Assessing Ethics Education Effectiveness in Engineering Programmes: A Multi-Phase Approach

Manal H. Atesh

PhD

University of York

Electronic Engineering

June 2019

Abstract

Engineers are involved in projects which face ethical issues on a day to day bases and can have ethical impacts on individuals, society and the environment. Although there is an expanding body of work on ethics and professional ethics education, researchers have noticed gaps, inconsistencies and limitations in the literature, particularly in the area of engineering ethics education. Engineering curricula focus mainly on technical skills and give less attention to improving ethical skills related to engineering. To provide more clarity and understanding of ethical decisions and how to improve these decisions among engineering students, this research aims to investigate whether ethics education can help develop engineering students' ethical perceptions and decision-making skills.

This thesis addresses one main gap in ethics education in the engineering discipline, which is exploring the effectiveness of ethics education in engineering programmes. A new conceptual model is developed to provide more understanding and to address the factors that can affect students' ethical perceptions and reasoning. The model employs two frameworks which are a moral reasoning and the Royal Academy of Engineering's Statement of Ethical Principles. The first framework focuses on exploring students moral reasoning based on Rest's four components model. The second framework focuses on exploring students' ratings of the level of importance and the level of development based on the Royal Academy of Engineering's Statement of Ethical Principles.

The result of the research shows that there is a positive impact of ethics education in the engineering curricula, where students that were exposed to ethics education interventions showed superior ethical skills compared to those who were not.

This research served as a tool for academics and professional engineers to help in assessing ethics education, and to provide an understanding of the different roles individual and organisational factors can play in ethical decision making.

Table of Contents

List of Tables

List of Figures

Acronyms

DIT	Defining Issues Test
FCM	Four Components Model
TPB	Theory of Planned Behaviour
MIM	Moral Intensity Model
MIS	Moral Intensity Scale
HEIs	Higher Education Institutes
RAEng	Royal Academy of Engineering
SEPs	Statement of Ethical Principles
IDEA	Inter-Disciplinary Ethics Applied
ABET	Accreditation Board for Engineering and Technology
RQ	Research Question
SRQ	Sub-Research-Question
UoY	University of York
CU	Coventry University
H	Hypothesis
HO	Null Hypothesis
GSA	Graduate Students' Association
YUSU	University of York Students' Union
MMM	Mixed Methods Methodology
MMs	Mixed Methods
CTra	Concurrent Transformative
CTri	Concurrent Triangulation
EFA	Exploratory Factor Analysis
CFA	Confirmatory Factor Analysis
PCA	Principle Component analysis
MCAR	Missing data Completely at Random
MAR	Missing data At Random
MNAR	Missing data Not at Random
MI	Multiple Imputation
ML	Maximum Likelihood
SPSS	Statistical Package for the Social Sciences

EERN Engineering Education Research Network

Acknowledgement

First, I would like to thank my supervisor, Tony Ward, for his guidance and for giving me the opportunity to expand my knowledge. I would also like to thank other members of my research group, Bidyut Baruah and Noel Jackson for their valued advice and input. Helena Daffern and Kanapathippillai Cumanan members of the Physical Sciences Ethics Committee, who facilitated obtaining my ethical approvals in short periods of time, and especially Helena for encouraging me and calling me 'superhuman'. Camilla Danese, the Graduate Administrator, and Helen Smith, Graduate Admissions and Demonstrator Coordinator, who were fantastic and provided me with great help throughout my study years. A special thanks also go to Chris Mellor and Francis Duah, Statistics and Maths Advisors at the University of York, for making the impossible things possible again. My gratitude also goes to Professor Ivan Rimac, Chair of Research Methodology in Social Work and Social Policy in the University of Zegreb, who was kind enough to respond my emails and questions inquiring certain topics in factor analysis and provided me with valuable information. I also would like to thank Charlotte Collins, a lecturer at the Aerospace Engineering Department at Coventry University, who was interested in my research and offered me the opportunity to collect data from engineering students at her department. Hellen Sharples for being very supportive and kind to me throughout my stay at York, and Alice Courvoisier who was my number one fan and a supporting the cause and importance of ethics education in the engineering curriculum.

I would like to thank Mr Tony Gibbons, the Orthopaedics who was very humanistic and caring for me during my injury time, and after my surgery.

Many thanks go to my managers and supervisors at Kuwait Fire Service Directorate for giving me the opportunity to come to York, pursue my dream and continue my higher education.

My gratitude also reaches my sisters and brothers, all my friends and relatives, whose names will take many pages, who were very supportive, kind and believing in me.

A special thank you, love and appreciation go to my parents, who supported me, morally and financially, and backed me up during my study time

Last but not least, I would like to thank my husband and two sons. Thank you, Youssef, for your unwavering support, your patience and understanding when I had to work on my

thesis all the time, for going back home to support me financially, for loving and believing in me, and taking care of our children alone. A special appreciation, love and apologies for my two sons, whom I had to leave for the last three years to finish my studies. I appreciate your patience and I hope you understand that this is for you both as much as it is for me too, and I hope I will use this new knowledge that I earned to raise you as better human beings and give you opportunities I didn't have. I apologise for all the suffering I caused, but I hope you can see one day that I was suffering even more.

This thesis is dedicated to my late grandmother, Fatma, who always encouraged me to become a better person, taught me patience and reach out high.

Declaration

I declare that this thesis is a presentation of original work and I am the sole author, if not otherwise stated. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as References. Some of the material presented within this thesis has previously been published in the following conferences:

M. Atesh, B. Baruah and T. Ward, 2016. *Analyzing the perception, judgment and understanding of Ethics among engineering students in higher education.* Istanbul, IEEE, pp. 1-8.

M. Atesh, B. Baruah and T. Ward, 2017. *Analyzing the Factors Influencing the Ethical Decision Making Skills Among Engineering Students.* Valencia, IATED, pp. 1-8.

B. Baruah, M. Atesh and T. Ward, 2017. A new framework for measuring the ethical awareness and perception among engineering students in Higher Education. Florence, New Perspectives in Science Education: 6th Edition.

M. Atesh, B. Baruah and T. Ward, 2017. *How Do We Measure Ethical Perception and Decision Making Competences Among Higher Education Students?* London, 5th Annual Symposium of the United Kingdom & Ireland Engineering Education Research Network.

The work was done under the supervision of Professor Tony Ward, at the University of York, U.K.

Chapter 1 Introduction

1.1 Research overview

Engineering ethics plays a great role in the society. In order to solve environmental and professional issues, engineering ethics shifted the focus from preventing harm, to ensuring and instilling engineering social responsibilities. Thus, engineers are expected to have and demonstrate personal and professional ethical skills to enable them to act ethically. Currently, engineering students seem to have relatively rigid and narrow views of professional values and ethics regarding social issues, compared to students from other disciplines, such as business. In view of this, researchers suggested that new engineering education paradigms should involve strong technical knowledge integrated with real-world social, ethical, environmental, and economic concerns. One reason for teaching ethics to engineering students is the multidisciplinary nature of the engineering practice, which usually requires engineers to work in teams. The engineering industry has expressed concerns about a lack of some of the core skills such as decision making and problem-solving skills among university graduates (The Royal Academy of Engineering, 2011) (Rodzalan and Saat, 2016). In addition, engineering students lack communication, organizational and leadership skills, emotional intelligence and social ethics, which are in high demand in all industry sectors (Bairaktarova and Woodcock, 2017). Hence, the significance of ethics education in the engineering discipline is reflected and emphasized by the Royal Academy of Engineering. The Royal Academy of Engineering in response to the global attention given to ethics education in engineering published a Statement of Ethical Principles and offered several workshops to provide tips and information on ethics education in engineering to those responsible for teaching engineering ethics. In general, codes cannot provide a solution for every ethical issue or dilemma that professional engineers might face in their careers. Therefore, engineering programmes are responsible for providing their students with adequate ethical knowledge and skills, which are needed to face the day to day ethical challenges of their professions.

Ethics education in engineering, however, is a complex task and a complex area. Ethics are characterized by various dynamic topics, delivered to diverse students, and taught in various depths, breadths, levels, and ways. All these factors create several challenges for engineering ethics' academics and educators. The variety in the methods and approaches for ethics education caused gaps in the HEIs' assessment of ethics education and its effectiveness. For educators, in order to teach ethics effectively and to apply appropriate

teaching approaches, it is important to understand the students' current perceptions and awareness of ethics. In order to understand students' ethical perceptions, an understanding of the process of ethical decision making and the factors that can affect this process should be established at the outset. The literature presents several attempts and approaches to provide such understandings represented in the forms of models, frameworks, concepts, theories, etc. However, each of those models was developed for and dedicated to specific research focuses, aims and objectives, and the disciplinary effect on the researchers who invented these models is clear in each of the methods, methodologies and paradigms. As a result, each of those existing models came with its inherited limitations and gaps.

In response to the limitations of these models in providing a full picture of ethical decision making and the lack, inadequacy and ambiguity of the literature on ethics education in engineering, this research aims to provide an alternative model for ethical decision making. This model is an integrated model based on several of the most commonly used models and concepts in the field of ethics, ethical decision making and ethics education which also integrates the Royal Academy of Engineering's (RAEng's) Statement of Ethical Principles (SEPs) among its main elements. The thesis aims to introduce this new integrated conceptual model to help ethics educators and professionals in the engineering field to better understand the process of the ethical decision-making process, and to summarise and explain the factors embedded in this process. The impact of this research is, first, to enrich the body of literature and provide new assessment tools and strategies to assess the effectiveness of ethics education, where the results can be generalised, using the newly developed model presented in this thesis. Another potential impact of this thesis, is that as a result of the new assessment strategies that are offered in this thesis, the newly developed model can serve as a tool for academics and professionals interested in ethics education to guide them and help them improve their ethics teaching methods, and to provide them with the necessary methods to assess the effectiveness of ethics education.

1.2 Defining the research problem and proposal

Ethics education in engineering is complex because it involves understanding and measuring students' ethical perceptions, which include various implicit, reasoned and intuitive factors that can influence students' ethical understanding and decision-making capabilities. Some of these could be linked to their attributes, demographic and other

individual differences, which can all affect students' ethical perceptions. Thus, addressing all these factors can be a complex task for educators in their teaching strategies, as there is not much clarity in the literature so far. Another challenge is that many prior studies that tried to assess ethical reasoning, perceptions and decision-making skills have been providing contrasting and inconclusive results, such as studies done on the effect of ethics education, and differences among diverse groups of students. These inconsistencies are related to many reasons, such as researchers using different frameworks and theories, sampling, statistical analysis as well as excluding and including different factors. Moreover, there are a vast amount of learning criteria that can be included and employed in ethics assessments; therefore, the role of ethics education is not clear when considering the effectiveness of ethics education. In general, the previous work on ethical decision making in other fields mostly included theories from philosophy and psychology when developing conceptual frameworks, while in the field of engineering education using such frameworks and theories is relatively new and unclear. Thus, this research study aims to establish a method to assess ethics education in the engineering discipline, using a new integrated model that is based on two key frameworks. The first is based on the classical models, theories and concepts of cognitive moral psychology and social psychology, while the second framework is based on the RAEng's SEPs

1.3 Research objectives

This research aims to increase the understanding of ethical reasoning in general, and engineering students' ethical and professional perceptions. This will be achieved by exploring engineering students' moral and professional ethical perceptions. To fulfil the research aims, several objectives were developed such as thesis objectives, theoretical objectives and empirical objectives.

1.3.1 Thesis objectives

The thesis objectives are:

1. Review the literature on moral reasoning and development, ethics, and ethical decision-making models to determine which are more relevant in the context of this study.

2. Identify and define the key characteristics that affect ethical decisions and perceptions of ethical issues, and their relative perceived importance and development.

3. Develop a conceptual model that can help in describing the relationships between key factors that can affect engineering students' perceptions of ethical issues, and the dynamics of these perceptions.

1.3.2 Theoretical objectives

In addition to developing thesis objectives, several theoretical objectives were also defined to help contribute to the main research aims. These theoretical objectives are as follow:

1. Presenting an up-to-date literature review of moral reasoning from different disciplines, incorporating an engineering code of ethics into these classical theories and concepts and using them to evaluate engineering students' moral reasoning and ethical perceptions.
2. Identifying the gaps in the literature review, establishing and providing clarity to research in engineering ethics education.
3. Identifying the gaps in the methodologies that have been used in the past.
4. Proposing a new methodology: a multi-phase mixed methodology approach that illustrates the interrelations between two contexts of ethics, that is moral reasoning and engineering ethics. This approach consists of integrating two methodologies (qualitative and quantitative methodologies), and four data collection methods which includes focus group interviews, self-reflective writing assessment, survey, and semi-structured interviews. The approach also includes using three data analysis methods, which are thematic analysis, independent t-test and factor analysis.
5. Establishing the position of engineering ethics in professional and business ethics research using the multi-phase mixed methodology approach.
6. Developing two different but complementary frameworks to assess engineering students' moral reasoning and professional ethical perceptions, which represents the first and second research sub-questions. The first framework seeks to explore and investigate engineering students' moral reasoning, the key ethical factors and skills that can affect this process, and whether ethics education can change students' ethical perceptions and behaviours. The second framework seeks to explore students' perceptions by exploring their rating of the level of importance and the level of

development of a set of ethical and professional skills. These skills are based on the RAEng's SEPs.

1.3.3 Empirical objectives

After defining the sets of theoretical objectives, several sets of empirical and practical objectives were then defined to accomplish the theoretical objectives and aims. These empirical objectives are:

1. Studying the key factors that affect students' ethical perceptions within an engineering educational organization.
2. Identifying the influential ethical factors and skills that affect ethical development.
3. Presenting the key findings of comparing different groups of students within two engineering educational institutions, two engineering sub-disciplines, two gender groups, two culturally diverse groups, and two groups of students with and without work experience.
4. Identifying the effects of ethics education on engineering students.

1.4 Research questions

The purpose of this research is to explore and provide data on engineering students ethical perceptions and skills for the academic years 2015 to 2018. Also, a professional development model for academics and professionals is proposed. A broad research question will mainly be driving the literature review, and in the later chapters, two sub-questions are generated and introduced. The main research questions for this thesis is:

RQ. How effective is ethics education in the engineering curriculum?

