at planning and result phase	R17- this is a good fit
R6- there should be a comparison between concept and generalisation	R18- Good fit, although I do not like Kolb's learning cycle, it is artificially organised
R7- engineering design process is a better fit as far as engineering students are concerned	R19- this is a good fit
R8- this is a good fit for lower Level more modification for advance level	R20- it feels right
R9- it has to incorporate the interest/aim	
R10- this is a good fit	
R11-	
R12- this is a good fit	

Figure 327: what do you think the process cycle of engagement with CPD should contain using Kolb's learning cycle as an example.

When asked about what the process cycle of engagement with CPD should contain using Kolb's learning cycle as an example, the participants' responses are as indicated by the summaries in Figure 327. Overall, the response presented by participants helped establish an understanding of what the process cycle of engagement with CPD should contain using Kolb's learning cycle as an example in the engineering department and faculties at the selected universities in Nigeria and UK.

Regarding what the process cycle of engagement with CPD should contain: most participants in Nigeria were of the position Kolb's learning cycle represented a good process cycle for engagement with CPD although some went on to advise the following changes should be included: a) 'observation and reflection focused on results'; b) 'working with peers should be inserted at planning and result phase'; c) 'there should be a comparison between concept and generalisation'; d) 'engineering design process is a better fit as far as engineering students are concerned', 'more modification for advance level' and 'it has to incorporate the interest/aim'.

2) Among participants in the UK, most were of the position Kolb's learning cycle represented a good process cycle for engagement with CPD although some went on to advise the following: the need to have a goal [you must have a goal], 'putting it in simple words make it approachable for the student', and 'some went as far as to describe it as artificially organised'.

Regarding what the process cycle of engagement with CPD should contain using Kolb's learning cycle as an example: Among participants in Nigeria, 20% of respondents stated that the Kolb's Learning cycle is a good fit for the process cycle for engagement with CPD however' observation and reflection should have to do with result'; 30% of respondents stated that the Kolb's learning cycle is a 'good fit' for the process cycle for engagement with CPD; 10% of respondents stated that the Kolb's learning cycle is a 'good fit' but 'working with peers should be inserted at planning and result phase'; 10% of respondents stated that in determining the process cycle for engagement with CPD there should be 'comparison between concept and generalisation'; 10% of respondents stated that 'engineering design process is a better fit' for a process cycle for engagement with CPD as far 'as engineering students are concerned'; 10% of respondents stated that the Kolb's learning Cycle is a 'good fit for lower Level' learners but more modification need to be made to the cycle for advance level learners; 10% respondents stated that the Kolb's learning cycle was a good fit however' it has to incorporate the interest/aim'. Overall, 80% of the respondents in Nigeria stated Kolb's learning cycle was a 'good fit' for the process cycle for engagement with CPD.

In comparison, among participants in the UK, 57.1428% of the respondents stated that the Kolb's Learning cycle is a good fit for the process cycle for engagement with CPD; 14.2857% of respondents in the UK stated that the Kolb's Learning cycle is a good fit for the process cycle for engagement with CPD but 'a goal' should be included. Among respondents in the UK, 14.2857% of the respondents stated that the Kolb's Learning cycle is a good fit for the process cycle for engagement with CPD but, 'Putting it in simple words makes it approachable for the student'; 14.2857% of the respondents stated that the Kolb's Learning cycle is a good fit for the process cycle for engagement with CPD, but it is 'artificially organised'. Overall, 100% of the respondents stated that the Kolb's Learning cycle is a good fit for the process cycle for engagement with CPD, although 14.2857% of respondents expressed some reservations. The identified parameters are in line with the CPD cycle and parameters that form the underlying premise for measurement of CPD used in this study as detailed in Chapter 2.

12.3.4 Continuous Professional Development Versus Employability

Do you believe there is a difference between Continuous Professional Development and the development of employability skills?	
Nigeria	UK
R1- no difference	R13- no difference
R2- no difference	R14- there is a difference
R3- there is a difference	R15- similar but different
R4- no difference	R16- there is no difference
R5- there is a difference	R17- Similar but different
R6- different but similar	R18- yes
R7- no but similar	R19- there is a difference
R8- there is a difference	R20- there is a difference
R9- there is a difference	
R10- there is a difference	
R11-	
R12- there is a difference	

Figure 328: what is the difference between Continuous Professional Development and development of employability skills?

When asked if there was a difference between Continuous Professional Development and development of employability skills, the participants' responses are as indicated by the summaries in Figure 328. Overall, the response presented by participants helped establish an understanding of CPD and if they thought it was different from the development of employability skills in the engineering department and faculties at the selected universities in Nigeria and the UK.

Regarding the difference between Continuous Professional Development and development of employability skills: Among participants in Nigeria, 27.2727% stated that there is 'no difference' between Continuous professional development and employability; 54.5454% of respondents stated that 'there is a difference' between Continuous Professional Development and development of employability skills; 18.1818% expressed some reservations. Overall, 54.5454% of respondents in Nigeria stated that there is a difference between Continuous Professional Development and the development of employability skills.

In comparison, among participants in the UK, 25% stated that there is 'no difference' between Continuous Professional Development and development of employability skills; 50% of respondents in the UK stated that 'there is a difference' between Continuous Professional Development and development of employability skills; 25% of respondents in the UK stated that there is a 'difference' but expressed some reservation, stating that they are 'similar'. Overall, 75% of respondents in the UK stated that there is a difference between Continuous Professional Development and the development of employability skills.

12.4 Quantitative Results

12.4.1 Mean Motivation Profile

Is the mean Motivation Profile (MP) high or Low in the Engineering Department/Faculty of your university?	
Nigeria	UK
R1- Medium, 40% R2- Medium, 40% R3- Medium, 40% R4- low, 20% R5-low 25% R6- Medium, 45% R7- Medium, 40% R8- high: 60% R9- very high, 80% R10- very high, 75% R11- high, 60% R12-high, 60%	R13- Medium, 50% R14- High, 60% R15- High, 60% R16- High, 60% R17- low, 25% R18- Low, 35% R19- High, 70% R20- Low, 30%

Figure 329: Mean motivation profile

When asked if the Motivation Profile (MP) is high or Low in the Engineering Departments and Faculties of the selected universities, the participants' responses are as indicated by the summaries in Figure 329. Overall, the responses presented by participants helped establish the mean motivation profile in the engineering department and faculties at the selected universities in Nigeria and the UK.

Regarding if the Motivation Profile (MP) is high or Low in the Engineering Departments and Faculties of the selected universities: Among Participants in Nigeria, 8.3333% of respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of very low level (20%), 8.3333% of respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of low level (25%); 33.3333% stated that the motivation profile in the Engineering Departments and Faculties in their universities are of medium level (40%); 8.3333% of respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of medium level (45%); and 25% of respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of high 60%, 8.3333% of respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of very high level (75%); 8.3333% of respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of very high level 80%.Overall, 41.6667% respondents in Nigeria, stated that the mean level of motivation profile in the Engineering Departments and Faculties in their universities was high to very

high levels, on the other hand, 58.3333% stated that the mean level of motivation profile in the Engineering Departments and Faculties in their universities very low to medium.

Among Participants in the UK, 12.5% of respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of low level (25%); 12.5% of Respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of low (30%); 12.5% of Respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of low level (35%). 12.5% of Respondents in the UK stated that the motivation profile in the Engineering Departments and Faculties in their universities are of medium level (50%); 37.5% of Respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of high level (60%); 12.5% of Respondents stated that the motivation profile in the Engineering Departments and Faculties in their universities are of high level (70%). Overall, Respondents in the UK, 50% stated that the mean level of motivation profile was high to very high, while 50% stated that it was low to medium.

12.4.2 Cause of the High/Low LECPD in the Selected Universities

What do you think is responsible for the high/low LECPD in your university?	
Nigeria	UK
R1- background	R13-
R2- background	R14- the pre-education system does tell about engagement with CPD
R3- inadequate classrooms/laboratories, inadequate research grants	R15- students are busy with what they came to school for so no time
R4- no motivation from lecturers/ university, poor classrooms/ laboratories	R16-
R5- recruitment services are more certificate-based than competency-based, no motivation, opportunities, no structured system,	R17-
R6- it is competing with good grades, state of opportunities,	R18-
R7- lack of proper guidance providing quality info	R19-
R8- lack of availability of jobs	R20- they have been pre-programmed in high school for the immediate result while CPD is a long-life process
R9- the internet is keeping them on their toes	
R10- motivation from the lecturer	
R11-	
R12- situation of the country	

Figure 330: What do you think is responsible for the high/low LECPD in your university?

When asked about is responsible for the high/low LECPD in the university, the participants' responses are as indicated by the summaries in Figure 330. Overall, the response presented by participants helped establish an understanding of what responsible for the high/low LECPD in the engineering department at the selected universities in Nigeria and the UK.

In this regard, a list of factors was identified by participants; 1) Among participants in Nigeria the items that were listed are: a) background; b) inadequate classrooms/laboratories, inadequate research grants; c) no motivation from lecturers/ university; d) 'recruitment services are more certificate-based than competency-based', no motivation, opportunities, no structured system'; e) 'competing for good grades', state of opportunities; f) 'lack of proper guidance using quality info; g) 'lack of availability of jobs', 'internet is keeping them on their toes', 'motivation from the lecturer', 'situation of the country'. 2) Among Participants in the UK the items that were listed are: a) 'pre-education system does tell about engagement with CPD'; b) 'students are busy with what they came to school for so no time'; c) 'they have been pre-programmed in high school for the immediate result while CPD is a long-life process'; d) 'pre-education system does tell about engagement with CPD'.

Regarding what is responsible for the LECPD in the university: Among participants in Nigeria, 18.1818% of respondents stated that the student's 'background' is responsible for the high/low LECPD in the university; 9.0909% of respondents stated that 'poor classrooms/ laboratories, poor research grant' is responsible for the LECPD in the university; 9.0909% of respondents stated that' no motivation from lecturers/university, inadequate classrooms/ laboratories' is responsible for the low LECPD in the university; 9.0909% of respondents stated that' recruitment services being more certificate based than competency based, no motivation, opportunities, no structured system' is responsible for the low LECPD in the university; 9.0909% of respondents stated that 'competing for good grades, state of opportunities' is responsible for the high/low LECPD in the university; 9.0909% of respondents stated that' lack of proper guidance providing quality info' is responsible for the low LECPD in the university; 9.0909% of respondents stated that' lack of availability of jobs' is responsible for the low LECPD in the university; 9.0909% of respondents stated that' the internet keeping them on their toes' is responsible for the high LECPD in the university; 9.0909% of respondents stated that the' motivation from the lecturer' is responsible for the high/low LECPD in the university; 9.0909% of respondents stated that the' situation of the country' is responsible for the high/low LECPD in the university.

While among participants in the UK, 33.3333% of the participants stated that' pre-education system does tell about engagement with CPD'; 33.3333% states that 'students are busy with what they came to school for so no time' which in turn is responsible for the low LECPD in the university; 33.3333%

states that ‘they have been pre-program in high school for the immediate result while CPD is a long-life process’.

12.4.3 LECPD and MP versus Ethnicity

Do you think the LECPD and MP different for Engineering Students (ES) from certain ethnic groups in the Engineering department/faculty of your university	
Nigeria	UK
R1- there is a difference R2- there is a difference R3- no, I do not think so R4- there is a difference R5- there is a difference R6- no R7- there is a difference R8- no, I do not think so R9- not really R10- certainly not R11- R12- there is a difference	R13-yes. there is a difference R14- yes there is a difference R15- no difference R16- I really do not know. there is a difference R17- different R18- yes there is a difference R19- there is a difference R20- there is a difference

Figure 331: LECPD and MP Versus Ethnicity

When asked about what they thought about LECPD and MP being different for Engineering Students (ES) from certain ethnic groups, the participants’ responses are as indicated by the summaries presented in Figure 331. Overall, the response presented by participants helped establish an understanding of LECPD and MP vs ethnicity in the engineering departments and faculties at the selected universities in Nigeria and the UK. Regarding if LECPD and MP are different for Engineering Students (ES) from certain ethnic persuasions. Among participants in Nigeria, 45.4545% of respondents in Nigeria stated that LECPD and MP are not different across ethnic persuasions, on the other hand, 54.5454% of respondents stated that they are different across ethnic persuasions. In comparison, 12.5% of respondents in the UK stated LECPD and MP are not different across ethnic persuasions, while 87.5% of respondents stated that they are different across ethnic persuasions.

12.4.4 LECPD and MP Versus Income Classes

Are the LECPD and MP different for Engineering Students (ES) across income classes in the Engineering department/faculty of your university?	
Nigeria	UK
R1- not really	R13- No difference just in the confidence level of the high-income class
R2- not really	R14- there is a difference. High with students with low income
R3- not really	R15- no difference. Function of personality
R4- there is a difference	R16- there is a difference. LECPD is High with students with high income, and Motivation is the same
R5- there is a difference	R17- there is a difference. LECPD and MP is High with students with high income,
R6- there is a difference	R18- there is a difference. LECPD and MP is High with students with high income
R7- there is a difference	R19- there is a difference. LECPD and MP is High with students with low income
R8- there is a difference	R20- there is a difference. LECPD and MP is High with students with low income
R9- there is a difference	
R10- there is a difference	
R11-	
R12- there is a difference	

Figure 332: Why the LECPD and MP are different for Engineering Students (ES) across income classes in the Engineering department/faculty of universities.

When asked if the LECPD and MP are different for Engineering Students (ES) across income classes in the Engineering department/faculty of their university the participants answered as indicated by the summaries presented in Figure 332. Overall, the response presented by participants helped establish an understanding of why the LECPD and MP are different for Engineering Students (ES) across income classes in the engineering department and faculties at the selected universities in Nigeria and UK.

Regarding if LECPD and MP are different for Engineering Students (ES) across income classes: among participants in Nigeria, 27.2727% of respondents stated that LECPD and MP are 'not really' different across income classes; 72.7273% stated that LECPD and MP respondents stated that they are different across income classes.

While among participants in the UK, 12.5% of respondents stated that LECPD and MP are not 'difference' across income classes although there is a difference 'just in the confidence level of the high-income class'; 12.5% of respondents stated that there is 'no difference' in LECPD and MP across income classes and that any perceived differences are a 'Function of personality'. Also among participants in the UK, 12.5% of respondents stated that' there is a difference' in LECPD across income classes and that LECPD is High with students with high income, however going further to state that the 'Motivation is the same' across Income Classes. Also, 25% of respondents stated that ' there is a difference in LECPD and MP across income classes and that LECPD and MP is High with students with high income; 37.5% of respondents stated that 'there is a difference' in LECPD and MP across income

classes and that LECPD and MP is 'High with students with low income'. Overall, 75% of respondents stated that LECPD and MP are different for Engineering Students (ES) across income classes in the Engineering department/faculty of their university. In comparison, 25% of respondents stated LECPD and MP are not different for Engineering Students (ES) across income classes in the Engineering department/faculty of their university.

12.4.5 Nature of Course

Do you think the width of the course/degree or lack of credit affects the Level of engagement and motivation to engage with CPD	
Nigeria	UK
R1- no, it is not too wide. It does not have an effect	R13-no it is not too wide. It does not have an effect
R2- no, it is not too wide. It does not have an effect	R14- it is forcibly shrunk, not broad enough. It has a negative effect
R3- it is too wide and has a negative effect	R15- it is above average. It has a negative effect because no time
R4- it is too wide and has a negative effect	R16- it is okay. does not have an effect
R5- it is too wide, but variety is lacking and has a negative effect	R17-
R6- it is too wide. It has a negative effect.	R18- it is way too high. It does have a negative effect
R7- no, it is not too wide. It does not have an effect	R19- it is about right. it has a positive effect
R8- Even though it is wide it should not be narrowed down and has a negative effect	R20- it is okay. It does not have an effect
R9- I will overhaul the program. It has a negative effect	
R10- It is too wide. It may have a negative effect.	
R11-	
R12- It is not wide but narrow	

Figure 333: how the width of the course or lack of credit affects the Level of engagement and motivation to engage with CPD

When asked if they thought the width of the course or lack of credit affected the Level of engagement and motivation to engage with CPD, the participants' responses are as indicated by the summaries presented in Figure 333. Overall, the response presented by participants helped establish an understanding of how the width of the course or lack of credit affects the Level of engagement and motivation to engage with CPD at the selected universities in Nigeria and UK.

Regarding if the width of the course or lack of credit affects the Level of engagement and motivation to engage with CPD: Among participants in Nigeria, 27.2727% respondents stated that the course/degree content is 'not too wide' and 'does not have an effect' on the level of engagement and

motivation to engage with CPD. The width of the course or lack of credit does not affect the level of engagement and motivation to engage with CPD'; 36.3636% of respondents stated that the course/degree content is 'too wide' and the width of the course or lack of credit has a negative effect on the level of engagement and motivation to engage with CPD; 9.0909% respondents stated that the course/degree content is 'not too wide but too narrow'; 9.0909% of respondents state that that the course/degree content is 'too wide, but variety is lacking', and the width of the course or lack of credit has a negative effect on the level of engagement and motivation to engage with CPD; 9.0909% respondents stated that 'even though' the course/degree content is 'wide, it should not be narrowed down' while on the other hand stating that the width of the course or lack of credit 'has a negative effect' the Level of engagement and motivation to engage with CPD; 9.0909% of respondents stated that they would 'overhaul the program' and the width of the course or lack of credit has a negative effect on the Level of engagement and motivation to engage with CPD. Overall, among participants in Nigeria, 54.5454 % of respondents stated that the course/degree content is 'too wide', while 45.4545% respondents stated that the course/degree content is not too wide. On the other hand, 80% of respondents stated that the width of the course or lack of credit has a 'negative effect' on the level of engagement and motivation to engage with CPD while 20% of respondents stated it does not have an effect.

In comparison among participants in the UK, 42.85% of respondents stated that the course/degree content is 'not too wide' or 'is okay' and that the width of the course or lack of credit 'does not have an effect' on the level of engagement and motivation to engage with CPD'. Also, 14.2857% of respondents state that the course/degree content is 'forcibly shrunk, not broad enough', and that the width of the course or lack of credit has 'a negative effect' on the level of engagement and motivation to engage with CPD. Also, 28.5714% of respondents stated that the course/degree content is 'above average' or 'way too high', and the width of the course or lack of credit has a 'negative effect' on the level of engagement and motivation to engage with CPD. Also, 14.2857% of respondents stated that the course/degree content is 'about right' and the width of the course or lack of credit has a positive effect on the level of engagement and motivation to engage with CPD'. Overall, among participants in the UK, 28.5714% of respondents stated that the course/degree content is 'too wide', while 71.4285% respondents stated that the course/degree content is not too wide. On the other hand, 42.8571% of respondents stated that the width of the course or lack of credit has a 'negative effect' on the level of

engagement and motivation to engage with CPD, on the other hand, 14.2857% of respondents stated that it has a positive effect, while 42.8571% of respondents stated it does not have an effect.

12.4.6 Problem-based Learning and CPD

Do you think there is a relationship between problem-based learning and CPD ?	
Nigeria	UK
R1- different R2- different R3- no difference R4- R5- no difference R6- different but similar R7- different R8- different but similar R9- different but similar R10- different but similar R11- R12- different but similar	R13- R14- different R15- I do not know R16- it does not always apply R17- R18- R19- there is a relationship R20-

Figure 334: do you think there is a relationship between problem-based learning and CPD?

When asked if they thought there is a relationship between problem-based learning and CPD, the participants' responses are as indicated by the summaries presented in Figure 334. Overall, the response presented by participants helped establish an understanding of why the LECPD and MP are different for Engineering Students (ES) across income classes in the engineering departments and facilities at the selected universities in Nigeria and UK.

Regarding if there is a relationship between problem-based learning and CPD: Among Participants in Nigeria, 30% of respondents stated that there was no relationship between problem-based learning and CPD as they are ‘different’; 50% of respondents stated that there is a relationship between problem-based learning and CPD as they are ‘different but similar’; 20% of respondents stated that there is a relationship between problem-based learning and CPD as they are ‘no difference’. Overall, 70% of respondents stated that there is a relationship between problem-based learning and CPD, while 30% of respondents stated that there is no relationship.

In comparison, Among Participants in the UK: 25 % of respondents stated that there was no relationship between problem-based learning and CPD as they are ‘different’; 25% of respondents stated that ‘there is a relationship’ between problem-based learning and CPD; 50% of respondents

stated that they 'do not know' if there is a relationship between problem-based learning and CPD or 'it does not always apply'.

12.4.7 University or Department Role

what do you think the university or department can do more?	
Nigeria	UK
R1- making LECPD formal in the curriculum	R13- create a professional development framework (already in the process)
R2- making LECPD formal in the curriculum	R14- encourage students to engage more in CPD activities, raise awareness and create engaging curriculum
R3- mode of work delivery, equipped classes and labs	R15-
R4- reduce workload, create a centre for development	R16- encourage the students to engage more in CPD
R5- strategy: programs to encourage CPD	R17-
R6- reduce the curriculum and programs to encourage CPD, i.e. increase flexibility to give allowance	R18-
R7- programs to e encourage CPD	R19- teaching assistant should be employed to relieve researchers the stress of both teaching and researching
R8- programs to encourage CPD, encourage industry-based mentors,	R20-
R9- overhaul the system and reduce the workload and more time in the policy	
R10- making LECPD formal in the curriculum	
R11-	
R12- create a centre for CPD	

Figure 335: what the university or department can do more

When asked if they think the university or department can do more, the participants' responses, as indicated by the summaries presented in Figure 335. Overall, the responses presented by participants helped to establish an understanding of how the universities or departments can do more.

In this regard, a list of responses was identified by participants. 1) Among participants in Nigeria, the items that were listed are a) making LECPD formal in the curriculum; b) mode of work delivery, equipped classes and labs; c) 'reduce workload', 'create a centre for development'; d) programs to encourage CPD; e) 'reduce the curriculum' and 'programs to encourage CPD, i.e. increase flexibility to give allowance'; f) 'programs to encourage CPD', 'encourage industry-based mentors'; g) 'overhaul the system and reduce the workload and more time in the policy'; h) create a centre for CPD'. 2) Among

participants in the UK the items that were listed are a) create a professional development framework (already in the process); b) 'encourage students to engage more in CPD activities', 'raise awareness' and 'create engaging curriculum'; c) 'encourage the students to engage more in CPD'; d) 'teaching assistant should be employed to relieve researchers the stress of both teaching and researching'.

Regarding what the university or department can do more: Among participants in Nigeria, 27.2727% of respondents stated that 'making LECPD formal in the curriculum' is what the university or department can do more; 36.3636% of respondents stated that creating a 'programs to encourage CPD' is what the university or department can do more; 27.2727% of respondents stated that 'reducing the workload' is what the university or department can do more; 18.1818% of respondents stated that creating a 'centre of CPD' is what the university or department can do more.

In comparison, among participants in the UK: 50% of respondents stated that 'encouraging students to more in CPD activities' is what the university or department can do more; 25% of respondents stated that employing 'teaching assistant to relieve researchers the stress of both teaching and researching' is what the university or department can do more; 25% of respondents stated that creating 'a professional development framework (already in the process)'. Overall, respondents among participants in Nigeria and the UK agreed that the universities or departments could do more.

12.5 Chapter Summary

The findings from this chapter intend to shed light on the Level of engagement with CPD from an Interpretivist point of view. In so doing, presenting a different outlook on what motivates students to engage with CPD. Chapter Twelve presented the result of an in-depth exploration of Level of engagement with CPD through the lens of academics and students, enabling understanding of the constructed meaning associated with CPD. The chapter presents explicit knowledge of the full picture of embedded norms related to CPD in the collective societal net of the academic community. To this effect, participants were interviewed in Engineering departments/faculties of selected Universities in South-West Nigeria and South East England (UK), the response from the participant aided in understanding the embedded norms.

Definitions of CPD were gleaned from the responses are as follows: 1) The definition gleaned from respondents in Nigeria is that CPD is as any form of training or activity that would bring about professional development including attending professional workshops and seminar/conferences, software programming, competition. 2) The definition gleaned from Respondents in the UK is that CPD is any form of continuous training or activity that would help to analyse their professional qualities

and allow them to continue in their development in the right direction like communication skill to data processing, technical knowledge/problem, teamwork, time management, general skills. Both definitions are in line with the definition of CPD adopted in this study. A word cloud created from participants definition of CPD shows a wide range of terms that are also in line with the definition of CPD adopted in this study which indicates an understanding of Continuous Professional Development among participants in Institutions in NE England and SW Nigeria. Also, showing the relevance of the definition of CPD adopted in this study, as presented in Chapter 2.

The vast majority of participants agreed that it was reasonable to assume and theorise that students could engage with Continuous Professional Development. 100% of Participants in Nigeria agreed that students could and do engage with Continuous professional development, especially within the context of the outlook and definition adopted by this study in regards to student engagement with CPD; in comparison, 87.5% of respondents in the UK agreed that students could and do engage with Continuous professional development. All Participants who agreed stated activities that students usually engage with (within the context of their respective institutions) which could be termed as Continuous Professional Development activities. This finding supported postulation in this study concerning student engagement with CPD, at the same time showing the relevance of the definition of CPD in the context of students adopted in this study, as presented in Chapter 2.

Regarding the value of developing a measure for the level of engagement with CPD: a word cloud created based on responses of participants illustrated an emphatic and relatively unanimous agreement by participants across the board that there is value in having a measure for the level of learner's engagement with CPD. Particularly the said measure as developed in this study. 100% of respondents in Nigeria stated that there is value in having a measure for the level of engagement with CPD, in comparison, 87.5% of all respondents in the UK stated that there is value in having a measure for the level of engagement with CPD.

Regarding what the process cycle of engagement with CPD should contain (using Kolb's learning cycle as an example): overall 80% of the respondents in Nigeria stated Kolb's learning cycle was a 'good fit' for the process cycle for engagement with CPD. In comparison, 100% of the respondents in the UK stated that the Kolb's Learning cycle is a good fit for the process cycle for engagement with CPD, although 14.2857% of respondents expressed some reservations. Regarding the difference in LECPD and Motivation Profile (MP) for Engineering Students (ES) across ethnic persuasions: 45.4545% of respondents in Nigeria stated that LECPD and MP are not different across ethnic persuasions, on the other hand, 54.5454% stated that they are different across ethnic persuasions. In comparison, 12.5%

of respondents in the UK stated LECPD and MP is not different across ethnic persuasions, while 87.5% stated that they are different across ethnic persuasions. Regarding the difference between Continuous Professional Development and the development of employability skills: Overall, 54.5454% of Participants in Nigeria stated that there is a difference between Continuous Professional Development and the development of employability skills. Overall, 75% of Participants in the UK stated that there is a difference between Continuous Professional Development and the development of employability skills.

This chapter presented the result of an in-depth interpretive exploration of Level of engagement with CPD through the lens of academic and students, enabling understanding of the constructed meaning associated with CPD. Findings in Chapter 12 are a sound basis for further work in the future, but for this study, this level of evaluation is adequate.

Chapter Thirteen

13 Conclusion

13.1 Overview

This research was about how to get learners to learn efficiently and how to improve the process of learning and development, specifically the process of Continuous Professional Development. This study looked at factors that motivate Engineering students to engage in CPD and how these factors can be evaluated and improved. The study examined the nature and relationship of Learner's engagement with CPD and associated Motivation towards engaging with CPD. In so doing the study examined the nature of a learner's engagement with CPD, and examined the varying importance of aspects of CPD; established how to measure and track Level of engagement with CPD; examined associated Motivation toward engagement with CPD; identified and determined relevant dimensions of Motivation towards engagement with CPD; selected and established methods of measuring associated Motivation towards engagement with CPD. Based on this, the study determined the relationship between Motivation towards CPD and Level of engagement with CPD; identified the predictor of the Level of engagement with CPD among emergent and identified dimensions of Motivation.

In short, the study determined what Learner's engagement with CPD and associated Motivation towards engaging with CPD is and looked at ways motivating factors can be tracked and improved to positively affect a learner's continuous engagement with different forms of professional development and learning activity. The research answered the question; 'what motivates engineering students to engage in continuous professional development?'. It also explored the nature of the relationship between engineering students' (EES) Motivation towards engagement with CPD and Level of engagement with CPD (LECPD); and if engineering Students' Level of Motivation towards CPD can predict their engagement with CPD.

13.2 Motivation and Problem

The Motivation of this study was the establishment of further understanding of what motivates individuals in the context of university students to engage in Continuous Professional Development. Hence the principal Motivation for the study was to take a step forward in establishing mechanisms for enabling engagement with Continuous Professional Development and industry-specific skill and knowledge acquisition at an early stage (while students in University).

The problem statement for the study can be summarised as:

How can the factors that motivate engineering students to engage with Continuous Professional Development be identified and measured, so that the attributes often associated with those that are highly engaged with Continuous Professional Development can be explored?

13.3 Aim and Scope

The study achieved its aim of carrying out a holistic examination of engineering student's engagement with and Motivation towards Continuous Professional development, and in so doing, established a holistic understanding of the interaction between them. The research also achieved its aim to understand what factors motivate university students to engage with Continuous Professional Development; to identify the critical attributes of individuals that enhance engagement with Continuous Professional Development; to enable the selection and development of ideal approaches to motivate them to engage with Continuous Professional Development. All these aims were achieved during the research.

The scope of the study was the Motivation to engage with Continuous Professional Development in the context of university students, with a particular focus on engineering students. The concept of Continuous Professional Development was evaluated from the perspective of developing the ability to engage with Continuous Professional Development as a skill. The scope of the study encompassed positivist inclined aspects that focused on the establishment of a measure of the Level of engagement with CPD, exploring the varying importance of aspects of CPD, exploring the relationship between Motivation towards CPD and Level of engagement with CPD, and exploration and identification of predictor of the Level of engagement with CPD among dimensions of Motivation that emerge and are identified. The scope of the study also encompassed Interpretivism inclined aspects that shed light on the Level of engagement with CPD from an Interpretivist point of view and explored embedded norms related to CPD in the collective societal net of the academic community.

The objectives of the research shed light on the dynamics of Learner's engagement with Continuous Professional Development and serve as a guideline for developing particularistic approaches to Continuous Professional Development; these objectives were achieved.

13.4 Objective

13.4.1 Overarching Objectives

The following theoretical objectives of the research were achieved:

- To produce a holistic literature review about Motivation to engage in Continuous Professional Development. This objective was achieved as shown in Chapter 4.
- To propose a multidimensional approach utilising different methods of measuring and tracking the Level of Engagement with CPD and Motivation towards engagement with Continuous Professional Development. This objective was achieved as shown in Chapter 8 and Chapter 9.
- To identify and establish the relationship between the varying identified and emergent dimensions of Motivation that influence engagement with Continuous Professional Development. This objective was achieved as evidenced in Chapter 10
- To develop a tool for predicting the tendency of a learner to engage with Continuous Professional Development. This objective is achieved as shown in Chapter 8 and Chapter 11
- To develop tools to aid in changing a student's Level of Motivation to engage in Continuous Professional Development. This objective is achieved as shown in Chapter 5, Chapter 9, Chapter 10 and Chapter 11.
- To identify the various forms and dimension of Motivation that are best suited for promoting engagement with varying types of Continuous Professional Development activity. This objective was achieved, as shown in Chapter 5, Chapter 10 and Chapter 11.
- Establish the relationship between achievement motivation, self-determined Motivation and time perspective all within the premise of engagement with Continuous Professional Development. This objective was achieved as shown in Chapter 10

Empirical objectives of the research are to:

- Study the key factors that influence the Continuous Professional Development climate of pedagogic institutions and organisations. This objective was achieved as shown in Chapter 5, Chapter 7, Chapter 10, Chapter 11 and Chapter 12
- Identify the influences of Learner's dimensions of Motivation on Learner's engagement with Continuous Professional Development. This objective was achieved as shown in Chapter 10 and Chapter 11

- To determine factors that motivate the development of Continuous Professional Development as a skill. This objective was achieved as shown in Chapters 5, Chapter 7, Chapter 10, Chapter 11 and Chapter 12
- Illustrate the key motivation profiles of Learners engaged with Continuous Professional Development; Motivation profile being the outline of the student's multidimensional pattern of Motivation. This objective was achieved as shown in Chapter 9

Other objectives include:

- Utilising the concepts of Continuous Professional Development to aid in bridging the existing skill & knowledge gap (the gap between University acquired competence and Industry required skill). This objective is achieved in Chapter 7, Chapter 10, Chapter 11 and Chapter 12
- Develop approaches to aid the professional development of students. This objective is achieved in Chapter 7, Chapter 8, Chapter 10 and Chapter 11.
- Establishing factors that influence Continuous Professional Development. This objective was achieved as shown in Chapters 5, Chapter 10, Chapter 11 and Chapter 12.
- To develop methodologies for determining and analysing the Motivation towards engagement with Continuous Professional Development. This objective was achieved, as shown in Chapter 4, Chapter 5, Chapter 9, Chapter 10, Chapter 11 and Chapter 12.
- To develop a matrix for the evaluation of the Level of engagement with Continuous Professional Development. This objective was achieved, as shown in Chapter 7, Chapter 8.

13.4.2 Itemised Empirical Objectives

Detailed itemised empirical objective are as follows:

Measurement

1. Determine Level of engagement with CPD
    a. Determine if the Level of engagement with CPD can be measured. This objective was achieved, as shown in Chapter 2 and Chapter 8.
    b. Establish a measure for Level of engagement with CPD. This objective was achieved, as shown in Chapter 8.
    c. Determine the validity and reliability of measure for Level of engagement with CPD. This objective was achieved, as shown in Chapter 8.
2. Determine the level of Motivation to engage with CPD

Determine the level of motivation in the specific context of CPD through the computation of variables representative of underlying interaction specific to the sample population. This objective was achieved, as shown in Chapter 9

   a. Identify existing instruments that can be used to measure the emergent and identified dimensions of Motivation towards engagement with CPD. This objective was achieved, as shown in Chapter 4, Chapter 5, Chapter 6 and Chapter 9.
   b. Develop a commensurate way to aggregate the value of the level of Motivation towards engagement with CPD. This objective was achieved, as shown in Chapter 9.

3. Establish a way to compare the level of engagement with CPD to the extent of Motivation towards engagement with CPD. This objective is achieved, as shown in Chapter 10 and Chapter 11.

Importance of CPD

1. Determine Level of Importance (LP) students attach to varying aspects and items of CPD. This objective is achieved, as shown in Chapter 7.

2. Determine if students attach different levels of importance to different aspects of professional development. This objective is achieved, as shown in Chapter 7.

3. Determine if the Level of Importance (LP) attached to aspects of CPD vary across demographic features. This objective is achieved, as shown in Chapter 7.

Relationship

1. Establish the nature of the relationship between LECPD and dimension of Motivation towards engagement with CPD, including associated subsets (Motivation Profile). This objective was achieved, as shown in Chapter 10.
   a. Determine the extent (if at all) to which LECPD has a relationship with Motivation towards engagement with CPD. This objective was achieved, as shown in Chapter 10.
   b. Determine which elements and tier of dimensions of Motivation profile has the most pronounced relationship with LECPD. This objective was achieved, as shown in Chapter 10.

Overarching relationship

1. Determine the relationship between aspects of CPD and dimensions of Motivation towards CPD when effects occur simultaneously. This objective was achieved, as shown in Chapter 10.

2. Determine the tiers of motivation variables that have a better relationship with Level of engagement with CPD when effects occur simultaneously. This objective was achieved, as shown in Chapter 10.

Predictors

1) To determine to what extent the level of engagement with CPD and its respective aspects can be predicted from the motivation profile. This objective was achieved, as shown in Chapter 11.
2) To develop a model for predicting the value of LECPD and its respective aspects using elements of the motivation profile. This objective was achieved, as shown in Chapter 11.
3) To identify the most suitable model for predicting Level of engagement with CPD among the different tiers of motivation variables. This objective was achieved, as shown in Chapter 11.
4) To specify which element of motivation profile that most facilitates or affects the LECPD and its respective aspects. This objective was achieved, as shown in Chapter 11.

Based on these objectives outlined above a number of research questions were developed as shown below, these formed the basis on which the study was carried forth.

13.5 Research question

The research explored the interaction between students' level of engagement with CPD and Motivation towards engagement with CPD; all research questions were answered.

The research primary research question was:

- *What motivates engineering students to engage with Continuous Professional Development (CPD)?*

Based on this, there were Secondary and tertiary questions

- What is the relationship between Engineering Students' (EES) motivation towards CPD and Level of engagement with CPD?
- To what extent can Engineering Students' Level of Motivation towards CPD predict their engagement with CPD?

The research questions were further refined to generate sub-questions in a number of categories as follows:

- Measurement
    - Can the level of engagement with CPD be measured?
    - How can the level of engagement with CPD be measured?
    - How can the value of different subsets of dimensions of Motivation towards engagement with CPD be aggregated?
    - How can the level of engagement with CPD be compared to the associated Motivation towards engagement with CPD?
- Importance of CPD
    - What Level of Importance (LP) do students attach to varying aspects and items of CPD?
    - Do students attach different levels of importance to different aspects of professional development ranging across said groupings?
    - Does the Level of Importance (LP) attached to aspects of CPD vary across demographic features?
- Relationship
    - What is the nature of the relationship between LECPD and dimension of Motivation, including associated subsets?

    - To what extent, if at all does LECPD have a relationship with motivation profile?
    - Which element of motivation profile has the most Pronounced relationship with LECPD?
- Overarching relationship
    - What is the relationship between aspects of CPD and dimensions of Motivation when effects occur simultaneously?
    - What tier of motivation variables have a better relationship with Level of engagement with CPD
- Prediction
    - To what extent, if at all can LECPD and its several aspects be predicted from motivation profile?
    - What is the model for predicting the value of LECPD and its respective aspects using elements of individuals' motivation profile?
    - What is the most suitable model for predicting Level of engagement with CPD among the different tiers of motivation variables?

Based on the above research questions, a number of hypotheses were developed.

13.6 Hypotheses and Results.

A number of hypotheses developed from the research questions were tested, and their associated results are as presented below. The hypotheses were divided into different categories.

13.6.1 Level of Importance of CPD

The hypotheses related to the level of importance of CPD and associated results are presented in Figure 336.

	Overall		Sub –Hypothesis					
	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status
1.1	Individual Students attach different LP to items of CPD.	Confirmed	There is a difference in the Mean LP attached to different CPD items within a disparate range of aspects of CPD	Confirmed	Mean LP is different for different aspects of professional development.	Confirmed	There is a difference in the mean LP attached to aspects of CPD across demographic groupings.	Confirmed

Figure 336 Hypothesis examining Level of importance of Aspects and Items of CPD and associated results

13.6.2 Relationship

The hypotheses related to the relationship between Level of engagement with CPD and Motivation towards engagement with CPD and associated results are presented in Figure 337.