The two sub-research (SRQ) questions are:

SRQ.1 How do engineering students differ in their moral reasoning abilities?

SRQ.2 How do engineering students compare in perceiving professional ethics?

The research sub-questions are further broken down and include several hypotheses to add more details and depth to the research answer. These further sub questions and hypothesis are discussed in more details in Chapter 4.

1.5 Scope of research

The first step in this research is to define the areas this thesis will be focusing on. While this research study was born from experience in the engineering practice, the nature of the research requires that wider consideration should be given to other disciplines as well. This is essential as the engineering practice cannot be performed in isolation from other people, disciplines, the environment and the economy. As any model in ethical decision making would argue, individuals who are making ethical decisions are surrounded by various factors that affect their ethical decisions. Thus, it can be argued that engineering ethics is an interdisciplinary area, therefore, an inclusive approach is important when looking at engineering ethics education and assessment. It is also essential to state what this thesis is and is not about, and what assumptions have been made by the researcher. While some areas are outside the scope of the analysis, they may be referred to for context, and it is possible that adaptations of the model proposed in this thesis can be applied to such other disciplines and professions.

To accomplish the first research aim, that is to identify the gaps in the literature, the researcher looked at different models and frameworks that had been designed to assess different aspects of ethical decision making, and critically read through the literature to identify these gaps. The gap that was identified is that there is growing literature on ethics education in engineering, however, limited literature was found on the effectiveness of ethics education in engineering programmes. The literature review identified several methods, ways and approaches to teach ethics in engineering, yet there was no suggestion as to which is the best approach to teach ethics. In accordance with these varieties in ethics education methods and approaches, various assessments and evaluations were also identified in the literature, which reflected no clear best approaches to teaching ethics in the engineering curriculum. In other words, the literature was unable to provide effective ways and methods to evaluate the effectiveness of engineering ethics education.

In general, integrating methods in educational programme evaluation is considered the best and most appropriate way to assess the effectiveness of ethics education, because this methodology enables researchers to explore perceptions and behaviours related to ethics education in engineering education. However, what makes this research approach unique and novel is using a multi-phase approach, in which several mixed methods studies are used to form two broader studies that reflect the two distinct but interrelated

frameworks. The researcher believes that this thesis approach has not been used before and that such methodology has not been used in 'mainstream' research previously.

This research, however, is not about assessing students' ethical behaviours, because explaining human behaviour in all its complexity is a difficult task and measuring behaviour may require all behavioural biologists and psychologists to collaborate. However, some aspects of ethical behaviour are tackled, such as the effects of social and environmental factors on ethical behaviours, which play important roles in understanding and explaining some aspects of human behaviour. Moreover, assessing ethics education in accordance with behaviour suggests a transfer of education relevant behaviours or performance. This involves assessing the effectiveness of the educational intervention, or more broadly, the effectiveness of the educational organisation itself, and does not assess the extent to which the individual had changed in behaviour or performance. Thus, this research will assess some aspects of ethical behaviour, but not ethical behaviour itself.

It is also important to understand that this thesis specifically addresses engineering students' ethical perspectives, not the academic nor the industry's perspectives. However, the professional perspectives, which might reflect the industry's and academics' perceptions, are considered and used as benchmarks to compare students' ethical perspectives, being, in this case, the RAEng's ethical perspectives presented in the statements of ethical principles. Educational institutions can develop technically excellent models in terms of what is expected from students' as their ethical obligations and responsibilities. If these models do not align with students' ethical perceptions and development, the models will likely have little chance of success in teaching ethics, or eventually meeting the industry's requirements. They also might lack the ability to instil core skills among graduates in various areas of problem-solving, social ethics, communication, and leadership. While this PhD research will recommend that certain aspects of ethics should be emphasised in ethics education in the engineering curricula to improve ethics education, this thesis's main function is about discovering fundamentally influential factors on ethical reasoning and perceptions. It also aims to suggest how to improve engineering ethics education, but it is not dedicated to how to teach ethics to engineering students, rather, it is committed to finding ways to improve the current ethics education practices and provide several ways and approaches to assess ethics education.

While this thesis discusses ethical perceptions, it is not specifically about judging students' personal perceptions, and whether these perceptions are wrong or right, good or bad, it is not its primary area of investigation although it could be another benefit. It is also important to outline that this thesis does not intend to compare groups in terms of who is ethically better than the other, nor that one group is more ethically conservative than the other. Comparisons are made only to highlight certain points in terms of why these perceptions are expressed by the students, and whether different ethical emphases are perceived differently, to provide more insights to ethicists and ethics academics. Furthermore, these comparisons are developed for exploratory purposes which are meant to discover any potential differences in the students' ethical perceptions and not to indicate that one group is better than the other. Finally, the RAEng's SEPs are used in this thesis as a survey instrument, to construct and use this tool for measuring professional ethics among engineering students for the first time.

1.6 Significance of the research

First, this study seeks to explore engineering students moral reasoning and outline the factors that influence the students' ethical perceptions and ethical decision-making skills using a multi-method design. This mixed methodology aims to provide an overall view and understanding of how certain ethical or unethical perceptions are adopted by engineering students, which is done by comparing two groups of engineering students, one who was exposed to ethics educational intervention and another was not. The design of the methodology used for this purpose was adapted from the classical moral reasoning approaches.

Second, this study seeks to provide an exploratory measure of the students' professional and ethical perceptions using an explanatory sequential mixed methods methodology. This methodology aims to employ a code of engineering ethics in a mixed method design to provide, for the first time, theoretical and empirical evidence for using the RAEng's SEPs. This methodology aims to explore engineering students' perceptions of the relative importance and level of development of these sets of ethical skills. This is done by comparing different groups of engineering students, based on gender, culture, work experience, ethics education and cross institutions.

Third, using such theoretical basis in this PhD study, which is drawn from interdisciplinary literature, such as moral psychology, social psychology, business,

education and engineering, makes this PhD research approach unique and pragmatic. Thus, the findings of using and combining such frameworks can provide rich information and room for improvements in the engineering programmes' curricula, by providing feedback to the educational institution. Furthermore, this study will help to identify the most effective pedagogical interventions and the possible ways for them to be delivered. Moreover, it will provide insights on what ethical skills engineering programmes need to reinforce and emphasise on, in order to better meet the needs and expectations of the engineering industry and stakeholders as well as enable graduates to experience a successful engineering career.

Fourth, the newly developed conceptual model will offer rich contextual information that will illustrate and explain the impacts of students' ethical reasoning and perceptions, their relationships and their significances. Therefore, both academics and professionals can benefit from this research, which will act as an academically grounded understanding of engineering perceptions in the area of ethics education, which at present does not exist. The benefit of this PhD research is that it can be applied directly to an educational programme that lacks clear aims for ethics education in the engineering curriculum due unclear understanding and inadequate application of the pedagogical tools and approaches.

Finally, and on a practical level, the researcher has used multi-phase mixed methodology approach to fill the research gaps, and using this approach proved to be effective as a research methodology. The findings of this PhD study will serve as a guideline for academics and professional engineers in understanding the importance of engineering ethics in the 21st century, and the crucial role ethics play in the engineering practice nationally and internationally. The findings will also enable the understanding of the distinctive roles and ethical responsibilities that will benefit both professional engineers and academics, in approaching and practising professionalism in an effective manner.

1.7 Research approach

The initial idea of this thesis research approach was to design a two-phase study based mainly on the RAEng's SEPs to explore the students' ethical perceptions. However, the researcher realised that understanding professional ethics cannot be achieved in isolation from the overall moral reasoning and the personal ethical beliefs and perceptions of the students. Thus, the researcher decided to design another two-phases study to explore and

provide an understanding of why certain ethical views might emerge and be adopted by students. Figure 1.1 illustrates the research approach.

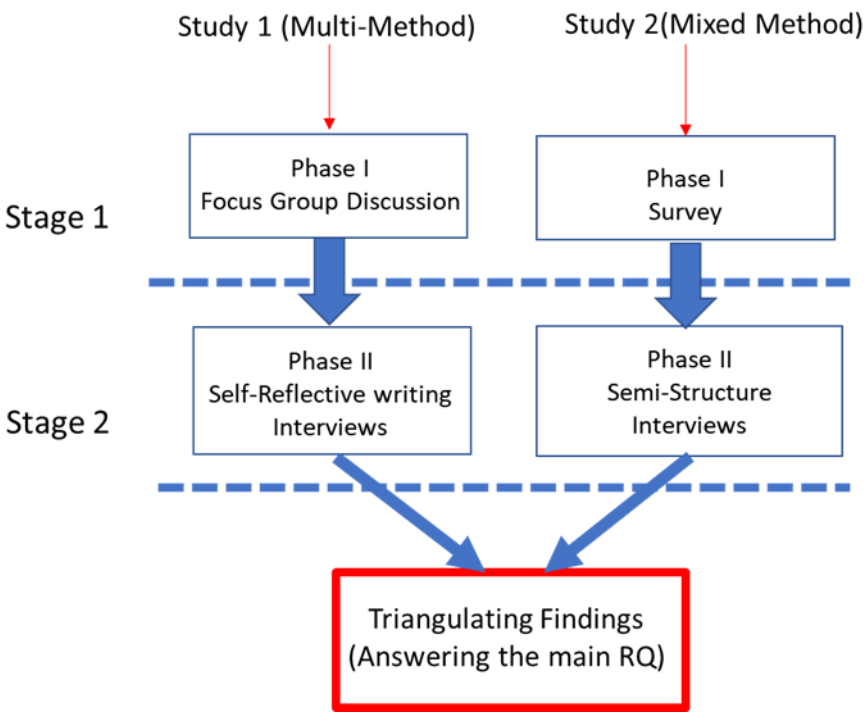


Figure 1.1 *Thesis research approach*

As demonstrated in Figure 1.1, and to answer the main research question, two sub-research questions were developed, and each sub-question aimed at exploring different aspects of students' ethical side. The first sub-question aimed at exploring students moral reasoning and the factors that affect this process, therefore, it employed a classical moral reasoning framework. On the other hand, the second research sub-question was aimed at exploring students professional and ethical perceptions of the relative importance and level of development in these ethical sets of skills, therefore, it employed a new and novel approach using the RAEng's SEPs as a framework. The first framework (Study1) approach was based on integrating two qualitative methods. The first phase of this study (Phase I) was based on focus group discussion, in which students discussed several given ethical case scenarios and they were questioned about their perceptions. The second phase of the study (Phase II) was based on and self-reflective writing interviews, in which some

of the students who participated in Phase I reflected on past unethical behaviours they have experienced, and whether they have changed their past perceptions as a result of being exposed to ethics education. Study 1 is designed to answer the first sub-question, which is concerned with how engineering students differ in their moral reasoning abilities.

The second framework (Study 2) approach was based on integrating a quantitative approach and a qualitative method, using surveys (Phase I) to compare different student groups using independent t-tests and factor analysis. The qualitative method (Phase II) employed semi-structured interviews, in which a few of the students who participated in the survey gave insights for the reasons behind their responses in the survey, and what they believed to be the most and least important as well as the most and least developed ethical skill sets. Study 2 is designed to answer the second sub-question, which involves exploring how engineering students compare in perceiving professional ethics.

1.8 Ethical statement

All studies were guided and conducted by ethical principles of 'confidentiality', 'do no harm', and 'informed consent' (Saunders, Lewis and Thornhill, 2009.p.185-201), which were also recommended by (The British Psychological Society, 2014) and is applicable to all research topics and contexts involving human participants. Ethical approvals were obtained from the Physical Sciences Ethics Committee of the University of York and the Ethics Committee of Coventry University. To ensure confidentiality, all the collected data were kept confidential and anonymous, and participants' anonymity was maintained when reporting results and a coding system was used to keep their identities hidden when quoting their comments. The data were also stored in protected systems with passwords to protect the data and respondents' identities from any unauthorised access. To ensure no harm was done to participants, the researcher tried to ensure that none of the participants in any of the four phases studies in this thesis were put in any emotionally harmful situations, and they were informed that they had the right to stop or withdraw at any point. Finally, all participants were informed about the aims, procedure, anonymity, confidentiality and the estimated time for completing the tasks before the participants started their participation and were encouraged to ask questions about any part of the studies.

1.9 Thesis outline and structure

This thesis outlines the background, rationale, and approach to the research, and develops a general framework for the key factors affecting engineering students' ethical perceptions. It provides a contextual analysis of both qualitative and quantitative research findings and concludes with a validated conceptual model and proposed topics for future research. Given that this thesis's main studies are exploratory research of a relatively new area in the engineering curriculum, the first two chapters provide a literature overview of the relevant themes in ethics and ethics education.

Chapter 1 outlines the thesis research aims, objectives, rationales, research scope and assumptions, and its original contribution to the body of ethics education in the engineering literature.

Chapter 2 provides an overview of the key terms in ethics and moral reasoning, explores the main models, concepts and theories in moral psychology, social psychology, and business ethics. The chapter concludes with the development of a new integrated conceptual model for ethical decision making.

Chapter 3 outlines the importance of ethics education in the engineering discipline, the pedagogical approaches used in ethics education, and the key professional and ethical skills required and expected from engineering graduates.

Chapter 4 discusses the research gaps and further sub questions, hypothesis, and sub-hypothesis development.

Chapter 5 outlines the methodology and data collection methods that are used in the qualitative and quantitative methods, and the research design approach.

Chapter 6 discusses the multi-method two phases' findings and integrate them

Chapter 7 discusses the mixed-method two phases' findings and integrate them. It also outlines the quantitative findings while approving or disapproving the stated hypotheses that were developed in Chapter 4.

Chapter 8 discusses the research results, whether they confirm, extend, or challenge the literature discussed in Chapters 2 and 3. It also summarizes the key findings of this PhD research, how they can be applied in Higher Education in general and in engineering education in particular and discusses the original empirical and theoretical contributions

that have been accomplished by thesis. In addition, it discusses the limitations and highlights of the methodology choice of the research and proposes several areas for further research.

1.10 Chapter summary

Figure 1.2 illustrates the thesis research flow, from Chapter 2 onwards.