	Overall		Sub –Hypothesis					
			First-Order		Second Order		Third Order	
	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status
2.1	There is a relationship between	**Partially Con**	There is a relationship between	**Partially Con**	There is a relationship between	**Partially Confi**	There is a relationship between	**Confirmed**

	LECPD and first-order variables, Second-order variables and Third-order variables of the identified and emergent dimensions of motivation.	**firmed**	LECPD and first-order variables of identified and emergent dimensions of motivation	**firmed**	LECPD and Second-order variables of identified and emergent dimensions of motivation	**rmed**	LECPD and Third-order variables of identified and emergent dimensions of motivation	
2.2	Different dimensions of motivation have different levels of relationship with the level of engagement with CPD.	**Confirmed**	Different dimensions of Achievement motivation have different levels of relationship with the level of engagement with CPD.	**Confirmed**	Different dimensions of Self Determined Motivation have different levels of relationship with the level of engagement with CPD.	**Confirmed**	Different dimensions of Zimbardo Time Perspective Inventory have different levels of relationship with the level of engagement with CPD.	**Confirmed**
			Different dimensions of Multidimensi	**Confirmed**	Different dimensions of motivation	**Confirmed**		

			onal Future Time Perspective have different levels of relationship with the level of engagement with CPD.		have different levels of relationship with the level of engagement with CPD.			
2.3	Compared to other dimensions of motivation, 'Achievement motivation in the context concerted effort' (AMSUB_F1_Index) has a greater relationship with LECPD.	**Confirmed**	Compared to other first-order dimensions of motivation, Intrinsic motivation to experience stimulation ('To_Experience_Stimulation_IM_Index') has a greater relationship with LECPD.	**Confirmed**	Compared to other Second-order dimensions of motivation, 'Achievement motivation in the context concerted effort' (AMSUB_F1_Index) has a greater relationship with LECPD	**Confirmed**	Compared to other Third-order dimensions of motivation, 'Combined value of Future Time Perspective using Factor analysis Index (Based on rotated)' (FTP_SUB) has a greater Relationship with LECPD	**Confirmed**

2.4	Compared to other dimensions of Achievement motivation, Affinity for Challenge form of Achievement motivation (AM_F5_Index) has a greater relationship with LECPD.	**Confirmed**	Compared to other first-order dimensions of Achievement motivation, Affinity for Challenge form of Achievement motivation (AM_F5_Index) has a greater relationship with LECPD.	**Confirmed**	Compared to other Second-order dimensions of Achievement motivation, 'Achievement motivation in the context of concerted effort' (AMSUB_F1_Index) has a greater relationship with LECPD	**Confirmed**	Compared to other Third-order dimensions of motivation, Resultant Achievement motivation (AMSUB_F1F2_Index) has a greater Relationship with LECPD	**Confirmed**
2.5	Compared to other dimensions of Self Determined motivation, Intrinsic motivation to experience stimulation	**Confirmed**	Compared to other first-order dimensions of Self Determined motivation, Intrinsic motivation to experience stimulation	**Confirmed**	Compared to other Second-order dimensions of Self Determined motivation, 'Level of Self determined motivation	**Confirmed**	Compared to other Third-order dimensions of Self Determined motivation, 'SDM Combined value on basis of the	**Confirmed**

	('To_Experience_Stimulation_IM_Index') has a greater relationship with LECPD.		('To_Experience_Stimulation_IM_Index') has a greater relationship with LECPD.		less amotivation' (SDM_F1_Index_5) has a greater relationship with LECPD		perceived level of Autonomy indicative of the overall resultant of Self Determined motivation' (SDM_Direct_Autonomy_Index5) has a greater Relationship with LECPD	
2.6	Compared to other dimensions of Zimbardo Time Perspective Inventory, 'Positive dimensions of Zimbardo time perspective' (ZTP_F2) has a greater relationship with LECPD.	**Confirmed**	Compared to other first-order dimensions of Zimbardo Time Perspective, Present Hedonistic (Future ZTPI) has a greater relationship with LECPD.	**Confirmed**	Compared to other Second-order dimensions of Zimbardo Time Perspective Inventory, 'Positive dimensions of Zimbardo time perspective' (ZTP_F2) has a greater	**Confirmed**	Compared to other Third-order dimensions of Zimbardo Time Perspective Inventory, overall resultant of Zimbardo time perspective (ZTP_F1F2) has a greater Relationship with LECPD	**Confirmed**

					relationship with LECPD			
2.7	Compared to other dimensions of Multidimensional Future Time Perspective, 'Positive dimensions of Multidimensional time perspective' (MDFTP_F2_Index) has a greater relationship with LECPD.	**Confirmed**	Compared to other first-order dimensions of Multidimensional Future Time Perspective, 'Opportunities Multidimensional Time Perspective' (Opportunities_I_MDFTP) has a greater relationship with LECPD.	**Confirmed**	Compared to other Second-order dimensions of Multidimensional Future Time Perspective, 'Positive dimensions of Multidimensional time perspective' (MDFTP_F2_Index) has a greater relationship with LECPD	**Confirmed**	Compared to other Third-order dimensions of Multidimensional Future Time Perspective, overall resultant of Multidimensional Future time perspective (MDFTP_F1F2_Index) has a greater Relationship with LECPD	**Confirmed**
2.8	Compared to other dimensions of Future Time Perspective, 'Combined value of Future Time	**Confirmed**	Compared to other first-order dimensions of Future Time Perspective, extremely opened	**Confirmed**	Compared to other Second-order dimensions of Future Time Perspective, 'Future Time	**Confirmed**	Compared to other Third-order dimensions of Future Time Perspective, 'Combined value of Future Time	**Confirmed**

	Perspective (FTP_SUB) has a greater relationship with LECPD		future time perspective (FTP_F2) has a greater relationship with LECPD.		Perspective Focused on Opportunities' (Focus_on_ Opportunities_FTP) has a greater relationship with LECPD		Perspective' (FTP_SUB) has a greater relationship with LECPD	
2.9	Different tiers of motivation variables have different extents of relationship with Level of engagement with CPD	**Confirmed**	First-order variables have a better level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	**Confirmed**	Second-order variables are better at predicting and modelling level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	Rejected	Third-order variables are better at predicting and modelling level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	Rejected

Figure 337 Hypothesis examining Relationship between LECPD and motivation I and associated Results

13.6.2.1 Overarching relationship

The hypotheses related to the overarching relationship between Level of engagement with CPD and Motivation towards engagement with CPD and associated results are presented in Figure 338.

	Overall		Sub –Hypothesis					
			First-Order		Second Order		Third Order	
	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status
3.1	There is a relationship between LECPD and cumulative effect (latent variates) of first-order variables, Second-order variables and Third-order variables of the identified and emergent dimensions of motivation, respectively.	**Confirmed**	There is a relationship between LECPD and cumulative effect (the latent variate) of first-order variables of identified and emergent dimensions of motivation	**Confirmed**	There is a relationship between LECPD and cumulative effect (the latent variate) of Second-order variables of identified and emergent dimensions of motivation	**Confirmed**	There is a relationship between LECPD and cumulative effect (the latent variate) of Third-order variables of identified and emergent dimensions of motivation	**Confirmed**

3.2	Different tiers of motivation variables have different extents of relationship with Level of engagement with CPD	**Confirmed**	Overall First-order variables have a stronger relationship with the level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	**Confirmed**	Overall, Second-order variables have a stronger relationship with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	Rejected	Overall, Third-order variables have a stronger relationship with the level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	Rejected

Figure 338 Hypothesis examining Relationship between LECPD and motivation II and associated Results

13.6.3 Predictability

The hypotheses related to the prediction of Level of engagement with CPD and associated results are presented in Figure 339.

	Overall		Sub -Hypothesis					
			First-Order		Second Order		Third Order	
	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status
4.1	There are predictors of LECPD among first-order variables,	**Confirmed**	There are Predictors of LECPD among first-order variables of	**Confirmed**	There are Predictors of LECPD among Second-order	**Confirmed**	There are Predictors of LECPD among Third-order variables of identified and	**Confirmed**

	Second-order variables and Third-order variables of the identified and emergent dimensions of motivation.		identified and emergent dimensions of motivation		variables of identified and emergent dimensions of motivation		emergent dimensions of motivation	
4.2	Different dimensions of motivation have different levels of effect on the level of engagement with CPD.	**Confirmed**	Compared to other first-order dimensions of motivation, Affinity for Challenge form of Achievement motivation (AM_F5_Index) has a greater effect on LECPD.	**Confirmed**	Compared to other Second-order dimensions of motivation, 'Achievement motivation in the context of concerted effort' (AMSUB_F1_Index) has a greater effect on LECPD	**Confirmed**	Compared to other Third-order dimensions of motivation, Resultant Achievement motivation (AMSUB_F1F2_Index) has a greater effect on LECPD	**Confirmed**

4.3	The suitability of models for predicting Level of engagement with CPD is different for the different tiers of motivation variables	**Confirmed**	First-order variables are better at predicting and modelling level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	**Confirmed**	Second-order variables are better at predicting and modelling level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	Rejected	Third-order variables are better at predicting and modelling level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	Rejected

Figure 339 Hypothesis examining Predictors of LECPD I and associated Results

13.6.3.1 Predictability: Aspects of LECPD

The hypotheses related to the prediction of Level of engagement with Aspects of CPD and associated results are presented in Figure 340.

	Overall		Sub -Hypothesis							
			Plan		Action		Result		Reflection	
	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	status
5.1	There are Predictors of the level of engagement	**Confirmed**	There are Predictors of the	**Confirmed**	There are Predictors of the level of	**Confirmed**	There are Predictors of the	**Confirmed**	There are Predictors of	**Confirmed**

	with the Plan, Action, Result and Reflection aspects of CPD among first-order variables of the identified and emergent dimensions of motivation.		level of engagement with the Plan aspect of CPD among first-order variables of identified and emergent dimensions of motivation		engagement with the Action aspect of CPD among first-order variables of identified and emergent dimensions of motivation		level of engagement with the Result aspect of CPD among first-order variables of identified and emergent dimensions of motivation		the level of engagement with the Reflection aspect of CPD among first-order variables of identified and emergent dimensions of motivation	
5.2	Different dimensions of motivation have different levels of effect on the level of	**Confirmed**	Compared to other first-order dimensions of motivation,	**Confirmed**	Compared to other first-order dimensions of motivation, 'AM_F2_Index'	**Confirmed**	Compared to other first-order dimensions of motivation,	**Confirmed**	Compared to other first-order dimensions of motivation,	**Confirmed**

	engagement with the Plan, Action, Result and Reflection aspects of CPD, respectively.		'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Plan aspect of CPD.		denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Action aspect of CPD.		'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Result aspect of CPD.		'AM_F5_Index denotative of 'Achievement Motivation in the context of Affinity of Challenge' has a greater effect on Level of engagement with the Reflection aspect of CPD.	
5.3	The suitability of models based on	**Confirmed**	Level of engagement with Plan	Rejected	Level of engagement with Action	Rejected	Level of engagement with	**Confirmed**	Level of engagement with	Rejected

	First-order motivation variables for predicting Level of engagement is different for different aspects of CPD.		aspect of CPD is better predicted and modelled by First-order variables of identified and emergent dimensions of motivation than Level of engagement with other aspects of CPD.		aspect of CPD is better predicted and modelled by First-order variables of identified and emergent dimensions of motivation than Level of engagement with other aspects of CPD.		Results aspect of CPD is better predicted and modelled by First-order variables of identified and emergent dimensions of motivation than Level of engagement with other aspects of CPD.		Reflection aspect of CPD is better predicted and modelled by First-order variables of identified and emergent dimensions of motivation than Level of engagement with other aspects of CPD.	

Figure 340 Hypothesis examining Predictors of LECPD II and associated Results

13.7 Thesis outline and Findings

The thesis was divided into 13 chapters; the first four chapters were theoretical; chapters five presented the Conceptual framework bringing together the findings of the theoretical chapters, and served as a bridge between the theoretical sections and the empirical sections. Chapter Six to twelve were empirical and analytical chapters, with Chapter Six laying out the research and analysis method, while Chapters 7 to 12 presented analysis and discussion. Chapter 13 contains the conclusion of the study.

Chapter 1 offered a brief introduction to the purpose and direction of the study. Chapter 2 examined the definition of CPD, evaluated the varying definition of CPD, and presented the most appropriate definition in the context of this study. This section focused on CPD also lays out the proposed methods/instruments for measuring LECPD. Chapter 3 examined pedagogic theories of interests to this study; this includes Vygotsky's theory of Zone of Proximal Development which is used in an uncharacteristically mechanical manner to illustrate and lend credence to constructs and arguments espoused.

Chapter 4 laid out the motivation theories of interest, exploring and examining Achievement motivation, Self-determined Motivation and Time Perspective, and how they interact individually and collectively with the Level of engagement with CPD. Furthermore, it laid out the foundation of the argument for the influence or effect of Motivation on LECPD. Chapter 5 brought together the findings of the literature review to create a cohesive argument to support the postulations made in the study. Chapter Five expands on the propounded relations between varying dimensions of Motivation and CPD with the aid of constructs such as the ZPD and recall. Chapter Five established a conceptual framework that guides the empirical and analytical evaluation of the research going forwards.

Chapter 6 in furtherance of the preceding Chapter presented the detailed research questions and hypotheses developed from the finding of the literature review and the arguments espoused. The research question is 'What motivates Engineering students to engage in CPD?' as aforementioned. The research question comprises of two sub-questions namely: 'What is the relationship between Engineering Students' (EES) motivation towards CPD and Level of engagement with CPD?' and 'To what extent can Engineering Students' Level of Motivation towards CPD predict their engagement with CPD?' The Hypotheses based on the research question is reflective of consideration of variation in LECPD, motivation profile and influences of motivation profile on LECPD. The pragmatic worldview applied towards the research and research methods for testing the hypotheses and answering the

research question is laid out in this Chapter. The research method utilised in the study is a Comparative Case Study design, using an Explanatory Sequential mixed method approach involving quantitative and qualitative data collection methods. This approach is in line with the research philosophy based on a pragmatism worldview. The purpose of this selected two-phase method will be to obtain statistically (quantitative) results from a sample, and then follow-up with a few individuals to probe results in more depth for each case (University) and across cases (Universities) [1].

In the first phase, the quantitative Hypotheses addressed the relationship between the level of Motivation towards engagement with CPD and LECPD for EESs. In the quantitative phase, the instrument was administered to collect data related to CPD engagement and motivation level; data was gathered from 510 students across six universities in Southwest Nigeria and the North of England. The instrument for the quantitative data collection comprised of a mix of elements from established instruments for measuring Motivation (based on the three-dimension selected) and the tool developed in this study for measuring the level of engagement with CPD (See Appendix for details). The instrument used for measuring motivation towards engagement with CPD based on each of the identified dimension are the following: 1) Intensity dimension of motivation in the form of achievement motivation was assessed using the achievement motivation inventory; 2) Source dimension of motivation in the form of self-determined motivation was assessed using the academic motivation scale; 3) Time dimension of motivation was assessed using a combination of the Zimbardo TP inventory, Multifaceted TP inventory/ Future Orientation Scale and the Future Time Perspective Inventory (see Appendix for details). In the qualitative second phase, 20 semi-structured interviews are used to explore aspects of engagement with CPD from an interpretivist point of view. The interviews comprise of question that representing different combination from the quantitative results and serve to expatiate embedded norms related to engagement with CPD in the collective societal net of the academic community. Chapter Six also details the approaches and methods used to carry out analysis following chapters including T-test, Factor Analysis, Reliability tests, Correlation, Canonical Correlation, Regression Analysis and qualitative analysis methods that are used in the study are also detailed in this section.

Chapter Seven established understanding of students' engagement and the level of importance (LP) that students attach to the varying aspect of CPD across subject areas, skill areas and activities types. This Chapter argues that students attach varying levels of importance to different aspects of professional development ranging across said areas. This section presented the result of the study into students' perception of LP of Items and Aspects of CPD. The varying aspects of CPD are presented, and

justification for selecting said aspects/item. The Chapter proceeds to elucidate the methodology used, giving a brief description of the questionnaire, target population (sample) and the distribution mechanism. The Chapter showed that students attach different levels of importance to different aspects and items of CPD. The LP is shown to vary depending on demographic features and the specific aspects in question. The result of this section of the study will help universities, Industry and policymakers to gain a better understanding of student's perception of CPD.

Chapter 8 showed that the postulated measure for the Level of engagement with CPD (LECPD) was established to enable further analysis and to provide an affirmatively answer to the research question regarding the measurability of level of engagement with CPD. The postulated instrument /measure of the level of engagement with CPD is designed based on the CPD cycle, and these Chapter showed how the items of the questionnaire were created for the varying subscales and the full scale. The validity and reliability of the questionnaire/ the postulated measure for the Level of engagement with CPD were established using a range of techniques presented in Chapter 8. To establish the external/construct validity of the questionnaire, a direct measure of engagement with CPD was operationalised and measurements that are taken using this are compared with that of the Postulated measure of the level of engagement with CPD. Also, the results of factor analysis and inferred implications for the interaction between items and subscales are presented. Chapter 8 presented computation details for variables representative of Plan, Action, Result, and Reflection subscales of the LECPD measure, respectively; those for the fullscale are also presented. To this effect, First-order, second-order and a singular third-order variable representative of the component and resultant value of the postulated level of engagement with CPD is also computed to enable the further analysis.

Chapter Nine presented the approach and results of the computation of variables representative of different dimensions and components of Motivation towards engagement with CPD. The computation of the variables enabled in-depth evaluation of the relationship between the level of engagement with CPD and motivation towards engagement with CPD and by effect answered vital research questions and hypotheses, variables representative of different dimensions, components and associated subsets of the Motivation towards engagement with CPD are computed. The variables of motivation computed in this Chapter in conjunction with the variable representative of LECPD computed in the previous Chapter enable exploration of the relationship between the dimensions of motivation and LECPD in the come Chapter. In addition to the process of computing, the variables using Factor analysis also provided valuable insight and inference about motivation in the context of CPD. The research objectives were achieved, objective pertaining to determining the level of motivation in the specific

context of CPD through the computation of variables representative of underlying interaction specific to the sample population. Information and knowledge gleaned in this Chapter were used in further analysis and to draw meaningful inferences.

In Chapter Ten, an in-depth evaluation of the relationship between the level of engagement with CPD and motivation towards engagement with CPD is carried out. By effect, answering key research questions and hypotheses regarding the relationship between, variables representative of different dimensions and components of motivation towards engagement with CPD and LECPD. Pearson correlation and Canonical Correlation were used to establish the nature of the relationship between the said dimensions of motivation and CPD. The variables of motivation computed in Chapter 9 in conjunction with the variable representative of LECPD computed in Chapter 8 enable exploration of the relationship between the dimensions of motivation and LECPD. These evaluations allowed for exploration and understanding of the interaction between varying dimensions of motivation in the context of CPD, offering valuable insight and inference about motivationS in the context of CPD. The research objective pertaining to establishing the nature of the relationship between LECPD and dimension of motivation, including associated subsets was achieved using Pearson Correlation to test the related hypothesis and the related hypothesis was partially confirmed. The hypothesis stating that: there is a relationship between LECPD and different dimensions of motivation and respective associated emergent subsets of said dimensions of motivation. The hypothesis was confirmed for all the dimensions of the motivation (Third-order variables); while the hypothesis was confirmed for most of the associated immediate subsets of the dimensions of motivation (Second-order variables) and the base level subset (First-order variables) as shown in Figure 341. Figure 341 contains a summary of the relationship between the motivation towards engagement with CPD and Level of engagement with CPD established in Chapter 10.

	Achievement Motivation		Self-Determined Motivation		Zimbardo Time Perspective		Multidimensional Future Time		Future Time Perspective	
	Variable	Relationship	Variable	Relationship	Variable	Relationship	Variable	Relationship	Variable	Relationship
First Order variables	AM_F1_Index	Insignificant **(Rejected)**	To_Experience_Stimulation_IM_Index	**Direct**	Past Negative ZTPI	Direct	Opportunities_I_MDFTP	**Direct**	FTP_F1	Direct
	AM_F2_Index	Inverse	Towards_Accomplishment_IM_Index	Direct	Present Hedonistic ZTPI	Direct	Limitations_I_MDFTP	Direct	FTP_F2	**Direct**
	AM_F3_Index	Direct	To_Know_IM_Index	Direct	Future ZTPI	**Direct**	Ambiguities_I_MDFTP	Insignificant **(Rejected)**	FTP_F3	Inverse
	AM_F4_Index	Direct	Identified_EM_Index	Direct	Past Positive ZTPI	Direct				
	AM_F5_Index	**Direct**	Introjected_EM_Index	Direct	Present Fatalistic ZTPI	Direct				
	AM_F6_Index	Direct	External_Regulation_EM_Index	Insignificant **(Rejected)**						
	AM_F7_Index	Direct	Amotivation_Index	Direct						
Second order Variables	AMSUB_F1_Index	**Direct**	SDM_F1_Index_5	**Direct**	ZTP_F1	Direct	MDFTP_F2_Index	**Direct**	Focus_on_Limitations_FTP	Inverse
	AMSUB_F2_Index	Inverse	SDM_F2_Index_5	Direct	ZTP_F2	**Direct**	MDFTP_F1_Index	Insignificant **(Rejected)**	Focus_on_Opportunities_FTP	**Direct**
Third Order Variables	AMSUB_F1F2_Index	**Direct**	SDM_Direct_Autonomy_Index5	**Direct**	ZTP_F1F2	**Direct**	MDFTP_F1F2_Index	**Direct**	FTP_SUB	**Direct**
			SDM_F1F2_Index5	Direct						

Figure 341 Summary of nature of Relationship between LECPD and Variables of Motivation

Chapter 10 also established the nature of the interactive network of motivation that comes together to propel individuals to engage with development activity. As shown in this Chapter exploring the intricate relationship between all the identified base level variables of motivation and engagement

with CPD not only enables the better understanding of engagement with CPD but also allows a clearer understanding of the interaction between motivation towards engagement with CPD and engagement with CPD. To this effect, the canonical analysis was carried out, taking into cognisance the variables representative of the aspects of CPD and dimensions of motivation. The result of this analysis shed crucial light on the variables of motivation that most effectively allow for a clear understanding of the behaviour of individuals in the context of engaging with CPD.

The Research objectives pertaining to getting a greater insight into the overall interaction of the aspect of CPD and the dimension of motivation was attained using Canonical correlation to test the related hypothesis. The hypothesis stating that: There is a relationship between the given variable set for the level of engagement with Aspects of CPD and the other Variables set of dimensions of motivation was confirmed (details in Figure 342 and Figure 343). Figure 343 and Figure 343 below shows a summary of the results of Canonical Correlation.

Wilks's λ	Accuracy/ Effect Size	Number of Canonical Functions
0.254	75.4%	3

Figure 342 Summary of Canonical Correlation

Canonical Function	F, Sig (P)	Correlation, squared canonical correlation	Latent Variable/ variate	Direct		Cross Loading	
				Strongest	Weakest	Strongest	Weakest
First	2.986, .000	.685, 46.92%	associated with the Aspect of CPD - Y_1	Plan	Result	To_experience_stimulation_IM	AM_F5_Index
			Dimensions of Motivation X_1	To_experience_stimulation_IM	Identified_EM_Index	Plan	Result
Second	2.169, .000	.580, 33.87%	associated with the Aspect of CPD – Y_2	Results	Plan	Opportunities_I_MDFTP	Present_I_Fatalistic_ZTPI
			Dimensions of Motivation X_2	Opportunities_I_MDFTP	AM_F5_Index		
Third	1.523, .020	.483, 23.32%	associated with the Aspect of CPD – Y_3	Reflection			
			Dimensions of Motivation X_3	Past_I_Postive_ZTPI			

Figure 343 Summary of Canonical functions

In all, 75.4% of the proportion of variance of the Level of engagement with CPD can be explained by motivation towards engagement with CPD. Information and knowledge gleaned in Chapter 10 are used in further analysis and to draw meaningful inferences.

Chapter Eleven took us through how the predictors of Level engagement with CPD denoted by the aforementioned variables representative of LECPD and its respective aspects were identified among the aforementioned variables representative of the different dimension of motivations towards engagement with CPD. In so doing achieving some of the primary objectives of this study which are 1) to determine to what extent, if at all LECPD and its respective aspects can be predicted from motivation profile, 2) To develop a model for predicting the value of LECPD and its respective aspects using elements of individual's motivation profile, 3) To identify the most suitable model for predicting Level of engagement with CPD among the different tiers of motivation variables 4) To specify which

element of motivation profile that most facilitates or affects the LECPD and its respective aspects. Chapter Eleven Showed how the hypotheses regarding the predictability of LECPD have tested; the different hypotheses and how they are tested are stated in their respective sections in Chapter 11. In all Chapter Eleven, not only shows that motivation and its many dimensions can be effective predictors of engagement with CPD and its respective aspects but also establish the intricate network of levels of motivation variables that come together to propel individuals to engage with said development activity.

In Chapter 11.1, the Predictors of the level of engagement with CPD were determined using multiple regression; this was carried out using the Automatic Linear Model feature of SPSS. The regression analysis was carried out within First-order, Second-order and Third-order subsets of variables from the identified dimensions of motivation that are postulated to affect the level of engagement with CPD.Figure 344 Show the predictors of engagement with CPD within each subset.

Ranking in descending order of importance (with 1 being most important)	First-order predictors:	Second-order	Third-order
1	AM- Affinity of Challenge	'Achievement motivation in the context of a concerted effort.'	'Overall Level of Achievement Motivation'
2	Am- Affinity for approval and competitiveness	'Extent of Measurability/Amotivation'	SDM Combined value on basis of the perceived level of Autonomy indicative of the overall resultant of Self Determined motivation
3	Future-oriented Zimbardo Time perspective Inventory	Future Time Perspective Focused on Opportunities	'Combined value of Future Time Perspective using Factor analysis Index (Based on rotated)'
4	Extremely opened opportunities Future Time Perspective	'Positive dimensions of Zimbardo time perspective	
5	Amotivation		
6	Am - Avoidance of Task		
7	Intrinsic Motivation Towards Accomplishment of task		
8	Intrinsic Motivation to experience stimulation		

Figure 344 Predictors of Level of Engagement with CPD

The summary of models for predicting the level of engagement with CPD based on the different subsets (tiers) of motivation variables, as shown in Figure 345, were examined in order to confirm or reject the relevant hypothesis. The hypothesis stated that: 'First-order variables are better at

predicting and modelling level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation'.

In selecting the best model for predicting the Level of engagement with CPD the F-statistics of all the models as shown in Figure 345 were examined and found to be adequate and significant, indicating the utility of all the models. Following this, the accuracy of the model and extent of information loss was examined. As shown in Figure 345, the predictive model based on first-order variables has the highest Adjusted R squared at 35.4% indicative of the highest accuracy, and most negative information Criterion at -294.775 indicative of the least information loss and as such best fit. It can thus be concluded that the best model for predicting the level of engagement with CPD is the model-based First-order variables, in so doing confirming the hypothesis.

Model	First-Order	Second-Order	Third
Adjusted R Squared	35.4%	28.7%	26.7%
Information criterion (AIC)	-294.775	-275.501	-270.005
F-ratio	17.337	24.979	29.957
Significance of F Value, F value	.010, 6.779	.032, 4.653	.011, 6.582

Figure 345 Model Summaries for Level of engagement with CPD

An overview of the entire hypothesis examined, and indications as to whether they are confirmed or rejected are presented in Figure 346.

	Overall		Sub -Hypothesis					
			First-Order		Second Order		Third Order	
	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status
	There are predictors of LECPD among first-order variables, Second-order variables and Third-order variables of the identified and emergent dimensions of motivation.	**Confirmed**	There are Predictors of LECPD among first-order variables of identified and emergent dimensions of motivation	**Confirmed**	There are Predictors of LECPD among Second-order variables of identified and emergent dimensions of motivation	**Confirmed**	There are Predictors of LECPD among Third-order variables of identified and emergent dimensions of motivation	**Confirmed**
	Different dimensions of motivation have different levels of effect on the level of engagement with CPD.	**Confirmed**	Compared to other first-order dimensions of motivation, Affinity for Challenge form of Achievement motivation (AM_F5_Index) has a greater	**Confirmed**	Compared to other Second-order dimensions of motivation, 'Achievement motivation in the context of concerted effort' (AMSUB_F1	**Confirmed**	Compared to other Third-order dimensions of motivation, Resultant Achievement motivation (AMSUB_F1F2_Index) has a greater effect on LECPD	**Confirmed**

			effect on LECPD.		_Index) has a greater effect on LECPD			
	The suitability of models for predicting Level of engagement with CPD is different for the different tiers of motivation variables	**Confirmed**	First-order variables are better at predicting and modelling level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	**Confirmed**	Second-order variables are better at predicting and modelling level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	Rejected	Third-order variables are better at predicting and modelling level of engagement with CPD than Second-order and Third-order variables of identified and emergent dimensions of motivation	Rejected

Figure 346 Overview of Hypothesis for Level of engagement with CPD

Figure 347 contains a summary of the multiple regression deterministic models for Level of engagement with CPD based on First-order Predictors, second-order predictors and Third-order -predictors.

Model	First-Order	Second-Order	Third-Order
With Only Significant	$Y = 1.100 + 0.194X_{F1} - 0.165X_{F2} + 0.317 X_{F3} + 0.131 X_{F4} + 0.098X_{F5} + 0.133 X_{F6} - 0.166 X_{F7} + 0.160 X_{8}$	$Y = 0.406X_{S1} + 0.132X_{S2} + 0.142 X_{S3} + 0.260 X_{S4}$	$Y = 0.489X_{T1} + 0.339X_{T2} + 0.125 X_{T3}$
With Non-Significant Components	All factors are significant	$Y = 0.249 + 0.406X_{S1} + 0.132X_{S2} + 0.142 X_{S3} + 0.260 X_{S4}$	$Y = 0.075 + 0.489X_{T1} + 0.339X_{T2} + 0.125 X_{T3}$

Figure 347 Multiple regression Deterministic models for Level of engagement with CPD

In Chapter 11.2 the Predictors of the level of engagement with the Plan, Action, Result and Reflection aspects of CPD were respectively determined using multiple regression, this was carried out using the Automatic Linear Model feature of SPSS. The regression analysis was carried out within First-order subsets of variables from the identified dimensions of motivation that were postulated to affect the level of engagement with the different aspects of CPD. Figure 348 shows the predictors of engagement with CPD within each subset.

Ranking in descending order of importance (with 1 being most important)	Plan	Action	Result	Reflection
1	AM_F2_Index	AM_F2_Index	AM_F2_Index	AM_F5_Index
2	To_Experience_ Stimulation_IM	Amotivation_ Index	Amotivation_ Index	AM_F2_Index
3	AM_F5_Index	AM_F1_Index	AM_F6_Index	Opportunities_I _MDFTP
4	Opportunities_I _MDFTP	AM_F6_Index	Identified_EM_Index	Amotivation_ Index
5	FTP_F2_Index5	FTP_F2_Index5		To_Experience_ Stimulation_IM
6	AM_F1_Index	AM_F7_Index		FTP_F2_Index5
7	Amotivation_ Index	To_Experience_ Stimulation_IM		
8	Introjected_EM _Index	Past_I_Positive _ZTPI		
9	AM_F7_Index			
10	Future_I_ZTPI			
11	Towards_ Accomplishment_IM			

Figure 348 First-order Predictors of Level of Engagement with Aspects of CPD

The summary of models for predicting the level of engagement with different aspects of CPD based on First-order motivation variables, as shown in Figure 349, were examined in order to confirm or reject the relevant hypothesis. The hypothesis stated that: the Level of engagement with Results

aspect of CPD is better predicted and modelled by First-order variables of identified and emergent dimensions of motivation than Level of engagement with other aspects of CPD.

In selecting the best-modelled aspect of CPD for predicting the Level of engagement with different aspects of CPD the F-statistics of all the models as shown in Figure 349 were examined and found to be adequate and significant, indicating the utility of all the models. Following this, the accuracy of the model and extent of information loss was examined. As shown in Figure 349, the predictive model based on first-order variables has the highest Adjusted R squared at 35.8% indicative of the highest accuracy, and most negative information Criterion at -338.983 indicative of the least information loss and as such best fit. It can thus be concluded that the best model for predicting the level of engagement with CPD is the model-based First-order variables, in so doing confirming the hypothesis.

Model	Plan	Action	Result	Reflection
Adjusted R Squared	35.8%	37.3%	43.7%	27.7%
Information criterion (AIC)	-338.983	-175.733	-368.186	-182.719
F-statistics	18.522	26.700	68.198	16.188
Significance of F Statistic, F value	.025, 5.059	.037, 4.383	.019, 5.561	.037, 4.416

Figure 349 Model Summaries for Level of engagement with Aspects of CPD

An overview of the entire hypothesis examined, and indications as to whether they are confirmed or rejected are presented in Figure 350.

Overall		Sub –Hypothesis							
		Plan		Action		Result		Reflection	
Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	Status	Hypothesis	status
There are Predictors of the level of engagement with the Plan, Action, Result and Reflection aspects of CPD among first-order variables of the identified and emergent dimensions of motivation.	**Confirmed**	There are Predictors of the level of engagement with the Plan aspect of CPD among first-order variables of identified and emergent dimensions of motivation	**Confirmed**	There are Predictors of the level of engagement with the Action aspect of CPD among first-order variables of identified and emergent dimensions of motivation	**Confirmed**	There are Predictors of the level of engagement with the Result aspect of CPD among first-order variables of identified and emergent dimensions of motivation	**Confirmed**	There are Predictors of the level of engagement with the Reflection aspect of CPD among first-order variables of identified and emergent dimensions of motivation	**Confirmed**

Different dimensions of motivation have different levels of effect on the level of engagement with the Plan, Action, Result and Reflection aspects of CPD, respectively.	**Confirmed**	Compared to other first-order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Plan	**Confirmed**	Compared to other first-order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engagement with the Action aspect of CPD.	**Confirmed**	Compared to other first-order dimensions of motivation, 'AM_F2_Index' denotative of 'Achievement Motivation in the context of Affinity for approval and competitiveness', has a greater effect on Level of engage	**Confirmed**	Compared to other first-order dimensions of motivation, 'AM_F5_Index denotative of 'Achievement Motivation in the context of Affinity of Challenge' has a greater effect on Level of engagement with	**Confirmed**

		aspect of CPD.				ment with the Result aspect of CPD.		the Reflecti on aspect of CPD.	
The suitability of models based on First-order motivation variables for predicting Level of engagement is different for different aspects of CPD.	**Con firm ed**	Level of engagem ent with Plan aspect of CPD is better predicte d and modelled by First-order variables of identifie d and emergen t dimensio ns of motivati on than Level of engagem ent with other	Rejec ted	Level of engagem ent with Action aspect of CPD is better predicted and modelled by First-order variables of identified and emergent dimensio ns of motivatio n than Level of engagem ent with other aspects of CPD.	Reje cted	Level of engage ment with Results aspect of CPD is better predicte d and modelle d by First-order variable s of identifie d and emerge nt dimensi ons of motivati on than Level of engage ment	**Con firm ed**	Level of engage ment with Reflecti on aspect of CPD is better predict ed and modell ed by First-order variabl es of identifi ed and emerge nt dimensi ons of motivat ion than	Rejecte d

	aspects of CPD.	with other aspects of CPD.	Level of engage ment with other aspects of CPD.

Figure 350 Overview of Hypotheses for the level of engagement with aspects of CPD

Figure 351 contains a summary of the multiple regression models for Level of engagement with different aspects of CPD based on First-order Predictors.

Model	Plan	Action	Result	Reflection
With Only Significant	Y_p = -0.193X_{PF1} + 0.242X_{PF2} + 0.153X_{PF3} + 0.200X_{PF4} + 0.132X_{PF5} + 0.135X_{PF6} + 0.097X_{PF7} – 0.110X_{PF8} + 0.113X_{PF9} + 0.200X_{PF10}	Y_A = 1.892 – 0.276X_{AF1} + 0.149X_{AF2} + 0.194X_{AF3} + 0.173X_{AF4} + 0.155X_{AF5} + 0.149X_{AF6} + 0.136X_{AF7} – 0.237X_{AF8}	Y_{RT} = 2.302 – 0.219X_{RT1} + 0.164X_{RTF2} + 0.174X_{RTF3} + 0.113X_{RTF4}	Y_{RF} = 1.252 + 0.205X_{RFF1} - 0.147X_{RFF2} + 0.221X_{RFF3} + 0.098X_{RFF4}
With Non-Significant Components	Y_p = 0.638 – 0.193X_{PF1} + 0.242X_{PF2} + 0.153X_{PF3} + 0.200X_{PF4} + 0.132X_{PF5} + 0.135X_{PF6} + 0.097X_{PF7} – 0.110X_{PF8} + 0.113X_{PF9} + 0.200X_{PF10} – 0.134X_{PF11}			Y_{RF} = 1.252 + 0.205X_{RFF1} - 0.147X_{RFF2} + 0.221X_{RFF3} + 0.098X_{RFF4} + 0.111X_{RFF5} + 0.107X_{RFF6}

Figure 351 Multiple regression Deterministic models for Level of engagement with different aspects of CPD based on First-order Predictors

Overall results presented in Chapter 11 were quite intuitive, providing insight and answers to the myriad of research questions and hypothesis. The results showed that among the variables representative of the different dimensions of motivation, there are quite good predictors of

engagement with CPD, especially when considering the overdetermined nature of motivation and behaviour [2]. The results of the regression analysis showed that variables representative of the different dimensions of motivation are good predictors of engagement with CPD. The high quality of prediction is apparent from the results of the regression analysis, with an adjusted R^2 above 30% (35.4%) indicative of a high level of accuracy, particularly for Behaviour/motivation focused research. An Information Criterion Below -290 (-294.775) which shows low information loss by the model and high information retention capacity of the model. An F-statistic of 17.337 which shows that the utility of the model is high [3, 4, 5, 6].

The dimension of motivation towards engagement with CPD and associated subsets were: 35.4% accurate in predicting the level of engagement with CPD; 35.8% accurate in Predicting engagement with plan aspects of CPD; 37.3% accurate in Predicting engagement with Action aspects of CPD; 43.7% accurate in Predicting engagement with Result aspects of CPD; 27.7% accurate in Predicting engagement with Result aspects of CPD. Upon consideration of all the inferences outlined in this section, a reasonable conclusion can be drawn that, predictors of engagement with CPD have successfully been identified and the stated research questions have been answered, and hypotheses tested; thereby producing useful results, inferences and information, and in so doing contributing to the body of knowledge.

Chapter Twelve shed light on the Level of engagement with CPD from an Interpretivist point of view. In so doing presenting a different outlook on what motivates students to engage with CPD. Chapter Twelve presented the result of an in-depth exploration of Level of engagement with CPD through the lens of academics and students, enabling understanding of the constructed meaning associated with CPD. The Chapter presents explicit knowledge of the full picture of embedded norms related to CPD in the collective societal net of the academic community. To this effect, participants were interviewed in Engineering departments/faculties of selected Universities in South-West Nigeria and South East England (UK), the response from the participant aided in understanding the embedded norms.

The definition gleaned from respondents in Nigeria is that CPD is any form of training or activity that would bring about professional development including attending professional workshops and seminar/conferences, software programming, competition. The definition gleaned from Respondents in the UK is that CPD is any form of continuous training or activity that would help to analyse their professional qualities and allow them to continue in their development in the right direction like communication skill to data processing, technical knowledge/problem, teamwork, time management, general skills. Both definitions are in line with the definition of CPD adopted in this study. A word cloud

created from participants' definition of CPD shows a wide range of terms that are also in line with the definition of CPD adopted in this study which indicates an understanding of Continuous Professional Development among participants in Institutions in NE England and SW Nigeria. Also, showing the relevance of the definition of CPD adopted in this study, as presented in Chapter 2.

The vast majority of participants agreed that it was reasonable to assume and theorise that students could engage with Continuous Professional Development. 100% of respondents in Nigeria agreed that students could and do engage with Continuous professional development, especially within the context of the outlook and definition adopted by this study in regards to student engagement with CPD; in comparison, 87.5% of respondents in the Uk agreed that students could and do engage with Continuous professional development. All Participants who agreed, stated activities that students usually engage with (within the context of their respective institutions) which could be termed as Continuous Professional Development activities. This finding supported postulation in this study concerning student engagement with CPD, at the same time showing the relevance of the definition of CPD in the context of students adopted in this study, as presented in Chapter 2.

Regarding the value of developing a measure for the level of engagement with CPD; a word cloud created based on responses of participants illustrated an emphatic and relatively unanimous agreement by participants across the board that there is value in having a measure for the level of Learner's engagement with CPD. Particularly the said measure as developed in this study. 100% of respondents in Nigerian stated that there is value in having a measure for the level of engagement with CPD, in comparison, 87.5% of all UK respondents stated that there is value in having a measure for the level of engagement with CPD.

Regarding what the process cycle of engagement with CPD should contain (using Kolb's learning cycle as an example): overall 80% of the respondents in Nigerian stated Kolb's learning cycle was a "good fit" for the process cycle for engagement with CPD. In comparison, 100% of the respondents in the UK stated that the Kolb's learning cycle is a good fit for the process cycle for engagement with CPD, although 14.2857% of respondents expressed some reservations. Regarding the difference in LECPD and Motivation Profile (MP) for Engineering Students (ES) across ethnic persuasions; 45.4545% of respondents in Nigerian stated that LECPD and MP are not different across ethnic persuasions; on the other hand, 54.5454% stated that they are different across ethnic persuasions. In comparison, 12.5% of respondents UK stated LECPD and MP are not different across ethnic persuasions, while 87.5% stated that they are different across ethnic persuasions. Regarding the difference between Continuous Professional Development and the development of employability skills; overall, 54.5454% of Nigerian

participants stated that there is a difference between Continuous Professional Development and the development of employability skills. Overall, 75% of UK participants stated that there is a difference between Continuous Professional Development and the development of employability skills. Chapter 12 presented the result of an in-depth interpretive exploration of Level of engagement with CPD through the lens of academic and students, enabling understanding of the constructed meaning associated with CPD. Findings in Chapter 12 are a sound basis for further work in the future, but for this study, this level of evaluation is adequate.

Chapter 13, which is the Conclusion, reflects on arguments made and propositions put forward. The conclusion reflects on the findings of the Literature review chapters (2 to 5) that established the theoretical basis for the research and then rehearsed details of the research methods that were used as presented in Chapter 6. The conclusion goes further to reflect on the findings of the positivist inclined chapters (7 to 11) that established the varying importance of CPD; the measure of the Level of engagement with CPD; established and aggregated the level of Motivation towards engagement with CPD; established and explored the relationship between motivation towards CPD and the Level of engagement with CPD; identified the predictor of the Level of engagement with CPD among emergent and identified dimensions of motivation. The conclusion also reflects on the findings of interpretivism inclined Chapter twelve, which presented explicit knowledge of the full picture of embedded norms related to CPD in the collective societal net of the academic community. The conclusion also reflects on the benefits and impacts of the study. Benefits and impact that potentially cut across many sectors of society: from Industry to Government and education research, policymakers, Human Resources, teachers. In all the Conclusion reflects on arguments made, propositions put forward and their potential impact and benefits.

13.8 Contribution to Knowledge and Impact

The research sheds light on the dynamics of Learner's engagement with Continuous Professional Development and serve as a guideline for developing particularistic approaches to Continuous Professional Development. The research contributed to an existing conversation on the role of traditional pedagogic systems and lifelong learning in the modern world. In so doing, contributed to generating impetus for a shift in an existing perspective of Continuous Professional Development as a mainstay in an industrial context, to engaging in Continuous Professional Development from an earlier point in life (definition of CPD and what constitutes CPD in the context of this research is expatiated upon in Chapter 2.0). The results and findings of the research helped improve understanding of the engagement of learners with learning activities and helped inform strategies to address skills and knowledge development needs, especially for those with performance challenges.