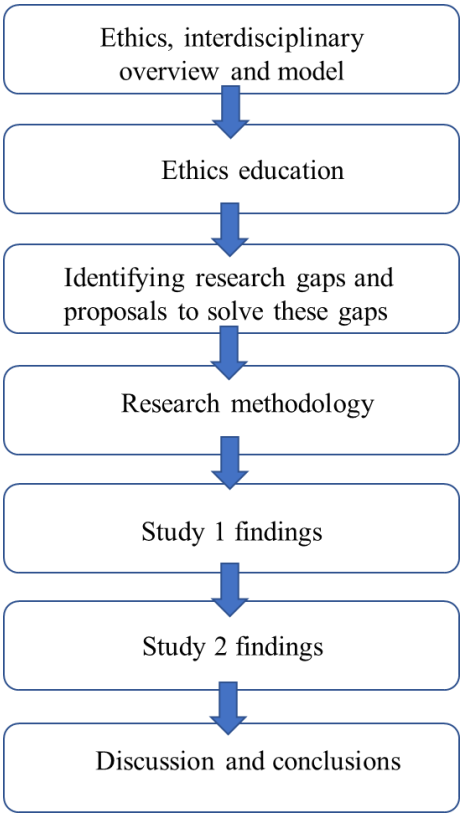


Figure 1.2 *Thesis research flow from Chapter 2 onwards*

This chapter outlines this thesis's research aims and objectives and gives an overall overview of its rationales, as well as its scope. Detailed background and introduction to the research topic are provided in Chapters 2 and 3, and an overview of the research gaps and further sub questions, hypothesis, and sub-hypothesis development are provided in Chapter 4. Chapter 5 provides a detailed description and discussion of this thesis research paradigm, approach and design. Chapters 6 and 7 report the results and findings of both research studies and discuss the highlights and limitations of each method used. Finally,

in Chapter 8, the general discussion of the thesis findings, answers to the research questions, conclusions and future recommendations are presented.

Chapter 2 Literature Review: Ethics and Moral Reasoning

2.1 Chapter overview

This chapter presents the literature on ethics from different disciplines and perspectives, such as philosophy, psychology, and business. This literature review chapter starts with a general discussion on ethics and the different definitions of ethics, followed by a discussion of the major concepts, theories and models on ethical decision making from different disciplines. After that, the main factors that affect the process of ethical decision making are introduced. At the end of this chapter, a new conceptual model is developed by integrating all the reviewed models and concepts. This is done to provide a better and more in-depth understanding of the different ethical factors that play essential roles in the process of ethical decision making. The new conceptual model is designed bearing in mind the limitations of the other frameworks explored in the thesis.

2.2 Ethics

Since the beginning of societies, human beings have constantly endeavoured to enhance the quality of life. However, such enhancements often bring challenges, one of which is the dilemma of ethics and ethical decision making (Brahmbhatt, 2016). According to Gülcan (2015), the term 'ethics' is derived from the Greek word 'Ethos' which means custom and character, and it is related to our values and virtues. In the beginning of societies, individuals were forced to accept some social obligations, to remain within their social groups and clans. These social obligations provided some type of security to the members, especially as survival and life outside that group was particularly challenging (Ulman, 2015). Greek philosophers, such as Aristotle and Plato, emphasised on the importance of being ethical individuals in society. In this context, Shields (2008) explained how Aristotle's ethical philosophy is based on the "good action", and that studying and understanding ethics aims to improve lives. Shields (2008) also added that ethics reflect the values and norms that promote the wellbeing of human beings in a society. Frede (2003) suggested that Plato's perspectives reflected ethical virtues such as courage, justice, and self-control. All these are social skills essential for the wellbeing and functioning of a society.

Greek philosophy, in general, has not only highlighted the value of the individual, but it has also acknowledged the potential conflict that may arise when an individual's need to belong to a group clashes with the need to be recognized as an individual with unique characteristics (Sherman, 1989). Sherman (1989), Ulman (2015) and Hursthouse (1999)

suggested that Aristotle's emphasis on the essence of an individual is based on their rationality and their social abilities to relate to others. Such social abilities are essential since most individuals are naturally part of a community or society. For Gilman (2005), the concept of using codes of ethics is ancient, noting how such codes are the foundations of many civic cultures and religions. Such codes of ethics also form the foundation of ancient Greek culture and politics.

There are different terminologies in the literature to express ethics and ethical character. For instance, Tzafestas (2016) and Gong (2010) used the term 'Virtues' to illustrate ethics. Hursthouse (1999) and Frede (2003) explained that virtue is a trait of character and that an individual who acts virtuously or applies virtues can be deemed as an ethical individual. In the history of virtue ethics, Aristotle's virtues are classed as the roots of Western ethics, whereas for Chinese ethics, it is Confucian virtues (Gong, 2010). In modern virtue ethics, utilitarianism (introduced by Bentham and Mill), and deontology (introduced by Kant) have taken over in the West (Driver, 2014). Mandal, Ponnambath and Parija (2016) defined utilitarian ethics as approaches where decisions are chosen based on the greatest amount of benefit obtained for the greatest number of individuals. The deontology ethics supports an approach where the nature of the action itself rather than the result of the action is deemed good or otherwise, i.e., harm is unacceptable irrespective of its consequences. These philosophical terms support the definition of ethics by McCloskey (2013) and Robinson et al. (2007), in which they stated that ethics are philosophical terms of what is perceived right and wrong in human conduct. It involves the principles or rules that should govern an individual's conduct.

To describe ethics, some researchers focus on the nature of behaviours (ethical and or unethical). For example, Resnik (2015.p.1), defined ethics as "*norms for conduct that distinguish between acceptable and unacceptable behaviour*". Hursthouse (1999) suggested that a behaviour is considered ethical if it complies to an accepted moral principle or rule. Gino and Bazerman (2007) cited examples such as stealing, cheating, lying, any other form of dishonesty (Gino, Ayal and Ariely, 2009) (Gino, 2015), fabrication, falsification, and plagiarism to illustrate unethical behaviours (Resnik, 2015).

Treviño, Nieuwenboer and Kish-Gephart (2013), described three types of behaviours:

- Unethical behaviour, which is not accepted by a society's moral norms and this includes activities such as cheating, stealing and lying.

- Routine ethical behaviour, which meets the minimum moral norms of a society, such as respecting others and displaying honesty.
- Extraordinary ethical behaviour, which exceeds a society's minimum moral norms, and this includes actions such as charity and whistleblowing.

2.3 Philosophical classification of ethics

Philosophers normally classify ethics under three categories: Metaethics, normative ethics and applied ethics.

2.3.1 Metaethics

As per Sayre-McCord (2012), metaethics tries to understand the epistemological, metaphysical, psychological and semantic commitments and beliefs of moral thinking and practice. The term 'meta' means beyond or after, and, accordingly, metaethics could be described as a "bird's eye view" of ethics as a whole (DeLapp, 2002). Metaethics include a broad range of questions and inquiries such as: Are moral standards related to culture? Is morality a matter of truth or taste? Are there such things as moral facts? And if there are moral facts, how did they originate and where did they originate from? How can these moral facts be set as appropriate standards for the individual's behaviour? How do these moral facts relate to other facts, such as conduct and psychology? And how do individuals learn about these moral facts, if there are any? These inquiries might naturally lead to questioning the meaning of moral perceptions and claims, what moral truth is about and the justifications of moral commitments (Sayre-McCord, 2012). Metaethics explores the connection between ethical values, reasons for behaviour and human motivation, asking questions about how moral standards might provide humans with reasons to do or not to do an action. Metaethics also addresses issues that might be connected with the nature of freedom" and its effects or lack of effect on moral responsibility (Sayre-McCord, 2012).

2.3.2 Normative ethics

Normative ethics, on the other hand, is concerned with the justifications and articulation of the fundamental ethical principles that govern issues that are related to the way humans ought to live their lives, and what they ought to do morally (DeLapp, 2002). The word normative came from 'norm', and in a philosophical context, this word means rule, standard, principle, and or what is 'normal' for people to do (New World Encyclopedia contributors, 2018) (Anscombe, 1958). Normative ethics is concerned with moral norms, and a moral norm is a norm which the moral agent ought to comply with. "Thou shall not

murder" could be an example of a moral norm, which is meant to guide human actions and when people do not comply, they would be morally judged and blamed (New World Encyclopedia contributors, 2018). Unlike metaethics, normative ethics attempts to help people distinguish between right or wrong (Rawls, 2001), yet, this does not mean that metaethical assumptions have no implications on the nature of normative ethics (New World Encyclopedia contributors, 2018). Darwall (1999) argued that obtaining a satisfactory answer by conducting normative ethical inquiry without considering metaethics is not possible. This can only be achieved by considering both schools of thought, questioning them and integrating them in the wider philosophical ethics arena. Normative ethics focuses on three different parts of ethical behaviour; first, the moral agent who performs the behaviour; second, the act itself; finally, the consequences of the behaviour (New World Encyclopedia contributors, 2018). Based on these three aspects of normative ethics, three types of normative ethics emerged: virtue, deontological, and utilitarianism ethics, where each type emphasises on certain elements of normative ethics.

2.3.2.1 Virtues and wisdom

In Western cultures, virtue ethics was established by Plato and Aristotle, while in the East it can be traced to the times of Confucius and Mencius. Usually, there are two main concepts in virtues ethics that are discussed and considered central to virtue ethics overall, which are virtues and wisdom (Smith, 2016) (Hursthouse and Pettigrove, 2016).

Virtues concentrate on the moral agent's character stating that a virtuous person ought to possess traits such as generosity, courage, compassion, etc. and these traits ought to be shown and manifested in the moral agent's actions (Hursthouse and Pettigrove, 2016). According to Smith (2016), an honest individual cannot be simply identified as one because s/he does not cheat or practices honest dealing because they feel it's the best policy. Also, behaving in an acceptable manner merely because this agent fears being caught rather than recognizing that doing otherwise would be 'dishonest', are not considered the behaviour of an honest person (Hursthouse and Pettigrove, 2016). An honest person might not and cannot be identified simply because s/he tells the truth because it is the truth, nor simply because s/he tells the truth without being indiscreet or tactless. An honest person is the one who recognizes that lying, and or perhaps overriding, is a strong reason for not saying certain statements in certain circumstances and weighs statements according to what would be the truth for making them (Smith, 2016) (Hursthouse and Pettigrove, 2016). The reasons and choices behind a person's honesty

virtues reflect the views held about truth, honesty and deception, and clarifies other actions and reactions as well. Valuing honesty should be clear in the individual's actions and choices such as choosing to be friends with honest people or to work with honest co-workers and training children to be honest. In addition to disapproving of, disliking and deploring dishonesty and deception, they should despise those who might have been successful through deception rather than thinking they were clever and be shocked and/or distressed when those who are close and dear to them committed dishonesty (Hursthouse and Pettigrove, 2016). Thus, Sreenivasan (2002) argued that it might be reckless to attribute virtue to an agent based on a single observed action or even a series of similar actions, especially as a virtue is a multi-faceted disposition, and knowing all the reasons behind conducting such actions would be difficult. It is equally common in some situations that an honest, generous and 'virtuous' individual might make a mistake. For example, a compassionate person might lead others to act wrongly, or an honest person might tell a lie to prevent hurting someone else's feelings, or a courageous person might be ruthless just because s/he is limitless (Smith, 2016) (Hursthouse and Pettigrove, 2016). Despite honesty, generosity, courage and compassion being virtues, they might be considered as faults sometimes. Someone who holds all these virtues might not be considered as a morally good person, because if this person is, then why virtues people act unwisely?

Aristotle made several remarks about ethical wisdom which are debatable, and one of these remarks is holding good intentions. A virtuous person who usually holds good intentions is not infallible and on occasion, these individuals might fail to act in accordance with their good intentions because they lack ethical wisdom. In addition, virtuous individuals might possibly think that they will not be considered responsible and guilty if they committed unethical acts because of lacking awareness or knowledge (Smith, 2016) (Hursthouse and Pettigrove, 2016). Adults might still be perceived as unethical and held responsible if they mess things up by being short-sighted, insensitive and by thinking that what suits them will suit everyone else rather than being more objective in their viewpoints. They might also be held responsible of their understanding of what is considered harmful or beneficial even if it was a mistaken perception, because it is part of ethical wisdom to be able to secure real benefits effectively (Smith, 2016). In general, good intentions are perceived as intentions to do the right thing or to act well, but ethical wisdom is the knowledge and understanding that helps its possessor to secure

the real benefits effectively in any given situation. Yet, the details and specification of what such knowledge or understanding involved were not clear in the literature, because applying an acceptable behaviour might require the ability to recognise the ethical features that might be considered salient in any situation (Hursthouse and Pettigrove, 2016). Recognising the salient ethical features in a situation might be related to two aspects of ethical wisdom. The first is relating ethical wisdom to life experiences, and the second is relating it to knowledge and skills gained thereby improving ethical wisdom. In relation to the first aspect, the assumption is that life experience through exposure to different life situations shapes the individual's ability to recognise the ethical features in a situation. The relevant features of a situation include the consequences of a certain behaviour and the people involved in the situation, however, some individuals could be clueless about these simply because they are inexperienced (Hursthouse and Pettigrove, 2016). In relation to the second aspect, a wise agent has the capacity to recognise some features of the situation as more important than the other features, or at least, as the only relevant ones. The ethically wise individual might not perceive things the same way as others who have under-developed virtues and tend to see from a personally disadvantageous nature, but they see things in terms of importance and as competing in nature with these personal features. Moreover, they perceive these issues as competing in importance with their justice, honesty or compassion, and perceive them as truly advantageous in their lives (Hursthouse and Pettigrove, 2016).