The contribution to knowledge revolved around the establishment of a holistic understanding of factors that motivate students to engage with Continuous Professional Development, employing a multidimensional approach. This lead to the identification and development of a domain of Motivation based on the intensity, source and time dimensions of Motivation which can be utilised for predicting, tracking and changing learner type and form of Motivation towards CPD and level of engagement with CPD. I.e. The creation of a tool to aid in transforming the nature of the student's Motivation through internalisation or creating the necessary conditions for a student to be best positioned to succeed in Continuous Professional Development.

The significant contribution to the body of already existing knowledge is the creation of indexes for the effective and practical evaluation of Level of engagement with CPD and Motivation towards engagement with CPD. An index developed to measure the level of engagement with CPD was created by evaluating different identified markers of engagement with CPD across identified aspects of CPD (as done in Chapter 8). An index was developed to measure motivation towards the level of engagement with CPD based on the resultant Motivation of the identified and emergent dimensions of Motivation. These indexes allow for effective measurement of Level of engagement with CPD and Motivation in the context of Continuous Professional Development, and support migration of Motivation through internalisation to a form of Motivation more conducive to the desired form of Continuous Professional Development activity.

In addition to this, the investigation of student motivation in the context of Continuous Professional Development enabled an understanding of factors that affect Motivation to engage with Continuous Professional Development. The investigation is different from previous explorations of Continuous Professional Development, which are usually in the context of subjects currently involved in a profession in the Industry as opposed, to the subjects of this study which are learners in tertiary academic institutions [7, 8].

The uniqueness of the research is further strengthened by the fact that Continuous Professional Development is considered more from the perspective of Continuous Professional Development as a skill rather than on the content of knowledge of the Continuous Professional Development activity. With the research focused on the development of the skill of engaging in Continuous Professional Development.

The theoretical contribution to the body of knowledge includes the establishment of a new student-centric outlook of Continuous professional development from the perspective of students engaged in tertiary education; the establishment and utilisation of a mechanistic approach to Vygotsky's zone of proximal development; and establishment of a conceptual framework for a holistic examination of engineering students engagement with and Motivation towards Continuous Professional development, and establishment of a holistic understanding of the interaction between them. The empirical contribution includes the establishment of the varying importance of CPD; establishment of the measure of the Level of engagement with CPD; establishment and aggregation of the level of Motivation towards engagement with CPD; establishment of the relationship between motivation towards CPD and Level of engagement with CPD; identification of the predictors of the Level of engagement with CPD among emergent and the identified dimension of motivation; and developing models for predicting the level of engagement with CPD. The empirical contribution also includes establishing knowledge of embedded norms related to CPD in the collective societal net of the academic community. This study also successfully expatiated on engagement with CPD from an interpretive point of view.

In all, the study not only contributes to the body of knowledge but also has real-world benefits and impact. The study established knowledge that is useful in developing good practise guidelines such as advising individuals that want to improve their overall engagement with CPD to 1) Focus motivation on Challenge rather than competitiveness; 2) Focus on experiencing stimulation rather than accomplishment; 3) Try to view the future as open. Benefits and impact that potentially cut across many sectors of society: from Industry to Government and education research, policymakers, Human

Resources, teachers and more. These areas can benefit from research that potentially enables a better understanding of students motivation to engage in Continuous Professional Development; understanding that allows the development of strategies for improving student engagement with Continuous Professional Development. The result of the study will help universities, Industry, and policymakers to gain a better understanding of student's perception of CPD

The implication of this can range from the development of bespoke approaches for individuals to change behaviour in the context of motivation in order to effectively engage with Continuous Professional development, to the establishment of a foundation on which tools and policy for evaluating and promoting engagement with CPD for institutions, universities and Industry.

13.9 Recommendation

Future work can be done in several directions, including but not limited to, the following:

1. Identify good practise for CPD based on findings of this study regarding the relationship of the dimension of motivation towards CPD and Level of engagement with CPD,
2. Identify good practise for CPD based on findings of this study regarding the predictor of engagement with CPD
3. Further interpretivist examination of engagement with CPD taking into cognisance finding of this study.
4. Carry out a holistic examination of engagement with and Motivation towards Continuous Professional development from the point of view of other groups of students apart from Engineering students.
5. Carry out a holistic examination of engagement with and Motivation towards Continuous Professional development from the point of view of other groups, such as various professionals in Industry.
6. Examining the effects of demographic features on level of engagement with CPD; on Motivation towards engagement with CPD; and the relationship between them and associated predictive ability
7. Carry out a more extensive study of students perception of the importance of items and aspects of CPD with a more extensive data set.

13.10 Limitations

There are constraints and limitations to the research. The multifaceted and subjective nature of motivation and Continuous Professional Development poses some restrictions, especially the over-determined nature of motivation and human behaviour. The study is subject to several limitations commonly associated with the nature of self-reported questionnaires. In terms of quantitative data, the data collected in Nigeria was more robust than the data collected in the UK, as such, creating some limitation, this imbalance was not present in the qualitative data collected. The complex and multidimensional nature of the study of motivation and Continuous Professional development resulted in a relatively large survey tool which in effect had its limiting influence on the study.

The study is relatively large because of the nature of the constructs that were evaluated as such, not all collected data was utilised or plausible line of enquires pursued due to space constraint. That said the study is relatively comprehensive although lines of enquiries not pursued serve as a reasonable basis for further studies, some of which are recommended above.

The research presented in Chapter 7 is a limited study that carried out a preliminary examination of the critical concept of Students perspective on LP of Items/ Aspects of CPD to generate required values for use in further analysis and at same time tests proposed research methodology and analysis approaches. Although preliminary findings were encouraging, the general constraints that result from a limited data set impeded further inference and led to limited generalisation from the result of Chapter 7.

Appendices

Appendix 1: Level of and Motivation towards Engagement with CPD Questionnaire

Consent Form

GENERAL INFORMATION AND CONSENT

We are asking you to participate in a study that investigates the motivation patterns among Electronic Engineering Students and how this affects the Level of engagement with Continuous Professional Development (CPD). **The following questionnaire should take around 45 minutes.** Participation in this study is voluntary, and you have the right not to answer any question or item, or to withdraw your consent and terminate participation at any time. The research and its associated results will be compiled at the University of York.
The survey is anonymous; no individual response will be reported, and only aggregated data will be used.

At the end of the Survey, you can enter your email address in order to stand **a chance to win one of over ten £20 Pound Amazon or Jumia Vouchers**

****

By clicking continue, I am consenting to participate in this survey. I understand the research purpose of the survey and the protection that will be given to any information I provide. I understand that any information provided by me will remain confidential with regard to my identity. I also understand that by participating in this study I am not waiving any of my legal rights.
I have been informed that I may contact Adeyosola Gbadebo (aaog500@york.ac.uk) from the Engineering Management Research Group, Department of Electronics, University of York, Heslington, York, YO10 5DD, if I have any queries about this survey.

- ○ I agree to participate in the survey
- ○ I do not want to participate in the survey

Demographic Data

In what country is your institution?

- ○ Nigeria
- ○ United Kingdom
- ○ Others

Please Specify

Your gender

- ○ Male
- ○ Female
- ○ Other

Your age

- ○ Less than 18 Years
- ○ 18 to 24 Years
- ○ 25 to 34 Years
- ○ 35 to 54 Years
- ○ 55 and above

Ethnicity
Choose an option that describes your ethnic group.

- ○ Black
- ○ Mixed/Multiple ethnic groups
- ○ Asian
- ○ White
- ○ Other ethnic groups
- ○ Rather not say

Black Ethnicity

- ☐ Yoruba
- ☐ Hausa
- ☐ Igbo
- ☐ Fulani
- ☐ Edo
- ☐ Ijaw
- ☐ Kanuri
- ☐ Ibibio
- ☐ Tiv
- ☐ Any Other Black Background

Please Specify,

Mixed/Mutiple Ethnicity

- [ ] Black and Asian
- [ ] Black and Arab
- [ ] Black and White
- [ ] Any other Mixed/Multiple ethnic background

Please Specify,

Asian Ethnicity

- [ ] Indian
- [ ] Bangladeshi
- [ ] Pakistani
- [ ] Chinese
- [ ] Any other Asian background

Please Specify,

White Ethnicity

- [ ] White African
- [ ] American
- [ ] European
- [ ] White Asian
- [ ] Any other White background

Please Specify,

Other ethnic groups

- [ ] Arab
- [ ] Any other ethnic group

Please Specify,

Ethnicity

Choose an option that describes your ethnic group.

- [ ] White
- [ ] Mixed/Multiple ethnic groups
- [ ] Black
- [ ] Asian
- [ ] Other ethnic groups
- [ ] Rather not say

White Ethnicity

- [ ] English/Welsh/Scottish/Northern Irish/British
- [ ] Irish
- [ ] Gypsy or Irish Traveler
- [ ] Any other White background

Please Specify,

Mixed/Mutiple Ethnicity

- [ ] White and Black Caribbean
- [ ] White and Black African
- [ ] White and Asian
- [ ] Any other Mixed/Multiple ethnic background

Please Specify,

Black Ethnicity

- [ ] African
- [ ] Caribbean
- [ ] Black European
- [ ] Black American
- [ ] Any Other Black Background

Please Specify,

Asian Ethnicity

- ☐ Indian
- ☐ Pakistani
- ☐ Bangladeshi
- ☐ Chinese
- ☐ Any other Asian background

Please Specify,

Other ethnic groups

- ☐ Arab
- ☐ Any other ethnic group

Please Specify,

Which of the following describes your household (Family's) income per day?

- ○ Less than ₦ 950
- ○ Between ₦ 950 and ₦ 1245
- ○ Between ₦ 1250 and ₦ 6285
- ○ Between ₦ 6290 and ₦ 15735
- ○ Above ₦ 15740

Please move the slider to indicate your household (Family's) income per day?

0 2000 4000 6000 8000 10000 12000 14000 16000 18000 20000

Household income in Nigerian Naira

Which of the following describes your household (Family's) income per day?

- ○ Less than £112
- ○ Between £ 112 and £ 142
- ○ Between £143 and £180
- ○ Between £181 and £341
- ○ Above £341

Please move the slider to indicate your household (Family's) income per day?

0 100 200 300 400 500 600 700 800 900 1000

Household income in British Pounds Sterling

Which of the following describes your household (Family's) income per day?

- ○ Less than $112
- ○ Between $ 112 and $ 142
- ○ Between $143 and $180
- ○ Between $181 and $341
- ○ Above $341

Please move the slider to indicate your household (Family's) income per day?

0 100 200 300 400 500 600 700 800 900 1000

Household income in US Dollars

Education details and background

Name of your current educational institution

- ○ Obafemi Awolowo University

- ○ University of Ibadan
- ○ University of Lagos
- ○ Others

Please Specify

Name of your current educational institution

- ○ University of York
- ○ University of Leeds
- ○ University of Sheffield
- ○ Others

Please Specify

Please identify your general field of study

- ☐ Administration
- ☐ Arts
- ☐ Agriculture
- ☐ Basic Medical Sciences
- ☐ Clinical Sciences
- ☐ Dentistry
- ☐ Environmental Design & Management
- ☐ Education
- ☐ Law
- ☐ Pharmacy
- ☐ Sciences
- ☐ Social Sciences
- ☐ Technology
- ☐ Others

Please Specify

Please identify your general field of study

- [ ] Agriculture and Forestry
- [ ] Arts
- [ ] Education
- [ ] Medicine
- [ ] Pharmacy
- [ ] Science
- [ ] Social Sciences
- [ ] Technology
- [ ] Veterinary Medicine
- [ ] Others

Please Specify

Please identify your general field of study

- [ ] Arts
- [ ] Business Administration
- [ ] Education
- [ ] Engineering
- [ ] Environmental Sciences
- [ ] Law
- [ ] Pharmacy
- [ ] Science
- [ ] Social Sciences
- [ ] Others

Please Specify

Please identify your general field of study

- [ ] Arts & Humanities
- [ ] Sciences
- [ ] Social Sciences
- [ ] Others

Please Specify

Please identify your general field of study

- [ ] Arts, Humanities and Cultures
- [ ] Biological Sciences
- [ ] Environment
- [ ] Mathematics and Physical Sciences

- [ ] Business
- [ ] Education, Social Sciences and Law
- [ ] Engineering
- [ ] Medicine and Health
- [ ] Others

Please Specify

Please identify your general field of study

- [ ] Arts & Humanities
- [ ] Medicine, Dentistry and Health
- [ ] Engineering
- [ ] Sciences
- [ ] Social Sciences
- [ ] Others

Please Specify

What 'level' is the degree you are studying?

- [ ] Bachelor
- [ ] Masters
- [ ] Doctoral/PhD
- [ ] Others
- [ ] Not Applicable

Please Specify

What is the title of the academic programme you are studying for?:

- [ ] Agricultural Engineering
- [ ] Chemical Engineering
- [ ] Computer Science & Engineering
- [ ] Civil Engineering
- [ ] Food Science & Technology
- [ ] Metallurgical & Materials Engineering
- [ ] Mechanical Engineering
- [ ] Others

☐ Electronic & Electrical Engineering

Please Specify

What is the title of the academic programme you are studying for?:

☐ Electrical & Electronic Engineering
☐ Industrial & Production Engineering
☐ Mechanical Engineering
☐ Others

Please Specify

What is the title of the academic programme you are studying for?:

☐ Chemical Engineering
☐ Metallurgy & Materials Engineering
☐ Civil & Environmental Engineering
☐ Surveying & Geoinformatics
☐ Electrical & Electronics Engineering
☐ Systems Engineering
☐ Mechanical Engineering
☐ Others

Please Specify

What is the title of the academic programme you are studying for?:

☐ Electronic Engineering
☐ Music Technology Systems
☐ Computer Science
☐ Others

Please Specify

What is the title of the academic programme you are studying for?:

- ☐ Chemical and Process Engineering
- ☐ Civil Engineering
- ☐ Computing
- ☐ Electronic and Electrical Engineering
- ☐ Mechanical Engineering
- ☐ Others

Please Specify

What is the title of the academic programme you are studying for?:

- ☐ Aerospace Engineering
- ☐ Automatic Control and Systems Engineering
- ☐ Bioengineering
- ☐ Chemical and Biological Engineering
- ☐ Civil & Structural Engineering
- ☐ Computer Science
- ☐ Electronic & Electrical Engineering
- ☐ Materials Science and Engineering
- ☐ Mechanical Engineering
- ☐ Others

Please Specify

How long have you been a student in your current Institution?

Number of Years

What academic year of study are you currently in?

Year of Study

What is the standard (or nominal) length of your degree programme?

Length of Degree (Years)

Please specify why it is not applicable?

Preliminary Questions

Do you feel that the degree programme is preparing you adequately for employment?

- ○ Very Little
- ○ Little
- ○ Some
- ○ Much
- ○ Very Much

How would you rate the employment potential of your degree?

- ○ Very Poor
- ○ Poor
- ○ Fair
- ○ Good
- ○ Very Good

CPD Background Questions - Subject & Skills

What subject area have you worked on as part of your Professional Development?

Instruction

Please tick to indicate the subject areas that you have worked on as part of your professional development. You can select more than one, so tick all that apply.

- ☐ Self-Development
- ☐ Communication
- ☐ Strategic Management
- ☐ Specialist Interest Areas
- ☐ Accounting and Finance
- ☐ Health, Safety and Welfare

- ☐ Project Management
- ☐ Technical
- ☐ Legislative
- ☐ Associated Professional Areas
- ☐ Working with others
- ☐ Business & Commercial practice
- ☐ Information Technology
- ☐ Logistics
- ☐ Enterprise & Innovation
- ☐ Operations Management
- ☐ Quality Control
- ☐ Creativity
- ☐ Management & Marketing of Technology
- ☐ Others

Please Specify

How often do you engage in professional development activities in the following Subject areas?

Instructions:
Please rate how often you take part in activities in each of the following Subject areas. Rate each item on a scale from 1 to 5. With 1 = Never and 5 = Always

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Self-Development	○	○	○	○	○
Communication	○	○	○	○	○
Strategic Management	○	○	○	○	○
Project Management	○	○	○	○	○
Technical	○	○	○	○	○
Legislative	○	○	○	○	○
Associated Professional Areas	○	○	○	○	○
Working with others	○	○	○	○	○
Business & Commercial practice	○	○	○	○	○
Information Technology	○	○	○	○	○

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Specialist Interest Areas	○	○	○	○	○
Accounting and Finance	○	○	○	○	○
Health, Safety and Welfare	○	○	○	○	○
Logistics	○	○	○	○	○
Enterprise & Innovation	○	○	○	○	○
Operations Management	○	○	○	○	○
Quality Control	○	○	○	○	○
Creativity	○	○	○	○	○
Management & Marketing of Technology	○	○	○	○	○
Others	○	○	○	○	○

To what extent do you want to improve your skills in these areas?

Instruction:

Please rate to what extent you want to improve your competency in this skills areas? Rate each item on a scale from 1 to 5. With 1 = Do not want to Improve and 5 = Definitely Want to Improve

	Do not want to Improve		Somewhat		Want to improve
	1	2	3	4	5
Self-Development	○	○	○	○	○
Communication	○	○	○	○	○
Strategic Management	○	○	○	○	○
Project Management	○	○	○	○	○
Technical	○	○	○	○	○
Legislative	○	○	○	○	○

	Do not want to Improve		Somewhat		Want to improve
	1	2	3	4	5
Associated Professional Areas	○	○	○	○	○
Working with others	○	○	○	○	○
Business & Commercial practice	○	○	○	○	○
Information Technology	○	○	○	○	○
Specialist Interest Areas	○	○	○	○	○
Accounting and Finance	○	○	○	○	○
Health, Safety and Welfare	○	○	○	○	○
Logistics	○	○	○	○	○
Enterprise & Innovation	○	○	○	○	○
Operations Management	○	○	○	○	○
Quality Control	○	○	○	○	○
Creativity	○	○	○	○	○
Management & Marketing of Technology	○	○	○	○	○
Others	○	○	○	○	○

Which Skills areas have you worked on as part of your Professional Development?

Instructions:
Please tick to indicate the Skills areas that you have worked on as part of your professional development. You can select more than one, so tick all that apply.

- ☐ Generic Skills
- ☐ Professional and Technical Skills
- ☐ IT Skills
- ☐ Professional Qualifications and Certifications
- ☐ Role Specific Skills
- ☐ Experience

- ☐ Personal Skills and Values
- ☐ Professional Organization requirements
- ☐ Academic Qualification (not part of requirement for current degree)
- ☐ Others

Please Specify

How often do you engage in professional development activities in this Skills areas?

Instructions:
Please rate how often you take part in activities in each of the following skill areas. Rate each item on a scale from 1 to 5. With 1 = Never and 5 = Always

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Generic Skills	○	○	○	○	○
Professional and Technical Skills	○	○	○	○	○
IT Skills	○	○	○	○	○
Personal Skills and Values	○	○	○	○	○
Professional Organization requirements	○	○	○	○	○
Professional Qualifications and Certifications	○	○	○	○	○
Role Specific Skills	○	○	○	○	○
Experience	○	○	○	○	○
Academic Qualification (not part of requirement for current degree)	○	○	○	○	○
Others	○	○	○	○	○

To what extent do you want to improve your skills in these areas?

Instructions:

Please rate to what extent you want to improve your competency in this skills areas. Rate each item on a scale from 1 to 5. With 1 = Do not want to Improve and 5 = Definitely Want to Improve

	Do not want to Improve		Somewhat		Want to improve
	1	2	3	4	5
Generic Skills	○	○	○	○	○
Professional and Technical Skills	○	○	○	○	○
IT Skills	○	○	○	○	○
Personal Skills and Values	○	○	○	○	○
Professional Organization requirements	○	○	○	○	○
Professional Qualifications and Certifications	○	○	○	○	○
Role Specific Skills	○	○	○	○	○
Experience	○	○	○	○	○
Academic Qualification (not part of requirement for current degree)	○	○	○	○	○
Others	○	○	○	○	○

Which Generic Skills have you worked on as part of Professional Development?

Instruction:

Please tick to indicate the generic skills that you have worked on as part of your professional development. You can select more than one, so tick all that apply.

- ☐ Capacity for analysis and synthesis
- ☐ Ability to communicate with non-experts in the field
- ☐ Capacity for applying Knowledge in practice
- ☐ Capacity to adapt to new situations
- ☐ Communication Skills
- ☐ Creativity
- ☐ Decision making
- ☐ Information management skills
- ☐ Initiative and entrepreneurial spirit
- ☐ Interpersonal Skills
- ☐ Patents and IPR
- ☐ Planning and Time Management
- ☐ Problem solving
- ☐ Project design and management
- ☐ Public speaking
- ☐ Reporting writing
- ☐ Research Skills
- ☐ Team working
- ☐ Others

Please Specify

How often do you engage in professional development activities in these Generic Skills?