2.3.2.2 Deontology ethics

The term deontology is derived from the Greek word meaning duty "deon", and study or science "logos". In moral philosophy, deontology falls within the normative theories domain that is interested in theories about guiding and assessing choices that are morally forbidden, required, or permitted. Deontology is different from virtue theories, in which the later focus on guiding and assessing the kind of person the individual should be (Alexander and Moore, 2016). Deontology is an ethical theory that uses rules to distinguish right from wrong. Deontology is often associated with the philosopher Immanuel Kant, who believed that ethical behaviours follow universal moral laws, such as "Don't steal", "Don't lie" and "Don't cheat" (McCombs School of Business – The University of Texas at Austin, 2019). Deontology moral theories require people to follow the rules and do their duties. Unlike utilitarianism ethics, which is discussed in the next subsection, deontology tends to not judge behaviours based on their results but the act

itself, and it does not require weighing the benefits and the costs of a situation, which avoids uncertainty and subjectivity because the person should only follow the rules. Despite its strengths on being easy to apply, if followed rigidly, it can produce unacceptable results. For instance, if a software engineer learned that a nuclear missile was about to launch, which might start a war, then hacking the network and cancelling the launch might be the right thing to do. However, this act is against this engineer's professional code of ethics, because that involved breaking into a software system without having permission. Moreover, it might be considered as a form of dishonesty and disloyalty, and deontology recommends not violating these rules, but allowing the missile launch and the resultant deaths. Thus, following the rules might make deontology easy to apply, but at the same time, it disregards the potential consequences of the individuals' behaviours and actions when deciding what is right or wrong (McCombs School of Business – The University of Texas at Austin, 2019).

2.3.2.3 Utilitarianism ethics

Utilitarianism is believed to be the view that morally right actions are the actions that produce the most good. In other words, and as stated by Stanford Encyclopedia of Philosophy (Driver, 2014) "*the right action is understood entirely in terms of consequences produced*". The utilitarianism ethics school believe that the individual should aim to maximize the overall good, and considers both, the good of others besides his/her own good. Yet, maximizing good should be impartially considered, such as not only considering one's own good, because it might not count for anyone else's good (Driver, 2014). This ethical theory is the most common approach that is used in moral reasoning in business decisions, because of the way in which its supporters account for benefits and costs (McCombs School of Business – The University of Texas at Austin, 2019). This approach of moral decision-making and evaluations has a limitation, because the future cannot be predicted, hence, it is difficult to know with certainty whether the consequences of a behaviour would be good or bad (McCombs School of Business – The University of Texas at Austin, 2019). Another limitation in this philosophical approach is accounting for ethical values such as individual rights and justice. For example, four people are in a hospital with their lives dependent upon receiving organ transplants: a liver, a kidney, lungs, and a heart while a healthy person is roaming around in the hospital. If his organs are harvested, they can save four lives meaning one life can save four lives. This would arguably maximize the greatest good for the largest number of people, but,

few would consider it as an acceptable action (McCombs School of Business – The University of Texas at Austin, 2019).

2.3.3 Applied ethics

Applied ethics is a classification of ethics that tries to deal with ethical questions that involve a discipline, a profession, or a practical field. In contrast to metaethics and normative ethics, applied ethics tries to examine moral problems encountered in certain experiences of ordinary people, rather than viewing it from predetermined and pre-conceived metaethical or normative theories, therefore, it is practical rather than theoretical (Holmes, 2019). At the beginning of the twentieth century, many philosophers neither focused on the ethical questions that might arise when practising a profession, nor focused on the normative rules of these practices. However during the century, many issues such as human cloning, pollution, poverty, human rights abuse, and others raised critical ethical questions, and applied ethics became an important sub-discipline in philosophy (Chadwick, 1998) (Jonsen and Toulmin, 1988). Due to the complexity of each ethical issue that might arise, philosophers often consider fundamental questions of epistemology, metaphysics, and other theories of human nature, in addition to collaborating with researchers and scholars from other fields. Applied ethics also requires knowledge of the specific fields and multiple fields (Frey and Wellman, 2003). For example, to address the ethical questions that are concerned with global warming, which is a critical issue in environmental ethics, philosophers should consider the economic, social, and political implications of this issue. In addition, applied ethics require not only theoretical bases and analysis, but also practical analysis and feasible solutions. For these reasons, professionals from different disciplinary areas and fields often collaborate as a team to develop such ethical rules (New World Encyclopedia contributors, 2016). In order to help individuals, practice their jobs effectively, those teams develop what is known as professional ethics.

Bowie (1985) believed that the term ‘professionalism’ refers to a set of attitudes and a way of thinking. He suggested that there are some distinctive set of attitudes that might characterise a professional from a non-professional individual, such as not perceiving the practised job as a source of money only and perceiving the job as serving the community. In addition to following, respecting and valuing job obligations as stated in the employment contracts and job descriptions, a professional is expected to behave in accordance with their job responsibilities when facing ethical issues. A professional also

values competency and is not self-centred, therefore, they show more concern about the quality of their work rather than personal progression. A professional also explores and seeks different ways to perform their jobs while also seeking to enhance and develop their professional ethics.

Professional ethics, in the opinion of Brahmbhatt (2016.p.142), are "*the ethical norms, values, and principles that guide a profession and the ethics of decisions made within the profession*". Professional bodies have identified the importance of 'good actions' within a profession, therefore, they encourage workers to behave ethically (Mathes, 2004) (Weiss, 2014). Codes of professional ethics are considered the ultimate terms of reference in the different professions and can be applied to certain groups of professionals (Gilman, 2005) (Mathes, 2004) (Weiss, 2014). In any given profession, professionals are expected to face ethical judgments in their day-to-day activities (Fulmer, 2014). This is one of the key reasons why these codes are considered the framework that professions should refer to and built on. For Naagarazan (2007), these codes can provide guidance as to the responsibilities that the professionals are expected to accomplish and provide interpretation guidelines for professionals and professional bodies. They also added that these codes can provide positive support for professionals to take moral stands, discourage immoral acts, and provide the necessary discipline to help them regulate their moral acts. According to the previous authors, these codes can also be used for education and sharing the common understanding of the implications of ethics by discussing and reflecting on moral issues. Reflecting on these practices can help to develop mutual understanding among the professionals, the public, the policy makers, and the government on the moral responsibilities associated with each stakeholder.

Examples of applied ethics include business ethics, medical ethics, legal ethics, bioethics, engineering ethics, etc. (Chadwick, 1998) (New World Encyclopedia contributors, 2016). Applied ethics is also found in other fields such as publication, academic research, and other areas (New World Encyclopedia contributors, 2016).

2.3.3.1 Business ethics

Business ethics tries to examine the ethical principles and the ethical problems that might arise in economic activities or business environments. As per Moriarty (2016), questions that might arise in business ethics are relevant to everyone, because almost everyone "does business" and engage in a commercial activity or transaction almost on a daily

bases. These daily commercial interactions might have laid the foundations for the demand and necessity for more ethical business activities and processes (New World Encyclopedia contributors, 2016). Business ethics can apply to both, normative and descriptive ethics, which is discussed later in subsection 2.4. As a career specialization and a corporate practice, the field might be perceived as mainly normative, while in academia, descriptive approaches might be undertaken. The breadth and amount of ethical issues in business reflect the degree to which business might be perceived to be at odds with "non-economic" social values (New World Encyclopedia contributors, 2016). Business ethics is a broad field, and many of the philosophical positions that were discussed earlier can still be understood as parts of business ethics. Some of the important topics that are discussed in research focusing on business ethics include leadership and management, social responsibility, moral rules that should guide the engagements of organizations with their customers and many more (Moriarty, 2016). These topics try to address some important issues in the fields of business and industry, such as product liability and safety (Hasnas, 2009), hiring, firing and discrimination (Hellman, 2008), whistleblowing (Malek, 2010), international business (Degeorge, 1997) and many other examples.

2.3.3.2 Environmental ethics

Environmental ethics is a sub-discipline in philosophy that focuses on considering the ethical relationships between human beings, and the status and value of the natural environment and its non-human contents (New World Encyclopedia contributors, 2016) (Brennan and Lo, 2015). This field exerts influence on a wide range of disciplines such as sociology, law, ecology, economics, and geography (New World Encyclopedia contributors, 2016). For example, improving the safety of drinking water requires developing a better mechanism to filter and process water. In some countries, the availability of safe drinking water might influence the demographics of a region by encouraging people to move to areas with better access to safe drinking water. This process might affect the population density in that area leading to other issues such as pollution while the built machines and the equipment used to process the drinking water might also cause serious environmental and health issues in the future. In addition, the need for data and communication systems in the modern world can lead to high levels of waste including heavy metals and pollution. These are some illustrations of potential ethical issues that might arise which necessitates setting standards to solve these issues

(The Royal Academy of Engineering, 2012) (The Society of Environmental Engineers, 2016). Thus, these set of ethics attempt to preserve the opportunities for wellbeing and sustainability of the future generations. Considering the current environmental threats such as loss of freshwater resources, climate change and deforestation, similar ethical regulations and policies should be issued, followed and valued (Brennan and Lo, 2015).

2.4 Morals, morality and moral theories

A terminology frequently associated with ethics is morals. Tzafestas (2016) and Robinson et al. (2007), note how this term has been used interchangeably with ethics. However, both terms have some distinctions between them. Ethics refers to the philosophical study of morality (Robinson et al., 2007), which are provided by an external source, such as professional codes, laws, etc. (Jasuja et al., 2019), while morality refers to the personal system of standards that guides the individual's behaviour (Robinson et al., 2007) (Gert and Gert, 2016). The term "moral" is defined in ancient Greek philosophy as ways of behaviour, habits and customs (Karafillis, 2012). Thus, morality can be:

1. Normative, referring to a code of conduct that is put forward by philosophers and rational persons, or.
2. Descriptive, referring to a certain code of conduct which could be an external code that is put forward by a group or society, or an internal code that is accepted by the individual to guide his/her own behaviour (Gert and Gert, 2016).

A moral theory, according to the University of San Diego (Baber, 2018), "*explains why a certain action is wrong or why we ought to act in certain ways*". A moral theory tries to provide a framework on how humans think, reason and evaluate moral issues, hence, a clear distinction between applied ethics and moral theory cannot be established. For instance, to enable critical evaluation of the moral issue of accepted behaviour, one should not only consider the accepted policies or behaviours without considering the determinants of this behaviour. In the previous discussion in section 2.3, some of the normative schools of thought prescribing how individuals ought to make these judgements were explored. On the other hand, descriptive schools attempt to describe morality and how individuals do, think and form a moral or immoral judgement in their everyday lives. The term descriptive refers to the empirical contribution to ethics research (Hiadt, 2003). Descriptive ethics is usually a term that is given to empirical research that focuses on the attitudes and behaviours of individuals or groups of individuals. In other

words, observing the moral decision-making process with the aim of describing the phenomenon (Greene, 2015).

Moral psychology tried to separate itself from moral philosophy and began their own empirical contributions, which mainly focused on studying moral reasoning (Hiadt, 2003). Piaget, between 1932-1965, focused on the development of a child's ethical understandings of rules and fairness (Bentham, 2002) (Fleming, 2006). Kohlberg (1969), who was an American psychologist and educator, introduced the theory of moral development and based his theories on the work of the psychologist Piaget and the philosopher Dewey. These researchers believed that human beings can develop philosophically and psychologically in a progressive way (Karafillis, 2012) (tutorialspoint.com, 2019). The difference between Kohlberg's Theory, and Piaget and Dewey are that the latter two built their theories on observing children (Dewey, 1909). Kohlberg (1978) provided a conceptual framework for studying moral reasoning based on Piaget's concept of development. Hiadt (2003) believed that the field of moral psychology grew rapidly since then and research in moral psychology tries to focus on answering questions of the origins of morality and how it might change across the lifespan. Fiske and Taylor (1991.p.5) summarised that the field of psychology is determined by the following factors:

1. Cognition and motivation, and
2. The person in the situation

Fiske and Taylor (1991) assumed that cognition provides the individual with the important knowledge of how s/he perceives the world and what the individual might do, while motivation explains whether a behaviour will occur, and to what extent. This indicates that understanding cognition alone is not enough, because motivation is the main driver of behaviour. In addition, the person can contribute to beliefs, skills, and needs, which all can react to an ethical situation, but knowing that a person is motivated to do something does not necessarily predict if or how much this person will act on his/her motivation. Thus, understanding the cognitive moral psychology and social psychology impacting moral cognition and reasoning is also essential. These concepts are explored and discussed in the next section, where some of the moral theories, concepts and models that explain human behaviour are analysed.

2.4.1 Moral development theories

Moral development refers to the principle of how individuals treat and interact with one another, with respect to others' welfare, justice and rights (Turiel, 1983). Understanding the way individuals gain morality include investigating the roles of beliefs, emotions, behaviour, and intentions. Moral development is a broad field, and factors such as peers, authority, culture, gender, self-regulatory mechanisms, ethical maturity and wisdom, empathy, and many more have been stated to impact on moral development. Some of these factors are discussed in this subsection and some will be discussed at the end of this chapter. The interest in moral development and morality spreads to many disciplines, such as biology (Wilson, 1998), political science (Wilson, 1993), economics (Reidenbach and Robin, 1990), medicine (Branch, 2000), engineering (Martin, Conlon and Bowe, 2018), etc. as well as sub-disciplines within psychology, such as cognitive moral psychology and social psychology (Snarey, 1985). The review in this chapter will highlight some of the well-known theories to introduce some concepts of moral development. When discussing moral development, and cognitive moral psychology, Kohlberg's Theory, the Neo-Kohlbergian approach and the ethical decision-making model are few of the best-known concepts. These three concepts explain how individuals might develop morality, make moral judgements and the process of ethical reasoning.

Kohlberg (1969) and (1971) proposed that individuals progress in their moral reasoning based on their ethical behaviours, and hypothesised his theory based on the younger children's thinking throughout their growing periods until adulthood. Kohlberg found that when children are faced with different moral issues, their judgments to act positively or negatively in each dilemma were heavily influenced by several factors. Kohlberg noted that younger children tend to build their judgements based on the potential consequences that might take place, whereas older children built their judgements based on their intuitions. He believed that there are three levels of ethical development, the pre-conventional, the conventional, and the post-conventional levels, and each level consists of two stages as illustrated in Figure 2.1.

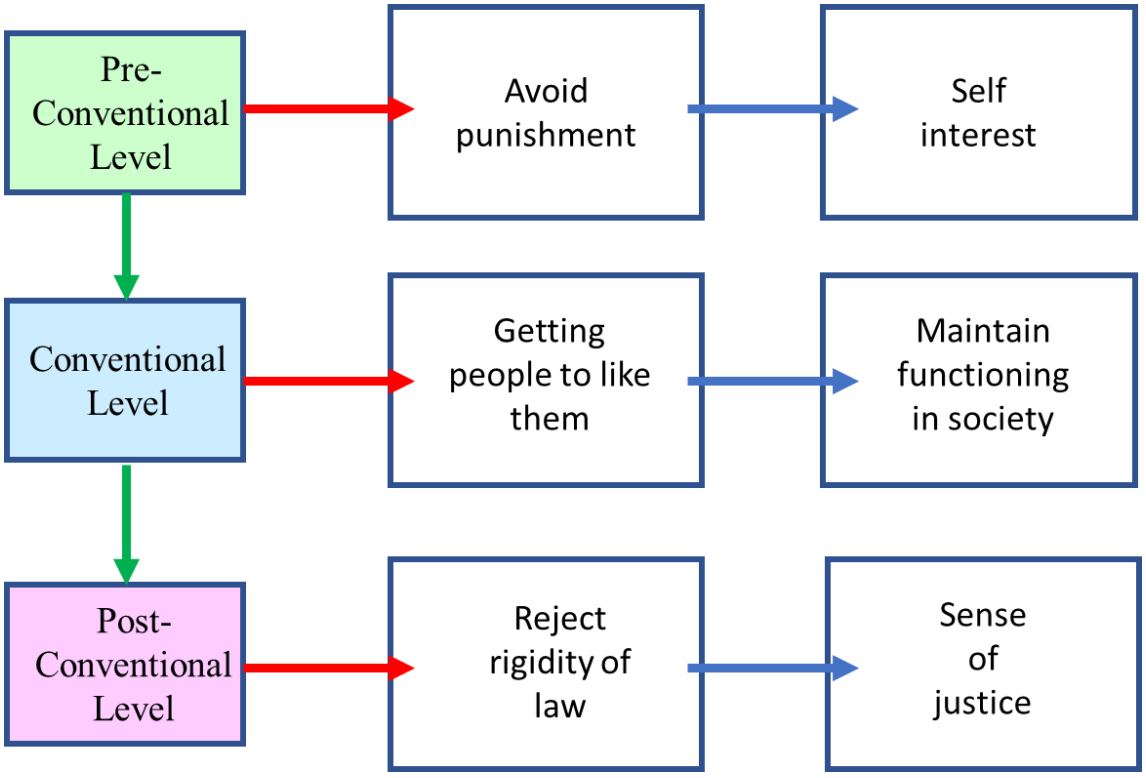


Figure 2.1 *Kohlberg's moral development levels*

The first developmental level of moral thinking is the pre-conventional level, which is generally developed at age four and is common among children although some adults can exhibit this level of moral reasoning. In this level, the physical consequence of an action is the determinant of the perception of good or bad, regardless of the individual's values of these consequences (Kohlberg and Hersh, 1977). In the first stage of this level, the perceptions of right versus wrong are based on society's standards because of the fear of punishment (Kohlberg, 1969) (Kohlberg, 1984). In the second stage of this level, the thinker seeks satisfying personal needs, and occasionally, the needs of others that are close to them, and that determines what is right and wrong (Kohlberg and Hersh, 1977). Thus, perceptions of right versus wrong at this stage are not based on a society's standards, but rather on personal desires and physical needs (Kohlberg, 1969) (Kohlberg, 1984). Overall, at this level, the individual cares little about how they do things and tend to struggle to function effectively in larger social groups as they are appetite driven (Carroll and Shaw, 2012) (Curran, 2008). Carroll and Shaw (2012) added that individuals at this level might suffer from the 'me first syndrome' and have little moral code.

Armstrong (2011.p.10) added to the same notions that "*our…. ancestors were, therefore, interested only in status, power control, territory, sex, personal gain, and survival*". In addition, Lewis, Amini and Lannon (2001) suggested that individuals at this level of ethical development lack emotions, and justify their personal interests as morally right by appealing to personal benefits and benefits of those who are close to them (Trevino, 1986).

The second developmental level of moral thinking is the conventional level, which is the typical moral reasoning of most adolescents and adults and is also found among primary and high school level individuals (tutorialspoint.com, 2019). In the second level, the first stage involves helping others and getting everyone's approval for this behaviour determines the perception of goodness or otherwise in the first stage of this level (Kohlberg and Hersh, 1977). In other words, the decisions at this stage might or might not support the social order and whatever the results are, the thinking process is based on impressing others or the society and on pleasing people around the individual (tutorialspoint.com, 2019). At the second stage of this level, the individual tends to maintain social rules, doing duties, and obeying authority are what is determined as right or wrong (Kohlberg, 1969) (Kohlberg and Hersh, 1977) (Kohlberg, 1984). Obeying the authorities at this stage of ethical development is out of respect for the social system rather than the personal qualities of the authority or fearing punishment (Rest et al., 2000). The individual at this stage also demonstrates the desire to maintain rules, follow authority and social order (Kohlberg and Hersh, 1977) and expresses intentions to follow the society's regulations. Overall, the individuals at this level show superior abilities to analyse one's own weakness and strengths in reaching an ethical judgment, compared to individuals at the earliest stage. Moreover, individuals at this level show more awareness of the possible factors that may affect one's own ethical judgment such as their own emotions and culture and are able to control their emotions and reflect on their own ethical judgment to regulate them as needed (Cheruvalath, 2019) (Gauthier, 2013). Individuals at this level also demonstrate the capacity for future planning, predicting, self-developing, reflecting, willingness to change, and problem-solving (Carroll and Shaw, 2012) (Lewis, Amini and Lannon, 2001). At this moral level, the sense of moral certainty is clearer than individuals at the lower level, and this can support and boost the individual's ethical awareness (Rest et al., 2000).

The third developmental level of moral thinking is the post-conventional level and some theorists, including Kohlberg himself, speculated that many individuals might never be able to reach this abstract level of moral reasoning (Kohlberg, 1976) (Gilligan, 1977). In a post-conventional level, the right behaviour is determined by the sense of responsibility and justice rather than following the law (Kohlberg and Hersh, 1977). In the first stage of this level, individuals tend to use logical reasoning and clearly have an internal source of justice and morality. In addition, they expressed opinions about the necessity of changing the rules according to humanitarian values and reject the rigidness of the existing rules and laws (Kohlberg, 1969) (Kohlberg, 1984). At the second stage of this level, the individual might feel a sense of justice, demonstrating his/her moral values by freeing themselves from the external influences that might affect their thinking process (Kohlberg, 1969) (Kohlberg, 1984).

There are many highlights of Kohlberg's moral development theory. For example, this theory can be used to provide ethical developmental support as Kohlberg's theory developed a new field of psychology that focuses on studying moral reasoning and providing a framework to evaluate it (Study.com, 2019). Although this theory is widely used among educators (Trevino, 1992) (Penn, 1990), several others have criticised it. For example, Fleming (2006) argued that higher levels of moral development would require higher levels of reasoning development, but moral judgements are also influenced by emotions and this theory neglects the role of emotions in moral judgements. Fleming (2006) added that understanding and acknowledging what is perceived 'right' does not necessarily translate into behaving and doing what is 'right'. For example, an individual may do a good deed for any reason, because it may "seem right", they feel guilty, or it will increase the individual's positive self-image of being a "good" person. Moreover, a person might do a good deed because this deed might bring recognition from others, or simply because the individual has the time.

Harré (1985) in support also highlighted that individuals respond differently to different situations using different levels of morality, which are more likely based on societal expectations rather than on the individual's abstract moral reasoning. Harré (1985) argued that people in the business world may operate more on a self-interest basis, which might be guided by level one of moral development, and that married couples who seek mutual exchanges and the expectations of approval might be guided by level 1 or 2. Thus, an individual who may have developed a high level of moral reasoning based on

Kohlberg's hierarchy, in certain circumstances, might engage in behaviours that are not consistence with the presumed level of ethical understanding. Moreover, the individual's motivation for specific actions in given situations are diverse (Fleming, 2006). In addition, Fleming (2006) argued that despite cultural differences regarding morals and manners, Kohlberg still believed that his theory is universal because he based his conclusions on general patterns of reasoning rather than referring to and considering specific cultural manners and ideals which are important in determining ethical behaviour. For example, showing disrespect for one's parent is taken more seriously in Shanghai than in Canada, and this might affect the person's beliefs about the severity of the punishment for such behaviour within the two cultures assuming similar reasoning processes (Fleming, 2006). Another criticism that is related to cultural differences is that Kohlberg's concepts of post-conventional morality might only reflect Western philosophical ideals, which are based on individual freedom and rights. Fleming (2006) claimed that Kohlberg himself questioned his last level of morality and its universality, finding that this level is rarely reached by most of the participants that he studied. His post-conventional level might represent philosophical ideals, such as those of Jesus, Gandhi, Socrates and so on, but certainly not those of average people. Other scholars such as Garrigan et al. (2018) have criticised Kohlberg's theory as being masculine in focus and that its stages are not culturally universal, which will be discussed later in subsection 2.4.6.

Although culture was observed as a key limitation of Kohlberg's model, gender bias has also been identified. Garrigan et al. (2018) argued that Kohlberg's claims that males moral reasoning is often more advanced than that of females, is incorrect. Garrigan et al. (2018) suggested that moral judgment could be more broadly conceptualised than the way Kohlberg approached it. Gilligan described two modes of moral reasoning being the ethics of care and ethics of justice. Garrigan et al. (2018.p.482) stated that "*The very traits that have traditionally defined the goodness of women, their care for and sensitivity to the needs of others, are those that mark them out as deficient in moral development*". This suggests that Gilligan might be indicating that Kohlberg's theory is gender biased, since he neglected the feminine sense of non-violence, compassion, love and care, which are generally associated with female socialization. Garrigan et al. (2018) concluded that Kohlberg's theory did not consider females approaching moral problems from an 'ethics of care' framework rather than an 'ethics of justice' framework, an argument that

challenges some of the fundamental arguments of Kohlberg's theory. Ethics of care is based on interpersonal relations and relatedness (Garrigan et al., 2018), where the decisions are based more on concerns for others and perceived as superior to the decisions which are solely based on right and wrong without interpersonal contexts. For example, stealing might be considered moral if it was based on helping people you love (Gump, Baker and Roll, 2000). On the other hand, ethics of justice are those ethical principles that follow Kohlberg's theory, where morality is based on moral reasoning, decisions are based on the individual's internal moral code systems and on the abstract concepts of right and wrong. These ethics are seen as superior to simply obeying societal laws and rules (Kohlberg, 1969) (Gilligan, 1977). For example, stealing could be considered moral if it was based on a personal rational code (Gump, Baker and Roll, 2000).

2.4.2 Moral reasoning theories

Taking a step further from moral development, it is important to explore the principals involved in moral decision making. Rest et al. (1999) and (2000) modified some aspects of Kohlberg's moral development theory. James Rest was an American psychologist who specialised in moral psychology and development. Together with his Minnesota Group of colleagues, including Muriel Bebeau, Darcia Narvaez and Stephen Thoma, they extended Kohlberg's approach to researching moral reasoning and used the terms 'schemas' instead of the moral development levels. Rest et al. (2000.p.389) defined schemas as the "*general knowledge structures residing in long-term memory*", and each schema summarizes the individual's expectations, hypothesis, and concepts, and based their arguments on several limitations to Kohlberg's theory. For example, Rest (1994.p.9) argued that using the levels to analyse the individual's ethical development cannot provide a "*fine-grained inventory*", that is able to explain all the individual's decisions and thoughts about what is considered morally right in an ethical dilemma or issue. Rest et al. (1999) and (2000) also suggested that Kohlberg's theory aimed to portray the main characteristics as a lifetime development and did not investigate the impact of education especially higher education on ethical thinking after undertaking ethics educational intervention. Rest et al. (1999) and (2000) argued that Kohlberg's theory gave the impression that the higher moral level stages are meant to be better, which they believed is not correct. The Minnesota Group proposed that the higher moral level does not mean that the individual at that level is more intelligent or entitled to more privileges and worldly goods, but rather has better reasoning and conceptual tools for guiding decision

making (Rest, 1994.p.16). The Minnesota Group work included Defining Issues Test (DIT), and the Four Component moral development Model. The DIT aims to measure moral reasoning development (Christensen, Cote and Latham, 2016). Christensen, Cote and Latham (2016) and Bebeau (2002) believed that DIT is an effective tool to assess ethical perceptions. Nevertheless, there are many debates regarding whether it is a good framework to be used or not. For example, O'Fallon and Butterfield (2005), indicated that the DIT captures the possibility of making ethical judgments rather than capturing the actual ethical decision itself. Bailey et al. (2010), also indicated that there is a lack of clarity regarding what the DIT is assessing, therefore, this model fails to reflect the understanding that ethical judgment is only one aspect of a larger picture.

Bebeau (2002), who is one of the originators of DIT and a member of the Minnesota Group stated that Rest's Four Components Model (FCM) summarises their research and development and has extended the research team's understandings of the processes that contribute to a more effective moral functioning. Bebeau (2002) added that the DIT focuses on assessing only one dimension of professional performance which is ethical judgement, while there are other dimensions that have clear impacts on professional performance. As reported by Bebeau (2002), Rest's FCM is based on the review of psychological research and extends philosophers' concepts of ethical sensitivity and ethical behaviour. The FCM identifies four integrated abilities as the most important necessary conditions for effective moral reasoning and functioning.

Rest's FCM was drawn from moral development theories. Rest presented a four-component ethical decision-making model of "*processes involved in the production of moral behaviour*" (Rest, 1984.p19), and this process is illustrated in Figure 2.2.