Instructions:
Please rate how often you take part in activities in each of the following Generic skills.
Rate each item on a scale from 1 to 5. With 1 = Never and 5 = Always

	Never	Almost Never	Sometime	Nearly Always	Always
	1	2	3	4	5
Capacity for analysis and synthesis	○	○	○	○	○
Ability to communicate with non-experts in the field	○	○	○	○	○
Capacity for applying Knowledge in practice	○	○	○	○	○
Capacity to adapt to new situations	○	○	○	○	○
Communication Skills	○	○	○	○	○
Creativity	○	○	○	○	○

	Never	Almost Never	Sometime	Nearly Always	Always
	1	2	3	4	5
Decision making	○	○	○	○	○
Information management skills	○	○	○	○	○
Initiative and entrepreneurial spirit	○	○	○	○	○
Interpersonal Skills	○	○	○	○	○
Patents and IPR	○	○	○	○	○
Planning and Time Management	○	○	○	○	○
Problem solving	○	○	○	○	○
Project design and management	○	○	○	○	○
Public speaking	○	○	○	○	○
Reporting writing	○	○	○	○	○
Research Skills	○	○	○	○	○
Team working	○	○	○	○	○
Other	○	○	○	○	○

To what extent do you want to improve your competency in each of the following Generic skills?

Instructions:

Please rate to what extent you want to improve your competency in each of these Generic Skills. Rate each item on a scale from 1 to 5. With 1 = Do not want to Improve and 5 = Definitely Want to Improve

	Do not want to Improve		Somewhat		Want to improve
	1	2	3	4	5
Capacity for analysis and synthesis	○	○	○	○	○

	Do not want to Improve		Somewhat		Want to improve
	1	2	3	4	5
Ability to communicate with non-experts in the field	○	○	○	○	○
Capacity for applying Knowledge in practice	○	○	○	○	○
Capacity to adapt to new situations	○	○	○	○	○
Communication Skills	○	○	○	○	○
Creativity	○	○	○	○	○
Decision making	○	○	○	○	○
Information management skills	○	○	○	○	○
Initiative and entrepreneurial spirit	○	○	○	○	○
Interpersonal Skills	○	○	○	○	○
Patents and IPR	○	○	○	○	○
Planning and Time Management	○	○	○	○	○
Problem solving	○	○	○	○	○
Project design and management	○	○	○	○	○
Public speaking	○	○	○	○	○
Reporting writing	○	○	○	○	○
Research Skills	○	○	○	○	○
Team working	○	○	○	○	○
Other	○	○	○	○	○

CPD Background Questions - Activities

What Categories of activities do you engage in as part of your professional development?

Instruction

Please tick to indicate the categories of activities you have engaged with as part of your professional development. You can select more than one, so tick all that apply.

- ☐ Training
- ☐ Work experience
- ☐ Academic Study
- ☐ Volunteering
- ☐ Events and seminars
- ☐ Self-study
- ☐ Others

Please Specify

How often do you engage in any of Professional Development activities listed below?

Instructions:

Please rate how often you take part in each of the following activities. Rate each item on a scale from 1 to 5. With 1 = Never and 5 = Always

Training Activities

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Soft skills courses	○	○	○	○	○
Technical courses	○	○	○	○	○
E-learning/distance courses	○	○	○	○	○
Courses leading to Validated and accredited qualifications (not if used to achieve required University Degree), e.g. PRINCE2	○	○	○	○	○
Preparing materials and Delivering training courses	○	○	○	○	○

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Professional Development & Technical presentations to colleagues and others (not if used to achieve required University Degree)	○	○	○	○	○
Vocational Training	○	○	○	○	○
Other training related activities	○	○	○	○	○

Work Experience Activities

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Learning by doing the job and developing experience.	○	○	○	○	○
Talking to suppliers, customers or specialists and working with them to determine their technical requirements.	○	○	○	○	○
Internship/ Job Shadowing/Secondment (not based on University requirement)	○	○	○	○	○
Receiving coaching from others	○	○	○	○	○
Apprenticeships.	○	○	○	○	○
Teaching /Coaching/training others (for those not in teaching post)	○	○	○	○	○
Supervising/Managing / leading others.	○	○	○	○	○

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Being Mentored by a professional in Industry of choice	○	○	○	○	○
Presentations to external clients, colleagues, etc.	○	○	○	○	○
Preparing and presenting reports.	○	○	○	○	○
In-house presentations on professional development or relating to industry of choice	○	○	○	○	○
Managing projects, budgets, teams and others	○	○	○	○	○
Activities of a technical or professional nature, e.g. involvement in specialist working parties or panels, planning aid work or acting as a consultee on topics of professional interest	○	○	○	○	○
Other work experience related activities	○	○	○	○	○

Academic Study Activities

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Action-based learning focused on problems in the industry of choice (there are various definitions of action-based learning. In this context it means a learning process involving a systematic, structured approach to the identification of problems and the search for solutions, with clear benefit to the individual member in terms of meeting the personal CPD needs identified in his or her PDP);	○	○	○	○	○
Formal distance and open learning courses (not if used to achieve required University Degree)	○	○	○	○	○
Home-based learning such as distance learning packages, systematic study or structured reading on particular themes or topics (but not routine reading which can be considered as part of everyday University activities);	○	○	○	○	○
Writing reports or Writing for publication (not if used to achieve required University Degree)	○	○	○	○	○
City & Guilds	○	○	○	○	○
National Vocational Qualifications (NVQs) or equivalent.	○	○	○	○	○

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Preparing papers and contributing to technical meetings and study groups. (not if used to achieve required University Degree)	○	○	○	○	○
Other academic study related activities	○	○	○	○	○

Volunteering Activities

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Professional body volunteering roles, for example, mentoring, local network roles, professional registration interviewer, committee roles.	○	○	○	○	○
Other volunteer roles that support the development of soft skills / financial / leadership skills e.g.	○	○	○	○	○
Scout/Guide leader, charity work, local organisations and similar activities.	○	○	○	○	○
Speaking at an event.	○	○	○	○	○
Membership of a technical expert group.	○	○	○	○	○

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Participating in Institution activities such as acting as a reviewer, a Liaison Officer or membership of Committees where new initiatives and ideas are discussed.	○	○	○	○	○
Promoting engineering in primary and secondary schools	○	○	○	○	○
Acting as a coach or mentor for a fellow student	○	○	○	○	○
Sharing knowledge and expertise with others	○	○	○	○	○
Other volunteering related activities	○	○	○	○	○

Events and Seminars Activities

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Conferences	○	○	○	○	○
Allied professional events (such as professional bodies not directly linked to Electronics)	○	○	○	○	○
Networking events	○	○	○	○	○
Technical visits, Exhibitions, Seminars, Lectures, Workshops	○	○	○	○	○
Organising meetings or events	○	○	○	○	○
Speaking at an event	○	○	○	○	○

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Attending trade exhibitions and systematically gathering information and knowledge to develop as an Engineer	○	○	○	○	○
Lecturing or teaching at an organised event	○	○	○	○	○
Participating in careers conventions	○	○	○	○	○
Peer guidance and discussion	○	○	○	○	○
Regional Electrical engineering institute event	○	○	○	○	○
Seminars and Workshops	○	○	○	○	○
Other events and seminars related activities	○	○	○	○	○

Self-Study Activities

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Reading books, journals and articles.	○	○	○	○	○
Research through internet searches and digital information sources.	○	○	○	○	○
Online technical communities & discussion forums.	○	○	○	○	○

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
Following professional organisation, and companies in the industry on social media	○	○	○	○	○
Listening to training sound clips, audio files, tapes and viewing CD Roms for research purposes and technical information	○	○	○	○	○
Research both on the industry of choice especially for jobs requirement and further qualifications needed for progression within the industry	○	○	○	○	○
Self-directed and informal learning	○	○	○	○	○
Self-Study through reading textbooks or study packs.	○	○	○	○	○
Structured Reading (test your understanding of the reading material)	○	○	○	○	○
Watching training films, television programmes, YouTube channels or online videos related to industry and job role of interest	○	○	○	○	○
Personal learning from the internet	○	○	○	○	○
Other self-study related activities	○	○	○	○	○

How often do you engage in ${q://QID97/ChoiceTextEntryValue} ?

	Never	Almost Never	Sometimes	Nearly Always	Always
	1	2	3	4	5
${q://QID97/ChoiceTextEntryValue}	○	○	○	○	○

Would you like to increase how often you take part in any of the following professional development Activities?

Instructions:
Please rate to what extent you want to improve how often you take part in any of the following professional development activities? Rate each item on a scale from 1 to 5. With 1 = Do not want to Improve and 5 = Definitely Want to Improve

Training Activities

	Do not want to Improve		SomeWhat		Definitely want to improve
	1	2	3	4	5
Soft skills courses	○	○	○	○	○
Technical courses	○	○	○	○	○
E-learning/distance courses	○	○	○	○	○
Courses leading to Validated and accredited qualifications (not if used to achieve required University Degree), e.g. PRINCE2	○	○	○	○	○
Preparing materials and Delivering training courses	○	○	○	○	○
Professional Development & Technical presentations to colleagues and others (not if used to achieve required University Degree)	○	○	○	○	○
Vocational Training	○	○	○	○	○

	Do not want to Improve		SomeWhat		Definitely want to improve
	1	2	3	4	5
Other training related activities	○	○	○	○	○

Work Experience Activities

	Do not want to Improve		SomeWhat		Definitely want to improve
	1	2	3	4	5
Learning by doing the job and developing experience.	○	○	○	○	○
Talking to suppliers, customers or specialists and working with them to determine their technical requirements.	○	○	○	○	○
Internship/ Job Shadowing/Secondment (not based on University requirement)	○	○	○	○	○
Receiving coaching from others	○	○	○	○	○
Apprenticeships.	○	○	○	○	○
Teaching /Coaching/training others (for those not in teaching post)	○	○	○	○	○
Supervising/Managing / leading others.	○	○	○	○	○
Being Mentored by a professional in Industry of choice	○	○	○	○	○
Presentations to external clients, colleagues, etc.	○	○	○	○	○
Preparing and presenting reports.	○	○	○	○	○

	Do not want to Improve		SomeWhat		Definitely want to improve
	1	2	3	4	5
In-house presentations on professional development or relating to industry of choice	○	○	○	○	○
Managing projects, budgets, teams and others	○	○	○	○	○
Activities of a technical or professional nature, e.g. involvement in specialist working parties or panels, planning aid work or acting as a consultee on topics of professional interest	○	○	○	○	○
Other work experience related activities	○	○	○	○	○

Academic Study Activities

Do not want to Improve		Somewhat		Definitely want to improve
1	2	3	4	5

	Do not want to Improve		Somewhat		Definitely want to improve
	1	2	3	4	5
Action-based learning focused on problems in the industry of choice (there are various definitions of action-based learning. In this context it means a learning process involving a systematic, structured approach to the identification of problems and the search for solutions, with clear benefit to the individual member in terms of meeting the personal CPD needs identified in his or her PDP);	○	○	○	○	○
Formal distance and open learning courses (not if used to achieve required University Degree)	○	○	○	○	○
Home-based learning such as distance learning packages, systematic study or structured reading on particular themes or topics (but not routine reading which can be considered as part of everyday University activities);	○	○	○	○	○
Writing reports or Writing for publication (not if used to achieve required University Degree)	○	○	○	○	○
City & Guilds	○	○	○	○	○
National Vocational Qualifications (NVQs) or equivalent.	○	○	○	○	○

	Do not want to Improve		Somewhat		Definitely want to improve
	1	2	3	4	5
Preparing papers and contributing to technical meetings and study groups. (not if used to achieve required University Degree)	○	○	○	○	○
Other academic study related activities	○	○	○	○	○

Volunteering Activities

	Do not want to Improve		Somewhat		Definitely want to improve
	1	2	3	4	5
Professional body volunteering roles, for example, mentoring, local network roles, professional registration interviewer, committee roles.	○	○	○	○	○
Other volunteer roles that support the development of soft skills / financial / leadership skills e.g.	○	○	○	○	○
Scout/Guide leader, charity work, local organisations and similar activities.	○	○	○	○	○
Speaking at an event.	○	○	○	○	○
Membership of a technical expert group.	○	○	○	○	○

	Do not want to Improve		Somewhat		Definitely want to improve
	1	2	3	4	5
Participating in Institution activities such as acting as a reviewer, a Liaison Officer or membership of Committees where new initiatives and ideas are discussed.	○	○	○	○	○
Promoting engineering in primary and secondary schools	○	○	○	○	○
Acting as a coach or mentor for a fellow student	○	○	○	○	○
Sharing knowledge and expertise with others	○	○	○	○	○
Other volunteering related activities	○	○	○	○	○

Events and Seminars Activities

	Do not want to Improve		Somewhat		Definitely want to improve
	1	2	3	4	5
Conferences	○	○	○	○	○
Allied professional events (such as professional bodies not directly linked to Electronics)	○	○	○	○	○
Networking events	○	○	○	○	○
Technical visits, Exhibitions, Seminars, Lectures, Workshops	○	○	○	○	○
Organising meetings or events	○	○	○	○	○
Speaking at an event	○	○	○	○	○

	Do not want to Improve		Somewhat		Definitely want to improve
	1	2	3	4	5
Attending trade exhibitions and systematically gathering information and knowledge to develop as an Engineer	○	○	○	○	○
Lecturing or teaching at an organised event	○	○	○	○	○
Participating in careers conventions	○	○	○	○	○
Peer guidance and discussion	○	○	○	○	○
Regional Electrical engineering institute event	○	○	○	○	○
Seminars and Workshops	○	○	○	○	○
Other events and seminars related activities	○	○	○	○	○

Self-Study Activities

	Do not want to Improve		Sometimes		Definitely want to improve
	1	2	3	4	5
Reading books, journals and articles.	○	○	○	○	○
Research through internet searches and digital information sources.	○	○	○	○	○
Online technical communities & discussion forums.	○	○	○	○	○

	Do not want to Improve		Sometimes		Definitely want to improve
	1	2	3	4	5
Following professional organisation, and companies in the industry on social media	○	○	○	○	○
Listening to training sound clips, audio files, tapes and viewing CD Roms for research purposes and technical information	○	○	○	○	○
Research both on the industry of choice especially for jobs requirement and further qualifications needed for progression within the industry	○	○	○	○	○
Self-directed and informal learning	○	○	○	○	○
Self-Study through reading textbooks or study packs.	○	○	○	○	○
Structured Reading (test your understanding of the reading material)	○	○	○	○	○
Watching training films, television programmes, YouTube channels or online videos related to industry and job role of interest	○	○	○	○	○
Personal learning from the internet	○	○	○	○	○
Other self-study related activities	○	○	○	○	○

Would you like to increase how often you take part in ${q://QID97/ChoiceTextEntryValue} ?

	Do not want to Improve		Somewhat		Definitely want to improve
	1	2	3	4	5
${q://QID97/ChoiceTextEntryValue}	○	○	○	○	○

Level of Engagement with CPD

Level of Engagement With Continuous Professional Development

Thinking back to past occasions when you engaged in professional development activities, there are actions you may have taken before, during and after commencing engagement with these activities. Which of these statements accurately portray the actions you might have taken?

Instruction:

Rate each of the following statement on a 5-point scale depending on how much it portrays the actions you take before, during or after commencing professional development activities. With 1 = Does not portray my actions and 5 = definitely portrays my actions

Plan

When preparing to engage or before engaging in Professional Development activities...

	Does not portray my actions		Somewhat portrays my action		Definitely, portrays my actions
	1	2	3	4	5
I Set Goals	○	○	○	○	○
I assess my needs	○	○	○	○	○
I Plan my professional development activities	○	○	○	○	○
I develop a Timescale for professional development activities	○	○	○	○	○

	Does not portray my actions		Somewhat portrays my action		Definitely, portrays my actions
	1	2	3	4	5
I carry out a structured review of my roles and expectations	○	○	○	○	○
I create a loose competency framework (list of current competency)	○	○	○	○	○
I create a detailed competency framework (Detailed list of my competency including a list of what I need to develop)	○	○	○	○	○
I clearly link my competence to the training activities and the required job role	○	○	○	○	○
I clearly prioritise or rank components of my plan	○	○	○	○	○
I ensure that my activities are individualised and fit-for-purpose	○	○	○	○	○

Action

When engaging in professional development activity I take the following actions:

	Does not portray my actions		Somewhat portrays my action		Definitely, portrays my actions
	1	2	3	4	5
I create a list of activities I engage in or record the activities I engage in	○	○	○	○	○
I record the number of hours I spend engaging with activities	○	○	○	○	○

	Does not portray my actions		Somewhat portrays my action		Definitely, portrays my actions
	1	2	3	4	5
I record the number of hours I spent engaging with activities and also keep evidence of engaging in these activities (e.g. certificate)	○	○	○	○	○
I examine and record Justification for engagement	○	○	○	○	○
I actively participate and record evidence of active participation (e.g. commentary from fellow students, references and feedback from colleagues and tutors)	○	○	○	○	○

Result

When I engaged in professional development activity the results I get are .....

	Does not portray my actions		Somewhat portrays my action		Definitely, portrays my actions
	1	2	3	4	5
Very poor results	○	○	○	○	○
Poor results	○	○	○	○	○
Average results	○	○	○	○	○
Good results	○	○	○	○	○
Excellent	○	○	○	○	○

Do you reflect back on professional development activities you have completed?

○ Yes

○ No

Reflection I

After completing a Professional Development activities .....

	Does not portray my actions		Somewhat portrays my action		Definitely, portrays my actions
	1	2	3	4	5
I reflect on the planning process and actions that were taken before commencing engagement with the activity/activities.	○	○	○	○	○
I reflect on actions taken while and immediately after engaging in the activity/activities	○	○	○	○	○
I reflect on Results attained in the activity/activities I engaged in	○	○	○	○	○

Reflection II

The reflection approach or process I utilise is

	Does not portray my actions		Somewhat portrays my action		Definitely, portrays my actions
	1	2	3	4	5
Open-ended Reflection	○	○	○	○	○
Structured reflection	○	○	○	○	○
Reflection with help from a Third Party	○	○	○	○	○

	Does not portray my actions		Somewhat portrays my action		Definitely, portrays my actions
	1	2	3	4	5
Reflection using well-established template or methodology	○	○	○	○	○
Competence specific reflection (Reflection based on my competence requirements)	○	○	○	○	○
Involves Critical evaluation of results of reflection	○	○	○	○	○

Motivation

ACHIEVEMENT MOTIVATION

Instruction.

Please read each statement carefully and then indicate your opinion on each statement by putting a tick (√) in the spaces provided beside it. Please put (√) in only one column for each statement.

	Completely disagree	Mostly disagree	Agree to some extent	Mostly agree	Completely agree
	1	2	3	4	5
I feel I am a lazy person	○	○	○	○	○
Days often go by without me having done a thing	○	○	○	○	○
I like reading the biography of great people in order to learn how they overcome hurdles and achieved great things in life	○	○	○	○	○
I plan ahead what subjects to study during my free time	○	○	○	○	○
When I come to know that somebody like me, have achieved something great, I am motivated to do the same thing in a better way.	○	○	○	○	○

	Completely disagree	Mostly disagree	Agree to some extent	Mostly agree	Completely agree
	1	2	3	4	5
Most people who know me say that I am hard working and ambitious.	○	○	○	○	○
I go on postponing what I should be studying today.	○	○	○	○	○
I take a lot of time to get started on the task of studying	○	○	○	○	○
Most evenings I kick back and relax rather than prepare for the next day's University work	○	○	○	○	○
Sometimes, I forget to do preparatory work/homework.	○	○	○	○	○
I never leave a task/assignment unfinished	○	○	○	○	○
I enjoy working with people who perform/Score at an equivalent or lower level, rather than with those who are smarter and more hardworking than me.	○	○	○	○	○
I dislike failing in my University examinations due to unpreparedness.	○	○	○	○	○
I always work very hard to be among the best students in my Department.	○	○	○	○	○
I find myself just taking life as it comes without planning.	○	○	○	○	○
I aim at reaching the highest level in my profession or Education.	○	○	○	○	○
As I progress further, I want to do something which others have not done.	○	○	○	○	○
I am basically a competitive person and I compete just for the sake of competing.	○	○	○	○	○

	Completely disagree	Mostly disagree	Agree to some extent	Mostly agree	Completely agree
	1	2	3	4	5
I believe that success in life has less to do with hard work and more to do with luck and being in the right place at the right time.	○	○	○	○	○
I enjoy reading all kinds of books including those that are not part of our University syllabus.	○	○	○	○	○
I shall be satisfied with an above average performance, even though it may not be my best.	○	○	○	○	○
I prefer to use my time for doing something else rather than trying to perfect something that I have already completed.	○	○	○	○	○
I enjoy spending most of my time alone concentrating on my University work.	○	○	○	○	○
I always try to standout from the rest of my team/colleagues in one way or the other.	○	○	○	○	○
I will go ahead with my plans only if I am sure that other people will approve of it.	○	○	○	○	○
I get restless and annoyed when I feel I am wasting time.	○	○	○	○	○
It is not a good idea to be always above others in achievement, because that may make them feel bad about themselves.	○	○	○	○	○
I like to be the best student in my class/department.	○	○	○	○	○
I enjoy finishing my University assignments/Projects even when they are difficult and time-consuming.	○	○	○	○	○

	Completely disagree	Mostly disagree	Agree to some extent	Mostly agree	Completely agree
	1	2	3	4	5
I enjoy making friends with the most intelligent student in my class/department so as to keep up my standards of performance.	○	○	○	○	○
I like when people say in front of others that I am doing well in University.	○	○	○	○	○
I would like to deal with difficult situations, so that the blame or praise for its results come to me alone.	○	○	○	○	○

Self-Determined Motivation

Why do you go to university?