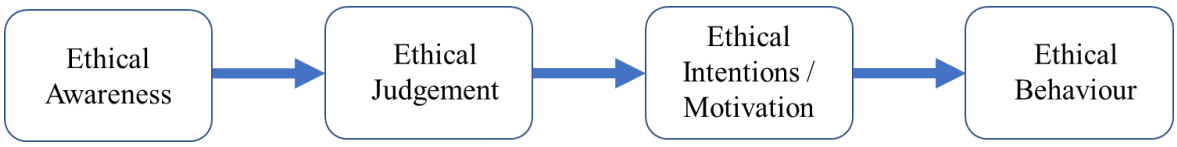


Figure 2.2 *Rest's et al. (1986) Four Components Model (FCM)*

As suggested by Rest et al. (1986), an individual goes through four cognitive processing stages when making ethical decisions:

- Ethical awareness- Moral awareness, as described by Rest et al. (1986), refers to the individual's ability to recognize the moral issue in a situation. Recognizing the moral issue in a situation requires the individual's awareness that their actions have the potential component or characteristic of harm and/or benefit to other individuals.

- Ethical Judgement- Developing a moral judgement, refers to the process of evaluating and formulating the possible solutions to the ethical issue and developing a moral justification to it. This stage of the process requires reasoning through the potential choices and their consequences, to determine which are the ethical sound choices (Rest, 1984) (Rest et al., 1986).

- Ethical intentions/motivations - this refers to prioritising moral issues over other issues or having a moral intent. Rest (1984) and Rest et al. (1986) used two terminologies to describe this process, moral motivation and moral intentions. Both terms refer to the intention of choosing the moral decision over other values and committing to the moral choice. When facing an ethical issue with two choices where one results in maximizing self-serving goal, and the other is morally right, the moral motivation or intention is to choose morality over self-serving goals.

- Ethical behaviour- Acting on moral concerns, or moral behaviour, which refers to the individual's behaviour or action in the ethical situation. This stage involves ethical courage, ability, and determination to follow one's own moral decision (Lincoln and Holmes, 2011).

Rest et al. (1986) stressed that one stage can influence and interact with the other stages, but he noted that the four stages perform unique functions at an individual level, but this model does not portray the basic elements of moral cognition and behaviour. Rest et al. (1986) also indicated that each distinct stage has its own separate development. Moral cognition is used in literature as a synonym to ethical reasoning (Rest et al., 1986) (Sternberg, 2012) (Menzel, 2010). Cognition, as per Brandimonte, Bruno and Collina (2006.p.3), is "*The mental process of knowing, including aspects such as awareness, perception, reasoning, and judgment. That which comes to be known, as through perception, reasoning, or intuition; knowledge*". Ethical reasoning, according Sternberg

(2012.p.38) is "*how to think about issues of right or wrong*". Dedeke (2015.p.440) added that moral reasoning is a *"conscious, intentional, effortful and controllable mental activity that consists of transforming given information about people to reach a moral judgment*". Furthermore, an individual who demonstrates ethical reasoning at one stage may not necessarily act so in the other stages. The sequence starts with an individual executing stage one, followed by stage two in turn, then three and four in order. The sequence is presented in a rational order to illustrate what may go on for moral behaviour to take place. Jones (1991), Trevino (1986) and Shah and Amjad (2016), argued that the majority of the models that have been developed so far in the field of ethics were based on Rest's model. The application of this model can be seen in diverse disciplines such as marketing (Sparks and Hunt, 1998), engineering (Bairaktarova and Woodcock, 2017), dentistry and education (Treviño, Weaver and Reynolds, 2006). Bebeau (2002), Kim (2016) and Thoma (2002) added that Rest's model is an effective tool to explore an individual's internal process of ethical decision making and that it includes all the key elements in moral decision making and moral behaviour (Jones, 1991). Overall, Rest's model can offer a simple illustration to how each stage in the process can influence each other via feedforward and feedback cognitive loops effects and behaviour all playing important roles (Rajeev, 2011) (Moores Chang, 2006). Since this model was developed, researchers have proposed and tested a variety of constructs believed to influence Rest's four stages, attempting to offer different integrative models that provide an understanding and describe the components of ethical decisions and their dynamics (Rajeev, 2011). An example of these models is Jones's (1991) Moral Intensity Model (MIM), which will be discussed in section 2.5 Ethical Decision-Making Models in Business. Given all the benefits and popularity of Rest's FCM, this model will be used as a basis for establishing a new conceptual model to help in ethics education in general and improve ethics education in engineering specifically.

The literature, however, noticed that showing abilities in exercising ethical judgements do not necessarily mean that individuals are likely to behave in ethical manners. Also, being ethically aware of the ethical implications of an issue does not necessarily mean holding ethical judgements or intentions (Rodzalan and Saat, 2016) (Bairaktarova and Woodcock, 2017). Thus, exploring and understanding what affects human intentions and motivations to behave ethically or unethically would be essential in building an understanding and constructing the elements of the new model that will be developed.

Therefore, some of the classical theories which discuss the factors influencing ethical decisions are discussed next.

2.4.3 Theories on intentions and motives

As indicated in Rest's model, moral motivation or intention is an essential ethical reasoning stage, that drives the individual to conduct a certain behaviour. One factor that can drive ethical or unethical behaviour is goals orientation and perception of egoism. Egoism, in general, claims that each individual has one aim, and that is self-interest (Shaver, 2019). Thus, the perceptions of right and wrong are determined by what the individual believes is in his/her self-interest, for that reason, it is immoral to act against one's self-interest (Baber, 2018). Ethical egoism does not imply aiming for some 'higher' good, such as wisdom or even political success, but rather to act to maximize self-interests. In general, Susewind and Hoelzl (2014.p203) believed that "*people hold different self-relevant goals simultaneously*", where the individual holds goals to provide benefits for others, which at the same time provides benefits for him/herself. According to Susewind and Hoelzl (2014), individuals cannot hold both goals at the same time, but they need to integrate them both in a course of action. This is believed to be so because balancing these goals require sacrificing some immediate or short-term goals and pleasures for the sake of achieving some long-term goals, or vice versa (Kidder, 1995) (Fishbach et al. , 2014). Fishbach et al. (2014.p.3) suggested that there are many goals and ambitions an individual wish to fulfil, and these ambitions may define the individual's identity and secondary wishes. Fishbach et al. (2014) also added that goals can compete, override and complement, depending on the circumstances. The challenge in balancing these goals and choosing between them is a function of the priority that is given to each goal. Fitzsimons and Fishbach (2010) believed that prioritizing may be the primary challenge when pursuing goals because the nature of deciding which goals to attend to and how much to invest in each of them in the present is unknown. Moreover, Fishbach et al. (2014) argued that determining the priority of a goal is a unique mental task, which can vary by importance. In addition, Fishbach et al. (2014) highlighted that prioritization relies on considering how much an individual has done so far, as well as how much s/he has left undone. In other words, individuals monitor their goals by addressing either what they have accomplished so far, or what is still missing.

Another theory that highlighted the role of intentions in commencing behaviours is Ajzen's (1991) Theory of Planned Behaviour (TPB). Ajzen's (1991) TPB is based on the

earlier version of Fishbach's and Ajzan's (2011) Reasoned Action theory. However, Ajzen's TPB attempts to provide a way to understanding behaviour and identify the determinants of behavioural intentions, and he theorized that intentions that drive human behaviours, in general, are categorised into three factors as demonstrated in Figure 2.3.

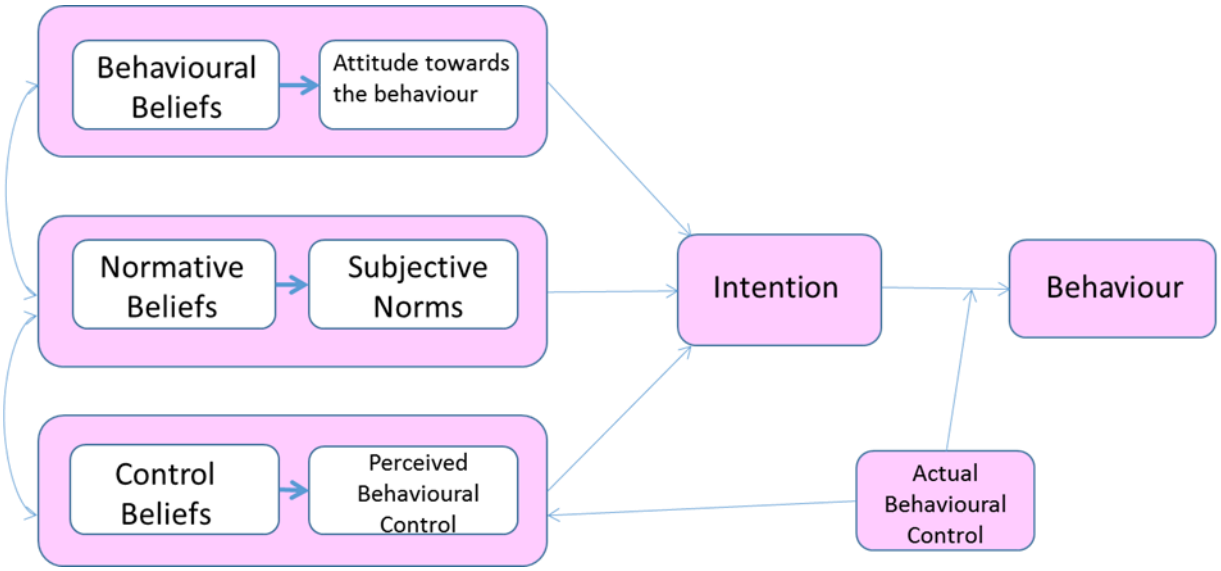


Figure 2.3 *Ajzen's (1991) Theory of Planned Behaviour (TPB)*

As demonstrated in Figure 2.3, Ajzen theorized that intentions can drive human behaviours in three ways:

- Behavioural Beliefs: beliefs held about the potential consequences of certain behaviour.
- Normative Beliefs: beliefs about the normative expectations of other individuals.
- Control Beliefs: beliefs held about the potential opportunities that may impede or facilitate performing a behaviour.

Where collectively, behavioural beliefs may produce an approved or unapproved *attitude regarding the behaviour*, normative beliefs may produce socially *subjective norms and/or pressures*, and control beliefs that may trigger *perceived behavioural control.* Combining all the three factors together may lead the individual to the formation of a certain

behavioural *intention*. Ajzen (1991) further added that the more the subjective norm is favourable, the stronger the perceived control is and the greater the individual's intention to perform the desired behaviour. Ajzen (1991) and (2006) also added that permitting individuals to apply enough 'actual' control over the behaviour would lead them to carry out their internal intentions if the opportunity is available to do so. Ajzen (2006) also explained that the way an individual perceives the difficulty or ability required to perform the behaviour (self-efficacy) can affect his/her overall perceived control, which can have an effect on planning a behaviour (Ajzen, 2002). Ajzen (2002.p.672) suggested that controllability which entails the "*beliefs about the extent to which performing the behaviour is up to the actor*", also affects the individual's intentions. Controllability in its wider meaning refers to the individual's perceptions of the extrinsic factors that he or she may have control over when performing a behaviour, and the external uncontrollable factors. Ajzen (2002) also indicated that if the individual has a high perceived behavioural control, his/her perceptions of the capability to perform the behaviour successfully can increase the intention and the likelihood of conducting the activity. Ajzen's (1991) TPB provides some explanations of the determinants of Rest's ethical intention and behaviour components. For example, the perceived consequences of certain behaviours, whether good/bad, wise/unwise, pleasant/unpleasant or fun/boring would affect the individual's attitudes towards the behaviour and his/her ethical intentions to behave ethically or unethically. Moreover, if certain behaviours are perceived as necessary to be done by other people, who are important to the decision maker, that can influence the individual's intentions to act ethically or unethically. Thus, Ajzen's (2002) TPB provides an explanation to why certain unethical behaviours might occur even of the induvial is ethical.

Another theory that can also provide more understanding to Rest's moral intention and behaviour, and fill in the gap between ethical awareness and unethical behaviour is the self-discrepancy theory (Higgins and Conwell, 2016). As specified by Higgins (1987) and Higgins and Conwell (2016), individuals represent their desired end-state for themselves in three different ways. The first concentrates on how the individual perceives, or likes to perceive, him/herself, which he defined as the "Ideal -Self" (Higgins, 1987), and it involves hopes and aspirations (Higgins and Conwell, 2016). The second concentrates on how the individual perceives how s/he should behave according to someone's else's perspectives, which he defined as the "Ought-Self" (Higgins, 1987), and it involves duties

and obligations (Higgins and Conwell, 2016). The third way of perceiving the self is the "Actual-Self", in which the individual, or others, believe that the individual does possess these attributes (Higgins, 1987). However, when individuals think that their "Ideal-Self" matches the "Ought-Self" (Higgins, 1987), they might experience high-engagement and positive emotions, such as relaxation and calmness. On the other hand, if individuals perceive that their "Actual-Self" does not match their "Ideal-Self", they might experience negative and low-engagement emotions, such as discouragement and sadness (Higgins and Conwell, 2016). This supports Mazar, Amir and Ariely (2008.p.634) proposals that individuals generally value honesty, because, this value is part of the individual's internal reward system and is an important aspect of self-concept. Mazar, Amir and Ariely (2008) added that occasionally, the competing motives and goals can cause a win-lose situation, where the individual must choose one path and sacrifice the other. Some individuals might manage to choose the moral goal and maintain a positive self-image. On the other hand, other individuals might derive some benefits from behaving unethically while maintaining their positive self-concept and choosing the unethical path can create ethical dissonance. According to Gino and Ayal (2011.p.4), ethical dissonance is "*the tension that arises from the inconsistency between one's actual cheating behaviour and one's ethical values or attitudes".* Barkan, Ayal and Ariely (2015) believed that ordinary individuals who perceive themselves as honest and trustworthy often break their own ethical code by lying, bending rules, and skimping for profit. Gino (2015) added that unethical behaviours are usually committed by individuals who value morality but behave unethically when facing an opportunity to cheat. By choosing the unethical path, the individual compromises his/her long-term desire to be an ethical person and to be seen by others as one, gains the social acceptance, and gain her/his short-term desire to act in a way that serves her/his self-interest (Mead et al., 2009). As a result, individuals might attempt to balance their desires psychologically and balance their moral judgements and moral behaviours to be more consistence with their self-image. This is done to protect their positive self-image, and accept their unethical behaviour (Gino, 2015) (Mead et al., 2009). Bowlby (1983) argued that the individual psychologically tries to regulate the effect of behaviour by reducing the unpleasant feelings that may be induced by this act and increasing the pleasant ones, and that is "*the driving force in human motivation*" (Bowlby, 1983.p.9). These psychological mechanisms can take many forms. For example, some individuals tend to use justifications to enable them to rationalize their unethical behaviour and to make their decisions sound ethical and acceptable in order to

minimize their ethical dissonance (Barkan, Ayal and Ariely, 2015) (Moore et al. , 2005). Some individuals might also maintain incorrect views about themselves and see themselves as being more objective than others, which Moore et al. (2005) referred to as "illusion of objectivity", and such individuals' fairness judgements are biased by their unique perspectives of self-serving interests (Sezer, Gino and Bazerman, 2015). Some of these biased judgements are discussed next.

2.4.4 Limitations of moral cognition

Gino, Ayal and Ariely (2009) and Moore and Gino (2013) indicated that individuals' cognitive limitations can sometimes influence them to behave unethically. Morally mature individuals are moral agents who are aware that they are moral agents (Mathieson, 2003), and they possess increased ability to consider their own cognitive processes while they develop ethically (Kegan, 1994). Thus, it is expected of ethically immature individuals to act unethically due to these cognitive limitations. Gino (2015), who is an American behavioural scientist, extended Rest's four components and added more possibilities that might drive individuals to act unethically. She believed that there are two streams of decisions, as illustrated in Figure 2.4:

- Unintentional unethical decisions,
- and, Intentional unethical decisions.

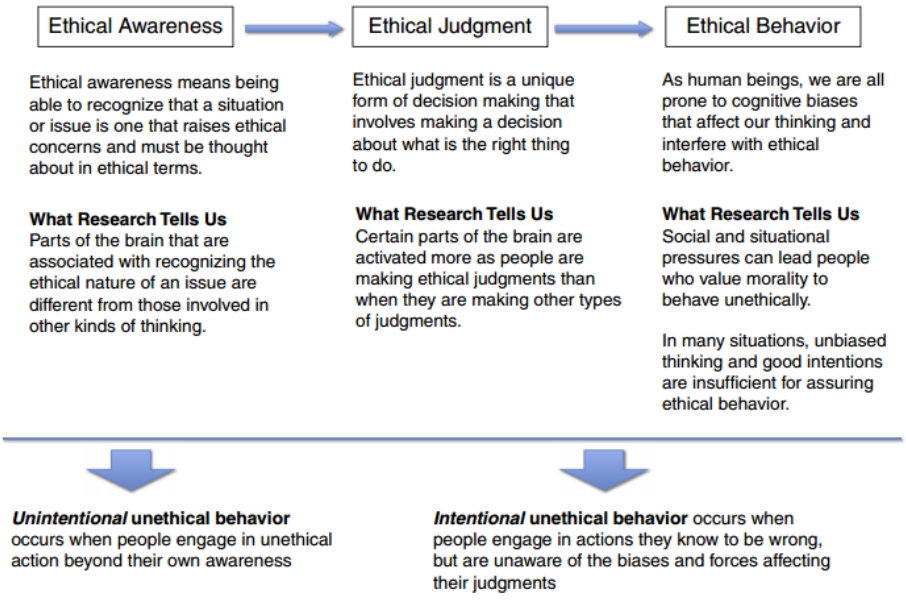


Figure 2.4 *Gino's (2015) Modified version of ethical decision-making stages*

Unintentional unethical decisions or behaviours are committed as a result of being unaware or experiencing bounded ethicality. Gino (2015) defined bounded ethicality as when individuals behave in ways that they perceive unethical upon further awareness or reflection and that most of the unethical behaviours observed in society are the results of failing to resist temptations, even if the individual strongly values morality. Examples of bounded ethicality include engaging in conflicts of interests or implicit discrimination, being unaware of exaggerated claims for group work, being unaware of in-group favouritism and the possible impacts on out-group (Chugh, Bazerman and Banaji, 2005) (Tenbrunsel et al., 2010). Accordant to Sezer, Gino and Bazerman (2015) individuals do not always recognize the ethical impacts or dimensions involved in their decisions due to being boundedly ethical as a result of the individuals' ethical blind spots. These blind spots include ignoring the slow degradation of someone's unethical behaviour (Chugh, Bazerman and Banaji, 2005), and the higher likelihood to condemn the unethical behaviour of someone when outcomes are bad rather than good (Gino, 2015). Another is an individual's unintentional discrimination against others, by offering preferential services to those they like or know personally. In this context, the outcome would be unconscious discrimination against those who lack such ties (Sezer, Gino and Bazerman, 2015) (Messick and Bazerman, 2001). Nonetheless, unethical behaviours are often not committed intentionally, because, people who commit unintentional unethical acts sometimes have their attention shifted from the violations they are committing leading to failure to supervise their own behaviours. On the other hand, intentional unethical behaviours are committed by individuals who intentionally bend ethical rules, either to serve themselves or their group (Gino, 2015) (Shalvi, Gino and Barkan, 2015), and they would choose to anticipate the easier option psychologically and rationally (Butterfield, Trevin and Weaver, 2000) (Reynolds, 2006) (Treviño, Weaver and Reynolds, 2006).

Personal biases and blind spots are factors that can affect one's moral judgements, such as misinterpreting past experiences as more positive than they actually are (Moore and Gino, 2013) (Tenbrunsel et al., 2010), minimizing the individual's role in the harmful behaviour, giving moral justifications for immoral actions, and blaming others (Treviño, Weaver and Reynolds, 2006). Sometimes people neglect the moral impact of their behaviour, and this can happen as a product of social categorization and social norms (Moore and Gino, 2013). This neglect can further develop mistreatment of the out-groups, causing a biased moral judgement. Sezer, Gino and Bazerman (2015) stressed that

judgements and decisions rooted in bias and ethical blind spots can lead to misevaluating and disregarding others' ethical mistakes. Therefore, these blind spots can cause individuals not to recognize their negative and/or positive perceptions of others and their in-group favouritism, thereby causing discrimination and harm towards out-group members (Messick and Bazerman, 2001). This shows how the effect of group loyalty may facilitate unethical behaviour (Treviño, Nieuwenboer and Kish-Gephart, 2013). Moore and Gino (2013) discussed how significant others can control and stray an individual's moral compass, and that individuals become immoral because of the social animal inside. Rosenberg (1973) suggested that significant influencers can be parents, professors, spouses, and peers. Familial values and goals such as credibility, obeying the law, honesty, hard work, and other types of ethical conduct all influence the individual's choices, perceptions and behaviour (Creyer, 1997) (Koiranen, 2002). Usually, family values and beliefs that are developed in the past are found to be having effects on the current social life. These family values are representations of religious affiliations and other embedded values in the individuals' childhood and upbringing experiences, such as honesty, kindness, respect, and compassion (Hanson and Moore, 2013). Bommer et al. (1987), on the other hand, stress that peers and groups can pressure individuals to act either ethically or unethically. Bommer et al. (1987) suggested that peers are the best predictors of the individual's unethical or ethical behaviours and that individuals who demonstrated high levels of ethicality, may decide to behave differently and negatively when the situation involves friends (Rodzalan and Saat, 2016). Treviño, Nieuwenboer and Kish-Gephart (2013) believed that peer effect is related to psychological closeness and the feelings of connection to others (Gino and Galinsky, 2012), hence, increasing the individual's desire to mimic both the ethical and unethical behaviour of peers (Moore and Gino, 2013). This mimicking behaviour results from several social goals, such as seeking peer or group acceptance, maintaining satisfying relationships with others (Hicks, 1997), and avoiding group alienation, which can be one of the negative impacts of a decision (Whitley, 1998) (Hirschi, 1969). Gino, Ayal and Ariely (2009), however, summarised peer effect in three possible ways:

- Seeing someone get away with an unethical behaviour (e.g. cheating), may change the observer's perception of the probability of getting caught in a similar act, and accordingly influence them to act unethically.

- Seeing someone's unethical behaviour may change the observer's own perceptions regarding the observed unethical act. The observer might consider the behaviour and decrease their tendency to engage in similar behaviour accordingly.

- Seeing someone's unethical behaviour may change the observer's understanding of social norms that are related to an unethical act, For instance, if an in-group member is observed behaving unethically, this member will be made the standard of social norm, and group members will engage more in unethical behaviours, while if an out-group member behaves unethically, the injunctive norm will be for the in-group member to distance themselves from the out-group member to maintain a positive and distinctive social identity.

From this discussion, emotions seem to play a crucial role in moral decisions and judgment, because moral decisions engage emotions as well as reason (Greene et al., 2001).

2.4.5 Moral emotions

Emotions play a vital role in ethical decision making. Lehrer (2009) suggested that the process of moral reasoning requires emotions and feelings, because emotions allow humans to comprehend the information that could not be understood directly. Haidt (2003.p.853) defined moral emotions as "*those emotions that are linked to the interests or welfare either of society as a whole or at least of persons other than the judge or agent…emotions that respond to moral violations, or that motivate moral behaviours*". Haidt and Joseph (2004) argued that moral judgment involves quick feelings and/or intuitions, which then triggers moral reasoning. Hiadt (2003) stressed that moral emotions are responsible for behaviour related to ethics, where these feelings trigger moral reasoning (Haidt and Joseph, 2004) (Haidt, 2007) intuitively and unconsciously (Rajeev, 2011). Haidt and Bjorklund (2008.p.188) defined intuitions as "*the sudden appearance in consciousness, or at the fringe of consciousness, of an evaluative feeling (like -dislike, good - bad) about the character or actions of a person, without any conscious awareness of having gone through steps of search, weighing evidence, or inferring a conclusion*". Haidt (2008) added that intuitions are automatic processes that involve some evaluative feeling. Sometimes, these affective intuitions are strong and different that they can be called moral emotions, such as disgust or gratitude, but normally they are experienced more as a strong sensitivity effect that can drive an evaluative gut feeling (Fazio et al.,

1986) (Greenwald, Nosek and Banaji, 2003). Thus, Haidt and Joseph (2004) might have placed emotions in control of morality, assuming reasoning as a lower aspect in the status rank, and that the nature of moral reasoning is socially functional, rather than truth-seeking. Haidt (2007) argued that emotions are responses to perceived threats, changes, or opportunities in the world, that it is mainly the 'self-interest' that might be directly affected by such events, but emotions go beyond direct self-interest in some cases. The reason for this is that humans devote considerable amount of emotions to reacting to social events that might not directly affect the self. Hiadt (2003) further explained that there are certain themes of emotions that control ethical judgement, and these themes are found in all cultures with some differences in some components of the emotional experience. An example is the cultural perceptions of harm and care. Hiadt (2003) explained that normal individuals' dislike seeing others suffers and feel compassion as a response because individuals are sensitive to harm and cruelty by nature.

Individuals also tend to express their approval towards other individuals who attempt to prevent harm, and this approval might be culturally codified as a virtue, such as compassion and kindness in contrast to aggression and cruelty. Another example is the cultural perceptions of in-group and loyalty. Hiadt (2003) assumed that since humans live in kin-based groups, unique social-cognitive abilities that are backed up by some forms of social emotions might be formed and that this can organise the in-group activities, such as recognizing, trusting, and cooperating among in-group members, while not trusting out-group members. Hiadt (2003) added that individuals usually value their in-group mates and value those who sacrifice for their group members but despise those who fail to help or betray the group members, especially in times of conflict. Thus, most cultures seem to have constructed virtues such as patriotism, loyalty, and heroism (defending the group) based on emotions.

Another issue Hiadt (2003) discussed is authority and respecting authority. Living in hierarchically structured and group-based structures, where dominant individuals get certain benefits and are expected to provide certain services or protections, might have shaped people's brains to help them navigate through hierarchical communities. Dominance might be relying mainly on voluntary defence and prestige, where individuals often feel awe, respect, and admiration toward legal authorities. Many cultures may have developed virtues such as good leadership which is thought to involve wisdom and magnanimity. Conversely, many societies might value virtues that are related to

subordination, such as duty, respect, and obedience. Thus, cultures might build their moralities based on the same moral foundations, but the degree to which they build their virtues might vary. Some of the moral emotions that appeared in the literature as responses to moral issues are summarised and illustrated in Table 2.1.

Other-Condemning Emotions (disrespect)	Self-Conscious Emotions	Other feelings
Negative feelings towards individuals, and emotions of contempt, disrespect anger, and disgust (Haidt)	Results from monitoring and constraining one`s own behaviour. Searchers list shame, embarrassment, and guilt, along with pride as an opposite of shame (Haidt)	Fear: essential motive in obeying or respecting laws and/or norms. However, fear may trigger concerns about the one`s self and/or one`s closest kin (Haidt)
Disappointment, which is experienced when a negative outcome is the result of a random procedure rather than choice (Rajeev & Bhattacharyya), and when things are beyond the individual`s control. In contrast to the feelings of regret, the individual feels less responsible for causing the negative outcome (Zeelenberg et al.).	Guilt: is regret over wrong doing (Eisenberg) and(Ferguson & Stegge).	worry, indignation, and blame (Willigenburg).
Anger: triggered when someone else behaves unfairly, or in a way that prevents others to reach their goal (Haidt) and (Panasiti & Ponsi)	Regret, is experienced as an outcome, when the present situation would have been better (Rajeev & Bhattacharyya), having a desire to undo the event and changing the unfavourable outcome or by improving future performance (Zeelenberg et al.).	
	Self-blame, the individual realizing that a negative outcome is created by their own behaviour, and therefore, a sense of responsibility is developed (Zeelenberg et al.)	