Instructions:

Using the scale below, indicate to what extent each of the following items presently corresponds to one of the reasons why you go to University.

	Does not Correspond at all		Corresponds a little		Corresponds moderately	Corresponds a lot	Corresponds exactly
	1	2	3	4	5	6	7
Because with only a high-school degree, I would not find a high-paying job later on.	○	○	○	○	○	○	○
Because I experience pleasure and satisfaction while learning new things.	○	○	○	○	○	○	○
Because I think that a University education will help me better prepare for the career, I have chosen..	○	○	○	○	○	○	○

	Does not Correspond at all		Corresponds a little	Corresponds moderately	Corresponds a lot		Corresponds exactly
	1	2	3	4	5	6	7
For the intense feelings, I experience when I am communicating my own ideas to others.	O	O	O	O	O	O	O
Honestly, I don't know; I really feel that I am wasting my time in school.	O	O	O	O	O	O	O
For the pleasure, I experience while surpassing myself in my studies.	O	O	O	O	O	O	O
To prove to myself that I am capable of completing my University degree.	O	O	O	O	O	O	O
In order to obtain a more prestigious job later on.	O	O	O	O	O	O	O
For the pleasure, I experience when I discover new things never seen before.	O	O	O	O	O	O	O
Because eventually, it will enable me to enter the job market in a field that I like.	O	O	O	O	O	O	O
For the pleasure that I experience when I read interesting authors.	O	O	O	O	O	O	O
I once had good reasons for going to University; however, now I wonder whether I should continue.	O	O	O	O	O	O	O
For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.	O	O	O	O	O	O	O

	Does not Correspond at all		Corresponds a little		Corresponds moderately	Corresponds a lot	Corresponds exactly
	1	2	3	4	5	6	7
Because of the fact that when I succeed in University, I feel important.	O	O	O	O	O	O	O
Because I want to have "the good life" later on.	O	O	O	O	O	O	O
For the pleasure that I experience in broadening my knowledge about subjects which appeal to me.	O	O	O	O	O	O	O
Because this will help me make a better choice regarding my career orientation.	O	O	O	O	O	O	O
For the pleasure that I experience when I feel completely absorbed by what certain authors have written.	O	O	O	O	O	O	O
I can't see why I go to University and frankly, I couldn't care less.	O	O	O	O	O	O	O
For the satisfaction, I feel when I am in the process of accomplishing difficult academic activities.	O	O	O	O	O	O	O
To show myself that I am an intelligent person.	O	O	O	O	O	O	O
In order to have a better salary later on.	O	O	O	O	O	O	O
Because my studies allow me to continue to learn about many things that interest me.	O	O	O	O	O	O	O

	Does not Correspond at all	Corresponds a little	Corresponds moderately	Corresponds a lot	Corresponds exactly
	1	2	3	4	5	6	7
Because I believe that a few additional years of education will improve my competence as a worker.	○	○	○	○	○	○	○
For the "high" feeling that I experience while reading about various interesting subjects.	○	○	○	○	○	○	○
I don't know; I can't understand what I am doing in school.	○	○	○	○	○	○	○
Because University allows me to experience a personal satisfaction in my quest for excellence in my studies.	○	○	○	○	○	○	○
Because I want to show myself that I can succeed in my studies	○	○	○	○	○	○	○

TIME PERSPECTIVE I

How true do you think the following statements are about you?

Instruction

Read each item and, as honestly as you can, answer the question: "How characteristic or true is this of you?" Check the appropriate box using the scale. Please answer ALL of the following questions.

	Very Untrue		Neutral		Very True
	1	2	3	4	5
I believe that getting together with one's friends to party is one of life's important pleasures.	○	○	○	○	○

	Very Untrue		Neutral		Very True
	1	2	3	4	5
Familiar childhood sights, sounds, smells often bring back a flood of wonderful memories.	○	○	○	○	○
Fate determines much in my life.	○	○	○	○	○
I often think of what I should have done differently in my life.	○	○	○	○	○
My decisions are mostly influenced by people and things around me.	○	○	○	○	○
I believe that a person's day should be planned ahead each morning.	○	○	○	○	○
It gives me pleasure to think about my past.	○	○	○	○	○
I do things impulsively.	○	○	○	○	○
If things don't get done on time, I don't worry about it.	○	○	○	○	○
When I want to achieve something, I set goals and consider specific means for reaching those goals.	○	○	○	○	○
On balance, there is much more good to recall than bad in my past.	○	○	○	○	○
When listening to my favorite music, I often lose all track of time.	○	○	○	○	○
Meeting tomorrow's deadlines and doing other necessary work comes before tonight's play.	○	○	○	○	○
Since whatever will be, it doesn't really matter what I do.	○	○	○	○	○

	Very Untrue		Neutral		Very True
	1	2	3	4	5
I enjoy stories about how things used to be in the "good old times."	○	○	○	○	○
Painful past experiences keep being replayed in my mind.	○	○	○	○	○
I try to live my life as fully as possible, one day at a time.	○	○	○	○	○
It upsets me to be late for appointments.	○	○	○	○	○
Ideally, I would live each day as if it were my last.	○	○	○	○	○
Happy memories of good times spring readily to mind.	○	○	○	○	○
I meet my obligations to friends and authorities on time.	○	○	○	○	○
I've taken my share of abuse and rejection in the past.	○	○	○	○	○
I make decisions on the spur of the moment.	○	○	○	○	○
I take each day as it is rather than try to plan it out.	○	○	○	○	○
The past has too many unpleasant memories that I prefer not to think about.	○	○	○	○	○
It is important to put excitement in my life.	○	○	○	○	○
I've made mistakes in the past that I wish I could undo.	○	○	○	○	○
I feel that it's more important to enjoy what you're doing than to get work done on time.	○	○	○	○	○

	Very Untrue		Neutral		Very True
	1	2	3	4	5
I get nostalgic about my childhood.	○	○	○	○	○
Before making a decision, I weigh the costs against the benefits.	○	○	○	○	○
Taking risks keeps my life from becoming boring.	○	○	○	○	○
It is more important for me to enjoy life's journey than to focus only on the destination.	○	○	○	○	○
Things rarely work out as I expected.	○	○	○	○	○
It's hard for me to forget unpleasant images of my youth.	○	○	○	○	○
It takes joy out of the process and flow of my activities, if I have to think about goals, outcomes, and products.	○	○	○	○	○
Even when I am enjoying the present, I am drawn back to comparisons with similar past experiences.	○	○	○	○	○
You can't really plan for the future because things change so much.	○	○	○	○	○
My life path is controlled by forces I cannot influence.	○	○	○	○	○
It doesn't make sense to worry about the future, since there is nothing that I can do about it anyway.	○	○	○	○	○

	Very Untrue		Neutral		Very True
	1	2	3	4	5
I complete projects on time by making steady progress.	○	○	○	○	○
I find myself tuning out when family members talk about the way things used to be.	○	○	○	○	○
I take risks to put excitement in my life.	○	○	○	○	○
I make lists of things to do.	○	○	○	○	○
I often follow my heart more than my head.	○	○	○	○	○
I am able to resist temptations when I know that there is work to be done.	○	○	○	○	○
I find myself getting swept up in the excitement of the moment.	○	○	○	○	○
Life today is too complicated; I would prefer the simpler life of the past.	○	○	○	○	○
I prefer friends who are spontaneous rather than predictable.	○	○	○	○	○
I like family rituals and traditions that are regularly repeated.	○	○	○	○	○
I think about the bad things that have happened to me in the past.	○	○	○	○	○
I keep working at difficult, uninteresting tasks if they will help me get ahead.	○	○	○	○	○

	Very Untrue		Neutral		Very True
	1	2	3	4	5
Spending what I earn on pleasures today is better than saving for tomorrow's security.	○	○	○	○	○
Often luck pays off better than hard work.	○	○	○	○	○
I think about the good things that I have missed out on in my life.	○	○	○	○	○
I like my close relationships to be passionate.	○	○	○	○	○
There will always be time to catch up on my work.	○	○	○	○	○

Multidimensional Future Time Perspective II

Instruction

The following statements describe how some people think about the future. Please read each statement carefully, and fill in the circle that best describes how much you agree or disagree. Open and honest responses are the most helpful.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
I look forward to the future with hope and enthusiasm.	○	○	○	○	○
I have the sense that time is running out.	○	○	○	○	○
My future is uncertain.	○	○	○	○	○
When I think about the future, I expect good things to happen.	○	○	○	○	○
I am beginning to experience that time is limited.	○	○	○	○	○

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
You cannot really plan for the future because things change so much.	○	○	○	○	○
I have little hope for the future.	○	○	○	○	○
Increasingly I feel like time is against me.	○	○	○	○	○
My future seems very vague and uncertain to me.	○	○	○	○	○
Each new day and season presents me with interesting opportunities.	○	○	○	○	○
I know that I do not have all the time in the world.	○	○	○	○	○
I do not focus on the future because it is so uncertain to me anyway.	○	○	○	○	○

FUTURE TIME PERSPECTIVE III

Instruction

Read each item and, as honestly as you can, answer the questions: "How true is this of you?" Select the appropriate number on the scale, where 1 means the statement is very untrue for you and 7 means that the statement is very true for you.

	Very untrue	Untrue	Somewhat untrue	Neutral	Somewhat true	True	Very True
	1	2	3	4	5	6	7
Many opportunities await me in the future.	○	○	○	○	○	○	○
I expect that I will set many new goals in the future.	○	○	○	○	○	○	○
My future is filled with possibilities.	○	○	○	○	○	○	○

	Very untrue	Untrue	Somewhat untrue	Neutral	Somewhat true	True	Very True
	1	2	3	4	5	6	7
Most of my life lies ahead of me.	O	O	O	O	O	O	O
My future seems infinite to me.	O	O	O	O	O	O	O
I could do anything I want in the future.	O	O	O	O	O	O	O
There is plenty of time left in my life to make new plans.	O	O	O	O	O	O	O
I have the sense time is running out.	O	O	O	O	O	O	O
There are only limited possibilities in my future.	O	O	O	O	O	O	O
As I get older, I begin to experience time as limited.	O	O	O	O	O	O	O

Block 8

Would you like to take part in the Raffle draw to win a £20 Pound Amazon or Jumia Voucher/gift cards?

- O Yes
- O No

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Appendix 2: Level of Importance of CPD Survey

Consent Form

GENERAL INFORMATION AND CONSENT

We are asking you to participate in a study that investigates the Level of engagement with Continuous Professional Development (CPD). **The following questionnaire should take around 10 - 15 minutes.**
Participation in this study is voluntary, and you have the right to not answer any question or item or to withdraw your consent and terminate participation at any time. The research and its associated results will be compiled at the University of York.
The survey is anonymous; no individual response will be reported, and only aggregated data will be used.

****

By clicking continue, I am consenting to participate in this survey. I understand the research purpose of the survey and the protection that will be given to any information I provide. I understand that any information provided by me will remain confidential with regard to my identity. I also understand that by participating in this study I am not waiving any of my legal rights.
I have been informed that I may contact Adeyosola Gbadebo (aaog500@york.ac.uk) from the Engineering Management Research Group, Department of Electronics, University of York, Heslington, York, YO10 5DD, if I have any queries about this survey.

- ○ I agree to participate in the survey
- ○ I do not want to participate in the survey

Demographic

In what country is your institution?

- ○ Nigeria
- ○ United Kingdom
- ○ Others

Please Specify

Your gender

- ○ Male
- ○ Female
- ○ Other

Your age

- ○ Less than 18 Years
- ○ 18 to 24 Years
- ○ 25 to 34 Years
- ○ 35 to 54 Years
- ○ 55 and above

Ethnicity

Choose an option that describes your ethnic group.

- ○ Black
- ○ Mixed/Multiple ethnic groups
- ○ Asian
- ○ White
- ○ Other ethnic groups
- ○ Rather not say

Black Ethnicity

- ☐ Yoruba
- ☐ Hausa
- ☐ Igbo
- ☐ Fulani
- ☐ Edo
- ☐ Ijaw
- ☐ Kanuri
- ☐ Ibibio
- ☐ Tiv
- ☐ Any Other Black Background

Please Specify,

Mixed/Mutiple Ethnicity

- [ ] Black and Asian
- [ ] Black and White
- [ ] Black and Arab
- [ ] Any other Mixed/Multiple ethnic background

Please Specify,

Asian Ethnicity

- [ ] Indian
- [ ] Chinese
- [ ] Bangladeshi
- [ ] Any other Asian background
- [ ] Pakistani

Please Specify,

White Ethnicity

- [ ] White African
- [ ] White Asian
- [ ] American
- [ ] Any other White background
- [ ] European

Please Specify,

Other ethnic groups

- [ ] Arab
- [ ] Any other ethnic group

Please Specify,

Ethnicity

Choose an option that describes your ethnic group.

- [ ] White
- [ ] Mixed/Multiple ethnic groups
- [ ] Black
- [ ] Asian
- [ ] Other ethnic groups
- [ ] Rather not say

White Ethnicity

- [ ] English/Welsh/Scottish/Northern Irish/British
- [ ] Irish
- [ ] Gypsy or Irish Traveler
- [ ] Any other White background

Please Specify,

Mixed/Mutiple Ethnicity

- [ ] White and Black Caribbean
- [ ] White and Black African
- [ ] White and Asian
- [ ] Any other Mixed/Multiple ethnic background

Please Specify,

Black Ethnicity

- [ ] African
- [ ] Caribbean
- [ ] Black European
- [ ] Black American
- [ ] Any Other Black Background

Please Specify,

Asian Ethnicity

- ☐ Indian
- ☐ Pakistani
- ☐ Bangladeshi
- ☐ Chinese
- ☐ Any other Asian background

Please Specify,

Other ethnic groups

- ☐ Arab
- ☐ Any other ethnic group

Please Specify,

Education details and background

Name of your current educational institution

- ○ Obafemi Awolowo University
- ○ University of Ibadan
- ○ University of Lagos
- ○ Others

Please Specify

Name of your current educational institution

- ○ University of York
- ○ University of Leeds
- ○ University of Sheffield
- ○ Others

Please Specify

Please identify your general field of study

- ☐ Administration
- ☐ Arts
- ☐ Agriculture
- ☐ Basic Medical Sciences
- ☐ Clinical Sciences
- ☐ Dentistry
- ☐ Environmental Design & Management
- ☐ Education
- ☐ Law
- ☐ Pharmacy
- ☐ Sciences
- ☐ Social Sciences
- ☐ Technology
- ☐ Others

Please Specify

Please identify your general field of study

- ☐ Agriculture and Forestry
- ☐ Arts
- ☐ Education
- ☐ Medicine
- ☐ Pharmacy
- ☐ Science
- ☐ Social Sciences
- ☐ Technology
- ☐ Veterinary Medicine
- ☐ Others

Please Specify

Please identify your general field of study

- [ ] Arts
- [ ] Business Administration
- [ ] Education
- [ ] Engineering
- [ ] Environmental Sciences
- [ ] Law
- [ ] Pharmacy
- [ ] Science
- [ ] Social Sciences
- [ ] Others

Please Specify

Please identify your general field of study

- [ ] Arts & Humanities
- [ ] Sciences
- [ ] Social Sciences
- [ ] Others

Please Specify

Please identify your general field of study

- [ ] Arts, Humanities and Cultures
- [ ] Biological Sciences
- [ ] Business
- [ ] Education, Social Sciences and Law
- [ ] Engineering
- [ ] Environment
- [ ] Mathematics and Physical Sciences
- [ ] Medicine and Health
- [ ] Others

Please Specify

Please identify your general field of study

- [ ] Arts & Humanities
- [ ] Sciences

- [ ] Medicine, Dentistry and Health
- [ ] Engineering
- [ ] Social Sciences
- [ ] Others

Please Specify

What 'level' is the degree you are studying?

- [ ] Bachelor
- [ ] Masters
- [ ] Doctoral/PhD
- [ ] Others
- [ ] Not Applicable

Please Specify

What is the title of the academic programme you are studying for?:

- [ ] Agricultural Engineering
- [ ] Chemical Engineering
- [ ] Computer Science & Engineering
- [ ] Civil Engineering
- [ ] Electronic & Electrical Engineering
- [ ] Food Science & Technology
- [ ] Metallurgical & Materials Engineering
- [ ] Mechanical Engineering
- [ ] Others

Please Specify

What is the title of the academic programme you are studying for?:

- [ ] Electrical & Electronic Engineering
- [ ] Mechanical Engineering
- [ ] Industrial & Production Engineering
- [ ] Others

Please Specify

What is the title of the academic programme you are studying for?:

- [ ] Chemical Engineering
- [ ] Civil & Environmental Engineering
- [ ] Electrical & Electronics Engineering
- [ ] Mechanical Engineering
- [ ] Metallurgy & Materials Engineering
- [ ] Surveying & Geoinformatics
- [ ] Systems Engineering
- [ ] Others

Please Specify

What is the title of the academic programme you are studying for?:

- [ ] Electronic Engineering
- [ ] Computer Science
- [ ] Music Technology Systems
- [ ] Others

Please Specify

What is the title of the academic programme you are studying for?:

- [ ] Chemical and Process Engineering
- [ ] Civil Engineering
- [ ] Computing
- [ ] Electronic and Electrical Engineering
- [ ] Mechanical Engineering
- [ ] Others

Please Specify

What is the title of the academic programme you are studying for?:

- [ ] Aerospace Engineering
- [ ] Automatic Control and Systems Engineering
- [ ] Bioengineering
- [ ] Chemical and Biological Engineering
- [ ] Civil & Structural Engineering
- [ ] Computer Science
- [ ] Electronic & Electrical Engineering
- [ ] Materials Science and Engineering
- [ ] Mechanical Engineering
- [ ] Others

Please Specify

How long have you been a student in your current Institution?

Number of Years

What academic year of study are you currently in?

Year of Study

What is the standard (or nominal) length of your degree programme?

Length of Degree (Years)

Please specify why it is not applicable?

CPD Background Question

Subject Area

Which subject area do you consider more important for Professional Development?

Instruction

Please group the following subject areas according to the categories below. Pick and drag the listed subject area to the corresponding categories.

Items

- Self-Development
- Communication
- Strategic Management
- Project Management
- Technical
- Legislative
- Associated Professional Areas
- Working with others
- Business & Commercial practice
- Information Technology
- Specialist Interest Areas
- Accounting and Finance
- Health, Safety and Welfare
- Logistics
- Enterprise & Innovation
- Operations Management
- Quality Control
- Creativity
- Management & Marketing of Technology
- Others

Extremely important

Very important

Moderately important

Slightly important

Not at all important

Skills Area

Which skills area do you consider more important for Professional Development?

Instruction

Please group the following skills areas according to the categories below. Pick and drag the listed subject area to the corresponding categories.

Items
Generic Skills
Professional and Technical Skills
IT Skills
Personal Skills and Values
Professional Organization requirements
Professional Qualifications and Certifications
Role Specific Skills
Experience
Academic Qualification (not part of requirement for current degree)
Others

Extremely important

Very important

Moderately important

Slightly important

Not at all important

Generic Skills

Which Generic skills do you consider more important for Professional Development?

Instruction

Please group the following Generic skills according to the categories below. Pick and drag the listed Generic skills to the corresponding categories.

Items
Capacity for analysis and synthesis
Ability to communicate with non-experts in the field
Capacity for applying Knowledge in practice
Capacity to adapt to new situations
Communication Skills
Creativity
Decision making
Information management skills
Initiative and entrepreneurial spirit

Extremely important

Very important

Moderately important

Interpersonal Skills	
Patents and IPR	
Planning and Time Management	
Problem solving	
Project design and management	**Slightly important**
Public speaking	
Reporting writing	
Research Skills	
Team working	
Others	**Not at all important**

CPD Background Questions - Activities

Types of Activities

Which kind activities do you consider more important for Professional Development?

Instruction

Please group the following type of activities according to the categories below. Pick and drag the listed activities types to the corresponding categories.

Items	Extremely important
Training	
Work experience	
Academic Study	

Volunteering	
Events and seminars	
Self-study	**Very important**
Others	
	Moderately important
	Slightly important
	Not at all important

Training Activities

Which types of training activities do you consider more important for Professional Development?

Instruction

Please group the following types of training activities according to the categories below. Pick and drag the listed types of training activities to the corresponding categories.

Items	Extremely important	Very important	Moderately important	Slightly important	Not at all important
Soft skills courses					
Technical courses					
E-learning/distance courses					
Courses leading to Validated and accredited qualifications (not if used to achieve required University Degree), e.g. PRINCE2					
Preparing materials and Delivering training courses					
Professional Development & Technical presentations to colleagues and others (not if used to achieve required University Degree)					
Vocational Training					
Other training related activities					

Work Experience Activities

Which types of Work Experience activities do you consider more important for Professional Development?

Instruction

Please group the following types of Work Experience activities according to the categories below. Pick and drag the listed types of Work Experience activities to the corresponding categories.

Items	Extremely important	Very important	Moderately important
Learning by doing the job and developing experience.			
Talking to suppliers, customers or specialists and working with them to determine their technical requirements.			
Internship/ Job Shadowing/Secondment (not based on University requirement)			
Receiving coaching from others			
Apprenticeships.			
Teaching /Coaching/training others (for those not in teaching post)			
Supervising/Managing / leading others.			
Being Mentored by a professional in Industry of choice			

Presentations to external clients, colleagues, etc.	
Preparing and presenting reports.	**Slightly important**
In-house presentations on professional development or relating to industry of choice	
Managing projects, budgets, teams and others	**Not at all important**
Activities of a technical or professional nature, e.g. involvement in specialist working parties or panels, planning aid work or acting as a consultee on topics of professional interest	
Other work experience related activities	

Academic Study Activities

Which types of Academic Study activities do you consider more important for Professional Development?

Instruction

Please group the following types of Academic Study activities according to the categories below. Pick and drag the listed types of Academic Study activities to the corresponding categories.

Items	Extremely important
Action-based learning focused on problems in the industry of choice (there are various definitions of action-based learning. In this context it means a learning process involving a systematic, structured approach to the identification of problems	

	Very important	Moderately important	Slightly important	Not at all important
and the search for solutions, with clear benefit to the individual member in terms of meeting the personal CPD needs identified in his or her PDP);				
Formal distance and open learning courses (not if used to achieve required University Degree)				
Home-based learning such as distance learning packages, systematic study or structured reading on particular themes or topics (but not routine reading which can be considered as part of everyday University activities);				
Writing reports or Writing for publication (not if used to achieve required University Degree)				
City & Guilds				
National Vocational Qualifications (NVQs) or equivalent.				
Preparing papers and contributing to technical meetings and study groups. (not if used to achieve required University Degree)				
Other academic study related activities				

Volunteering Activities

Which types of Volunteering activities do you consider more important for Professional Development?

Instruction

Please group the following types of Volunteering activities according to the categories below. Pick and drag the listed types of Volunteering activities to the corresponding categories.

Items

Professional body volunteering roles, for example, mentoring, local network roles, professional registration interviewer, committee roles.

Other volunteer roles that support the development of soft skills / financial / leadership skills e.g.

Scout/Guide leader, charity work, local organisations and similar activities.

Speaking at an event.

Membership of a technical expert group.

Participating in Institution activities such as acting as a reviewer, a Liaison Officer or membership of Committees where new initiatives and ideas are discussed.

Promoting engineering in primary and secondary schools

Acting as a coach or mentor for a fellow student

Sharing knowledge and expertise with others

Other volunteering related activities

Extremely important
Very important
Moderately important
Slightly important
Not at all important

Events and Seminars Activities

Which types of Events and Seminars activities do you consider more important for Professional Development?

Instruction

Please group the following types of Events and Seminars activities according to the categories below. Pick and drag the listed types of Events and Seminars activities to the corresponding categories.

Items	Extremely important	Very important	Moderately important
Conferences			
Allied professional events (such as professional bodies not directly linked to Electronics)			
Networking events			
Technical visits, Exhibitions, Seminars, Lectures, Workshops			
Organising meetings or events			
Speaking at an event			
Attending trade exhibitions and systematically gathering information and knowledge to develop as an Engineer			

Lecturing or teaching at an organised event	
Participating in careers conventions	
Peer guidance and discussion	**Slightly important**
Regional Electrical engineering institute event	
Seminars and Workshops	
Other events and seminars related activities	**Not at all important**

Self-Study Activities

Which types of Self-Study activities do you consider more important for Professional Development?

Instruction

Please group the following types of Self-Study activities according to the categories below. Pick and drag the listed types of Self-Study activities to the corresponding categories.

Items	Extremely important
Reading books, journals and articles.	
Research through internet searches and digital information sources.	

Online technical communities & discussion forums.	
Following professional organisation, and companies in the industry on social media	**Very important**
Listening to training sound clips, audio files, tapes and viewing CD Roms for research purposes and technical information	
Research both on the industry of choice especially for jobs requirement and further qualifications needed for progression within the industry	**Moderately important**
Self-directed and informal learning	
Self-Study through reading textbooks or study packs.	**Slightly important**
Structured Reading (test your understanding of the reading material)	
Watching training films, television programmes, YouTube channels or online videos related to industry and job role of interest	**Not at all important**
Personal learning from the internet	
Other self-study related activities	

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Appendix 3: Interview Question

1 GENERAL INFORMATION AND CONSENT

I am asking you to participate in a study that investigates the motivation patterns among Electronic Engineering Students and how this affects the Level of engagement with Continuous Professional Development (CPD).

The following Interview should take around 50 minutes. I will be recording this interview session on an audio recorder as it will assist me in analysing your responses more accurately. All your responses will be used only for this research purpose, and the output may be used for conference publications, journal papers and PhD thesis.

Participation in this study is voluntary, and you have the right not to answer any question or item, or to withdraw your consent and terminate participation at any time. The research and its associated results will be compiled at the University of York.

The interview is anonymous; no individual response will be reported, and only aggregated data will be used. All respondents in the interviews will be anonymized using numerical codes. The Audio recording will be stored in a locked device and saved with numerical codes. The audio recording will then be transcribed as a word document, and all personal details or identifying elements will be coded.

****

By choosing to continue and signing below, I am consenting to participate in this Interview. I understand the research purpose of the interview and the protection that will be given to any information I provide. I understand that any information provided by me will remain confidential with regard to my identity. I also understand that by participating in this study I am not waiving any of my legal rights. I understand that I am free to withdraw from this study at any time and any data that is connected to me,which has not yet been published, will be deleted

I have been informed that I may contact Adeyosola Gbadebo (aaog500@york.ac.uk) from the Engineering Management Research Group, Department of Electronics, University of York, Heslington, York, YO10 5DD, if I have any queries about this survey.

☐ **I agree to participate in the Interview**

_____ _____

Signature of Participant **Date**

2 Interview Questions

Below are interview questions for specific participants selected from the population sample.

Interviews Question
Activity
1. What do you define as Continuous Professional Development (CPD) or Professional Development (PD) activities
2. In what way do your students engage with CPD?
a. What are the indicators of engagement with these activities?
b. What do you think is the level of engagement with these activities?
3. Given the definition of CPD presented, what are the activities termed as CPD activities in your institution?
Measurement
1. What is the institution's CPD strategy?
2. Is there a pre-existing method for measuring or evaluating the Level of engagement with Continuous Professional Development (LECPD)?
a. If Yes, what is the fitness of existing measure of CPD?
b. If No, how would you gauge the Level of engagement with Continuous Professional Development (LECPD)? –
3. Do you measure LECPD at the individual student level? What measures do you use?
4. What parameters should be included in a measure of the level of engagement with CPD
5. Do you think there is value in having a measure?
6. Did you have a chance to take a look at the model used in this research?
a. Do you agree with the model of measurement of CPD used? If yes or no, why?
Process
N.B.: Process implying the process of developing CPD as a skill

1. What do you think are the steps that a student should take to develop professionally?
2. What do you think a good professional development process should look like?
3. Using Kolb's Learning Cycle as an example, what do you think the process cycle of engagement with CPD should contain?
4. Do you believe there is a difference between Continuous Professional Development and development of employability skills?
Based on Quantitative results
1. Is the mean Motivation Profile (MP) high or Low in the Engineering Department/Faculty of your university?
2. What do you think is responsible for the high/low LECPD in your university?
3. Why are the LECPD and MP different for Engineering Students(ES) from certain ethnic groups in the Engineering department/faculty of your university

Appendix 4: Interview Guide

In most definitions of Continuous Professional Development (CPD), some key terms stand out. They include, knowledge, skills, continuous improvement, development, competency, industry, deliberate. Based on this, CPD may be defined, as the deliberate development of professional competency (knowledge and skill) or engagement with activities promoting professional competency within the context of a specific industry towards the goal of improving productivity or innovation while still performing daily-based activities and work functions.

1.1 CPD in the Context of students

In the context of this research, CPD is explored as a student centric construct. CPD is seen as the deliberate professional development activities engineering student engages in outside the remit of their main degree activity. it is also perceived as development of industry focused competency (Knowledge and skills) by engineering students, apart from competency development as a result of degree related activities.

In the normative sense, CPD is thought of in terms of those who engaged in industry or engaged in a profession [5, 32]. In order to rationalize how CPD applies to students, it is important to consider how CPD which is often thought of as for professionals, is applied for those who are not yet engaged in a profession.

Considering Students as engaged in CPD can be justified by either considering their regular day to day degree related activities as a kind of profession or pointing out that CPD in the context of students is not such a strange idea as students are in some form already engaging with Professional development although under different names. The relevance of this is brought to the fore by taking into cognisance the fact that students across varying institutions are encouraged to take part in different forms of professional development activities apart from their day to day degree related activities in the form of what is termed professional or personal development planning. This is reflected in the policy statements of many Universities

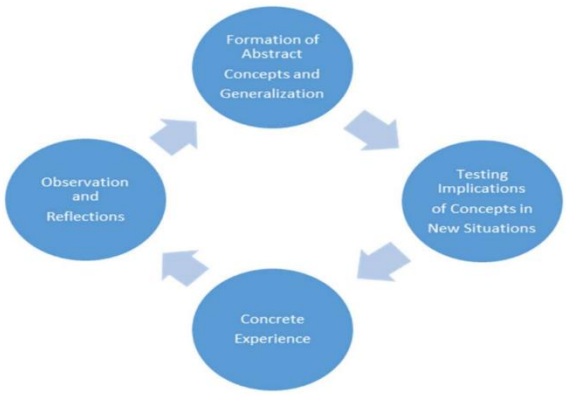

Figure 1 Kolb cycle of experiential learning

The design of the model was influenced by Kolb's cycle of experiential learning (as illustrated in Figure 1) in which planning is analogous to formation of abstract concepts and generalization, action analogous to testing implication of concept in new situation, learning outcomes analogous to concrete experience and reflection analogous to observation and reflection (Kolb & Kolb, 2005). The design is also in line with Dennison and Kirk's model of learning process [42].

Figure 2 Dennison and kirk's model of learning process

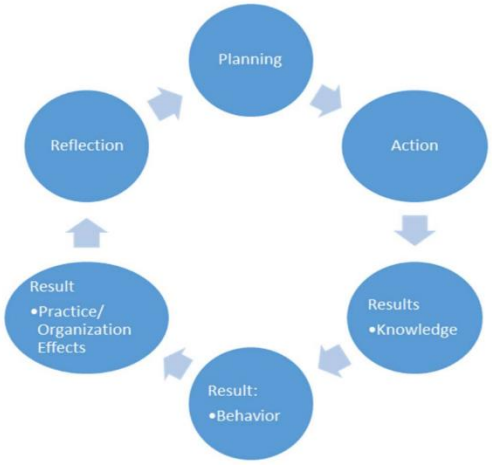

Figure 3 CPD Cycle

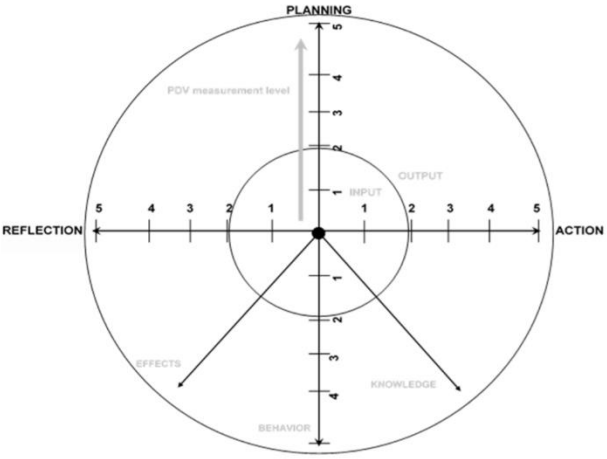

Figure 4 Revised Model of CPD measurement

The value of each component is determined as follows:

1.1.1 Planning

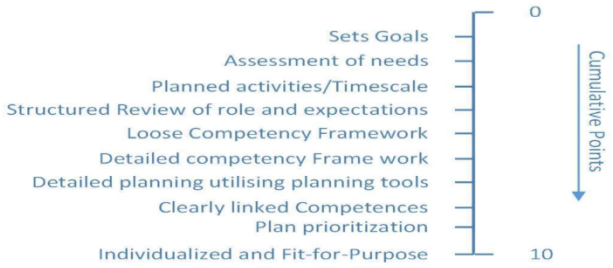

Figure 5 Evaluation of Planning

1.1.2 Action

Figure 6 Evaluation of Action

1.1.3 Result

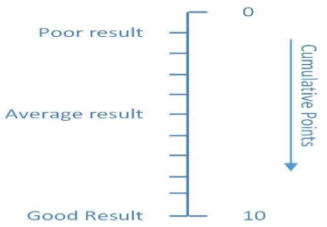

Figure 7 Evaluation of result

1.1.4 Reflection

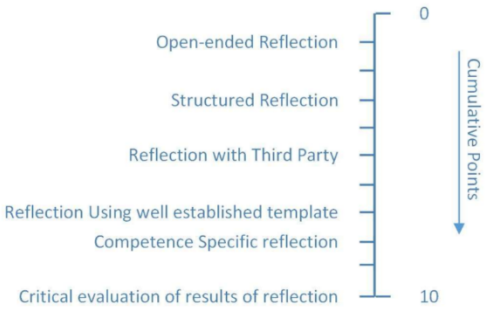

Figure 8 Evaluation of Reflection

1.1.5 Overall level of engagement

Component	Scale	Overall Weighting	Percentage
Planning	1 to 10	5	29.4%
Action	1 to 10	2	11.8%
Result	1 to 10	5	29.4%
Reflection	1 to 10	5	29.4%
Level of engagement with CPD (LECPD)	1 to 10	17	100%

Figure 9 Detail of evaluation approach

Abbreviations

Abbreviations and Acronyms

Amotivation_Index	-	Ability of Instrument to measure motivation
AMS	-	Academic motivation scale
AMS	-	Academic Motivation Scale
AM	-	Achievement motivation
AMSUB_F1_Index	-	Achievement motivation in the context of concerted effort
AMSUB_F2_Index	-	Achievement motivation in the context of laissez-faire and approbation
A-LECPD	-	Action Aspect of CPD
AIC	-	Akaike information criterion
AM_F2_Index	-	AM - Affinity for approval and competitiveness
AM_F5_Index	-	AM - Affinity of Challenge Index
AM_F1_Index	-	AM - Avoidance of Task Index
AM_F3_Index	-	AM - Success and challenge approaching Index
AMI	-	AM Inventory
AM_F6_Index	-	AM-Affinity for Planning
Ambiguities_I_MDFTP	-	Ambiguities Multidimensional Future Time Perspective
Ambiguities_I_MDFTP	-	Ambiguities Multidimensional Future Time Perspective
AM_F7_Index	-	AM-Dislike of Failure
AE	-	Amotivating Effect
ANOVA	-	Analysis of Variance
AAPSS	-	Attitudes and Approaches to Problem Solving survey
B	-	Behaviour
CAD	-	Computer-aided design
CA	-	Categories of Activities
CE	-	Characteristic of the environment
CET	-	Cognitive Evaluation Theory
MDFTP_F1F2_Index	-	Combined Value Multidimensional Future Time Perspective
FTP_SUB	-	Combined value of Future Time Perspective using Factor analysis Index
CFA	-	Confirmatory factor analysis
CPD	-	Continuous Professional Development
DTIGKS	-	Direct Transmutable Industrial Grade Skills & Knowledge
Rc2	-	Effect Size
EES	-	Engineering Students'
EFA	-	Exploratory factor analysis
SDM_F2_Index_5	-	Extent of Measurability/Amotivation
FTP_F2	-	Extremely Opened opportunities Future Time Perspective
EE	-	Extrinsic Effect
EM	-	Extrinsic motivation

FDFTPQ	-	Facet-Designed Future Time Perspective Questionnaire
Future ZTPI	-	Future oriented Zimbardo Time perspective
FTP	-	Future Time Perspective
Focus_on_Opportunities_FTP	-	Future Time Perspective Focused on Opportunities
GC	-	Generic Skills
Ts	-	Hope of success
Identified_EM_Index	-	Identified Extrinsic motivation
IAF	-	Incentive value of failure
Is	-	Incentive value of success
IQ	-	Intelligence Quotient
IPLOC	-	Internal perceived locus of causality
IFA	-	International Federation of Accountants
IFAC	-	International Federation of Accountants
ICC	-	Intra-class Correlation Coefficient
IE	-	Intrinsic Effect
IM	-	Intrinsic motivation
To_Know_IM_Index	-	Intrinsic motivation associated with knowledge acquisition and validation
To_experience_stimulation_IM	-	Intrinsic motivation to experience stimulation
Towards_Accomplishment_IM_Index	-	Intrinsic motivation towards accomplishment
Introjected_EM_Index	-	Introjected type of Extrinsic Motivation
KMO	-	Kaiser-Meyer-Olkin
LECPD	-	Level of engagement with CPD
LP	-	Level of Importance
SDM_Direct_Autonomy	-	Level of Self determined Motivation
SDM_F1_Index_5	-	Level of Self determined motivation less amotivation
SDM_F1F2	-	Level of Self Determined motivation on basis of Approach I
SDMALL_F1	-	Level of Self-determination Approach II
LS	-	Level of Study
LLL	-	Life Long Learning
FTP_F3	-	Limitation Future Time Perspective
Limitations_I_MDFTP	-	Limitations Multidimensional Time Perspective
LOC	-	Locus of Causality
MAE	-	Motivation and Attitudes in Engineering
MP	-	Motivation Profile
Ms	-	Motive of success
MAF	-	Motive to avoid failure
MFTP	-	Multidimensional future Time Perspective
MFTPQ	-	Multidimensional Future Time Perspective Questionnaire
MDFTP_F1_Index	-	Negative Multidimensional Future Time Perspective
MDFTP_F1_Index	-	Negative Multidimensional Time Perspective
ZTP_F1	-	Negative Zimbardo Time Perspective
NE	-	North of England
FTP_F1	-	Opened opportunities Future Time Perspective
Opportunities_I_MDFTP	-	Opportunities Multidimensional Time Perspective
AMSUB_F1F2_Index	-	Overall Level of Achievement Motivation

Past_I_Postive_ZTPI	-	Past Positive dimension of Zimbardo time Perspective Inventory
PC	-	Perceived Competency
PLOCQ	-	Perceived Locus of Causality Questionnaire
PDP	-	Personal development planning
P-LECPD	-	Plan Aspect of CPD
ZTP_F2	-	Positive dimensions of Zimbardo time perspective
MDFTP_F2_Index	-	Positive Multidimensional Future Time Perspective
Present_I_Fatalistic_ZTPI	-	Present Fatalistic Zimbardo Time Perspective Inventory
PCA	-	Principal components analysis
PAF	-	Probability of failure
Ps	-	Probability of success
PD	-	Professional Development
PDV	-	Professional Development Value
PDV	-	Professional Development Value
PP	-	Properties of a person
R	-	Respondent
RF-LECPD	-	Reflection Aspect of CPD
RT-LECPD	-	Result Aspect of CPD
RM	-	Resultant motivating effect
TA OR	-	Resultant motivation
R	-	Reward
SWLS	-	Satisfaction of life scale
SDM_Direct_Autonomy_Index5	-	SDM Combined value on basis of perceived level of Autonomy
SM	-	Self-determination
SM	-	Self-determined motivation
SDM	-	Self-determined motivation
SIMS	-	Situational Motivation Scale
SC	-	Skills Category
SWN	-	South West Nigeria
STEM	-	Science, Technology, Engineering, Mathematics
S	-	Stimulus
S-E-R	-	Stimulus response relationship
S-R	-	Stimulus-response
SMTSL	-	Students' motivation toward science learning
SA	-	Subject Area
TAF	-	Tendency to avoid failure
TAT	-	Thematic Appreciation Test
TP		Time perspective
UK	-	United Kingdom
ZTP	-	Zimbardo Time Perspective
ZTP_F1F2	-	Zimbardo Time Perspective Combined Value
ZTPI	-	Zimbardo Time Perspective Inventory
ZPD	-	Zone of Proximal Development

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