Table 2.1 *Summary of moral emotions adapted from Hiadt (2003), Eisenberg (2000), Stegge (1998), Rajeev and Bhattacharyya (2007), Zeelenberg et al. (1989), Spielthenner (2004), Willigenburg (2003), Panasiti and Ponsi (2017), and Zeelenberg, van Dijk and Manstead (1998)*

As indicated in Table 2.1, individuals might develop negative emotions towards other individuals who have committed ethical violations, even if they have never interacted with them before, and Hiadt (2003) called this theme of emotions, the other-condemning emotions. This theme of emotions includes feelings such as anger, disrespect, and disgust. Once individuals begin reacting with anger, contempt, and disgust towards social violations, they start to reflect, constrain and monitor their own behaviours. These self-conscious emotions, listed in the middle column, are related to an individual's strong need to be in and belong to a group, and these feelings can help the individual navigate the complexities that might be involved in fitting into groups without triggering the groups' anger, contempt, and disgust. Hiadt (2003) explained that western researchers have listed emotions, such as shame, embarrassment, and guilt as the principles of self-conscious emotions, but anthropologists suggest that non-western cultures perceive things differently when it comes to these emotions. Another moral emotion is moral obligation (Beck and Ajzen, 1991) (Cronan and Al-Rafee, 2008), which according to Cronan and Al-Rafee (2008), is the individual's feelings of guilt or moral obligation to perform a behaviour. Cronan and Al-Rafee (2008) added that the greater the moral obligation is for an individual to commit an unethical act, the lower the intention to commit it. However, the roots of human emotions are more diverse and wider than this limited list of moral emotions, and because human emotions evolved around increasing moral commitments to others, social structures and culture might have many more emotions that have moral impacts on individuals. Emotions, such as awe, righteousness, veneration, vengeance, happiness, joy, remorse, and even sadness can be considered as emotional activities in response to moral issues (Turner and Stets, 2006). Haidt and Graham (2007) concluded that the individuals' moral emotions are products of their socialising with the surrounding environment and culture.

2.4.6 Morality and culture

Culture, according to Geertz (1973.p.5-6), can refer to many things, and he summarised these definitions as follows:

- "*the total way of life of a people*";
- "*the social legacy the individual acquires from his group*";
- "*a way of thinking, feeling, and believing; an abstraction from behaviour*";
- "*a theory on the part of the anthropologist about the way in which a group of people in fact behave*";

- "*a set of standardized orientations to recurrent problems*";
- "*learned behaviour*";
- "*a mechanism for the normative regulation of behaviour*";
- "*a set of techniques for adjusting both to the external environment and to other men*";
- "*a precipitate of history*"

These opinions were based on his assumption that humans are "*the most dependent upon such control mechanisms that exist outside the skin*" (Geertz, 1973.p.44). However, Eckensberger (2009) argued that these rule systems and control mechanisms do not only exist "*outside the skin*", but they are also rooted in the heads of the people. This is because culture might also represent shared knowledge and shared meanings consisting of theories about who is considered a good person, society, nature, religion and the meaning of life. Turiel, Killen and Helwig (1987) highlighted that some rules may vary across cultures, but all cultures might share similar values in relation to issues of right, justice and harm. Many empirical pieces of research that have been done on cultural dimensions and their effects on individuals' ethical perceptions were based on Hofstede's theory. Hofstede (1998) and (2011) cultural theory is one example of theories that describe the effects of a society's culture on the values of the society's members, and how these values can be related to their behaviour. McSweeney (2002) and Ralston et al. (2014) indicated that Hofstede categorised cultural dimensions into four: masculinity and femininity, individualism and collectivism, uncertainty avoidance and power distance. These four dimensions can explain some of the cultural aspects that shape an individual's ethical perceptions. Masculinity and femininity can also be related to the previous discussion on gender differences. These cultural dimensions associate feminism with the ethics of care while individualism and collectivism have been predominantly related to ethical behaviour in literature more than any other cultural dimension (Ralston et al. , 2014) (Chhokar, Brodbeck and House, 2013) (Hofstede, 2001). Masculinity is defined as the societies' preference for heroism, achievement, assertiveness and the rewards system. In contrast, femininity represents the preference for modesty, cooperation, appreciating life's qualities, and caring for the weak (Hofstede, 2001) (Hofstede, 2011). In masculine societies, females are more competitive but less confident than males, and differences between male and female values are recognizable (Hofstede, 2001) (Hofstede, 2011). Masculine societies encourage male individuals to be competitive, ambitious, and to aim

for material success, which may all significantly affect individuals' engagement in unethical acts. The females are expected to care for children and the weak (Hofstede, 2001) (Hofstede, 2011) (Vitell, Nwachukwu and Barnes, 1993). On the contrary, feminine societies define overlapping social roles for males and females with neither gender allowed to be overly competitive or ambitious. Feminine societies value qualities such as concern for the weak and interpersonal relationships (Hofstede, 2001) (Hofstede, 2011) (Vitell, Nwachukwu and Barnes, 1993).

Husted and Allen (2008) suggested that collectivism and individualism is the way individuals tend to resolve conflicts of interests and compromise mutual benefits. In other words, collectivism and individualism can determine how individuals weigh and prioritize the importance of self and group interests, thereby affecting the ethical implications of decisions and behaviours the individual undertakes (Vitell, Nwachukwu and Barnes, 1993) (Ralston et al. , 2014). Oyserman, Coon and Kemmelmeier (2002) stressed that one main difference exists between collectivists and individualists and that is prioritizing and maintaining good group relations and completing work tasks. Collectivists cultures are more concerned about maintaining relationships and individualists' cultures are considered to be more concerned about completing tasks (Ralston et al. , 2014). Furthermore, Ralston et al. (2014) and Westerman et al. (2007) suggested that the societal level of collectivism or individualism impacts the extent to which individuals use their peers as their main referents for ethical decision-making. Uncertainty avoidance in cultures means the extent to which individuals can tolerate unexpected, unknown, or unfamiliar events, and the extent to which individuals in these cultures will attempt to avoid such situations. Individuals in these cultures adopt strict codes of conduct and believe in absolute truth (Vitell, Nwachukwu and Barnes, 1993) (Hofstede, 2011) (Hofstede, 1983). Professionals from high uncertainty avoidance societies tend to be intolerant of any deviations in the norms compared to their counterparts from societies with weak uncertainty avoidance (Vitell, Nwachukwu and Barnes, 1993). In relation to power distance, Hofstede (1980.p.45) defined it as the "*extent to which a society accepts the facts that power in institutions and organizations is distributed unequally*". Professionals in high power distance societies tend to accept the inequality in authority and power that may exist in organizations. Therefore, they tend to yield to their superiors in higher positions compared to professionals who work in societies with a low power distance (Vitell, Nwachukwu and Barnes, 1993). In other

words, in high power distance societies, it is considered important to consult the boss before taking any decision, while in low power distance societies, employers expect their subordinates to rely on their own skills and act on their own (Goolaup and Ismayilov, 2012). Dugan (2011) also added that some individuals may not have the chance to be leaders in these cultures. This could be related to inequalities in accessing resources, the general cultural messages regarding social roles and status, or genuine fears of negative consequences or safety.

The cultural dimensions might influence many individuals' ethical perceptions and behaviours, therefore, national cultural differences might be expected to influence many behaviours such as corruption. As believed by Seleim and Bontis (2009.p.167), corruption refers to "*the dishonest or partial exercise of official functions by the public official*" and misusing the public power for self-serving and private benefits. Corruption has been described in the literature as a primary impediment to economic growth (Mauro, 1995), which has dramatic consequences especially in developing countries (Kaufmann and Vicente, 2011). Corruption also includes other unethical activities such as bribery and theft, and it could also involve less obvious forms of unethical practices that might be legal in some countries. Corruption ranges from small favours to larger scale corruptions (Elliott, 1997). Small-scale or petty corruptions could be seen in several small places, such as police stations, registration offices (JUSTIA US Law, 1993) (Hall, Ely and Grossman, 2005), and several other private and public sectors. Large-scale corruptions could be related to weaknesses in an organization or a process, and it varies according to the corrupt officials acting corruptly within that system. This form of corruption might occur due to several factors, such as lack of transparency, monopolistic powers, culture, low pay, and conflict of interests (Di Tella and Savedoff, 2001). Lee and Guven (2013) warned that corruption could be 'contagious', because knowing that bribes might be considered common in a country, would induce more people to offer and accept bribes (Monash Business School, 2017).

2.5 Ethical decision-making models in business

Given some incidents that might happen in different countries, in which the economy might become negatively affected as a result of ethical decisions taken, economists and business researchers started to concentrate their efforts on reducing unethical incidents. Business leaders realised that not considering ethics can cause serious troubles for any organization, and that considering and developing codes of ethics in business is as

important as considering and developing the organisation's mission, vision, and principles (Status net, 2019). Joseph L. Badaracco, Jr. described the ethical issues that businesses face at the moment as "*not issues of right versus wrong,"* but *"conflicts of right versus right*", which makes the ethical issues even more grey (Stark, 1993). Rushworth Kidder, who is an ethicist and professor, in his book "How Good People Make Tough Choices: Resolving the Dilemmas of Ethical Living", proposed that ethical decisions are often driven by the individual's core morals, values and integrity (Kidder, 1995). These core personal values might fall into two categories, either moral temptations or ethical decisions. Thus, many scandals and business incidents could have been prevented if professionals had produced different and better ethical decisions (Jones et al. , 2003). These decisions might also be related to some misconceptions about professional social responsibilities. One example is Freidman in Chadwick and Schroeder's "Applied ethics: critical concepts in philosophy", who believed that "*The social responsibility of business is to increase its profits*" (Chadwick and Schroeder, 2002.p.57). Such misconceptions might lead to following and using unlawful methods, which might eventually result in very expensive lawsuits and long jail sentences (Rodrigo, 2012). If ethical behaviours are to be improved, it is vital to understand the possible components and factors that might be involved in the ethical decision-making process. Models of ethical decision-making attempt to show some of the variables that can impact individuals' ethical choices, and can help in forming foundations for how an ethical decision is made within an organizational context (Rodrigo, 2012). As discussed earlier in subsection 2.4.2, Rest's et al. (1986) in their FCM discussed what individuals might be subjected to when they are making an ethical decision. Some researchers in Business ethics were inspired by Rest's model, and stated clearly that they based their models, concepts and components on Rest's indications while other researchers did not state that, but, some of their concepts resembled Rest's, and some others did not state nor relate to Rest. Some of these models are discussed next.

2.5.1 The 4 dilemmas paradigms

Kidder (1995) and (1996) stated that ethical issues can be messy and totally confusing, because they can arise quickly and unexpectedly leading to unexpected consequences. Kidder (1995) and (1996) argued that besides understanding the structure of the ethical decision-making process, understanding the nature, reasons, and characteristics of the ethical issues and dilemmas is another important element in understanding the ethical

decisions. Kidder (1995) and (1996) suggested that when an individual face an ethical issue or dilemma, a tough conflict takes place in the individual's perception. An ethical issue involves a single ethical concern, such as fairness, public safety, honesty, employees' economic security, or truthfulness (Haidt, 2008), whereas an ethical dilemma arises when the individual faces two or more ethical conflicts (Maclagan, 2003). Dole and Hurych (2009) added that dilemmas are complex issues that make choosing between them very tough and usually the choice is between two right values while an ethical issue occurs when an individual behaves freely in a way that either benefits or harms others (Jones, 1991). In summary, Kidder (1995) and (1996) implied that once the choices are clear, the ethical issue needs to be recognised, the actor in the issue needs to be determined, relevant facts need to be gathered, the test for right-versus-wrong and right-versus-right issues will be carried out then the ethical perspective is applied. Before applying and making the decision, compromising and searching for a third option is one way to reach new alternatives that may help resolve the problem. Finally, Kidder concluded that revisiting and reflecting on the decision, after the issue has been resolved, can in some instances help in shaping the problem into an example or case study that can help the individual's learning. However, to ensure a better ethical decision is undertaken at the 'recognising the moral issue or dilemma' stage, Kidder (1995) suggested that individuals should assess the problem they are facing for any right-versus-wrong issues first. This should be done to determine whether there is any potential wrongdoing in the case, which can be done using several assessments such as:

- The legal test, which can help in evaluating whether lawbreaking might be involved in the issue or dilemma. If so, the problem might be considered as a legal rather than moral problem, and the resolution might come with legal proceedings.
- The stench test, which relies on intuition. If the decision maker has an uneasy sense about the decision, then the problem might involve right-versus-wrong issues.
- The front-page test which helps the decision maker to test their feelings about their private decision becoming public by appearing on a newspaper's front pages. If they think they might feel uncomfortable, then they must reconsider their decisions.

- The Mom test which helps to test the decision maker's feelings to see if their choice of a decision might affect their mothers or someone important.

If such decisions made the decision maker feel queasy, then they should reconsider their choice of decisions. Secondly, if the issue does not involve any wrongdoing, then it is more likely that it pits two right versus right ethical issues. Kidder (1995) and (1996) proposed that decisions usually fall into ethical decisions - the right versus right decisions, or moral temptations - the right versus wrong decisions. He also believed that the right versus right decisions are the most difficult ones. Dole and Hurych (2009) added that the 'right versus wrong' issues or dilemmas are not ethical dilemmas, but simply decisions in which individuals are tempted to do what they know is not right. Table 2.2 summarises Kidder's four dilemma paradigms model.

Kidder`s Right- Versus- Right Paradigms		
TRUTH	***VS.***	**LOYALTY**
Honesty		Commitment
Integrity		Responsibility
Statements of fact		Promise-keeping
		Allegiance, Fidelity
INDIVIDUAL	**VS.**	**COMMUNITY**
Self		Them
Us		Others
Smaller group		Larger group
SHORT-TERM	**VS.**	**LONG-TERM**
Now		Then
Immediate needs or desire		Future goals or prospects
JUSTICE	**VS.**	**MERCY**
Fairness		Compassion
Equity		Empathy
Even-handed application of the law or rule		Love

Table 2.2 *Kidder's four dilemma paradigms adopted from Baker's (1997)*

Kidder's dilemma paradigm has been thoroughly analysed by several researchers. Mathes (2004) gave examples of how Kidder's four ethical paradigms interact together. In the truth vs. loyalty dilemma, telling the truth may jeopardise allegiance with other individuals or organizations, such as facing the decision of whistleblowing on organizational misbehaviour (Malek, 2010). As indicated by Dyrud (2017), whistleblowing is when an individual holds evidence of another individual or

organization's wrongdoing and tries to fix this wrongdoing by discussing it with the wrongdoer directly or with the internal management of the organisation. Yet, this whistle-blower is dissatisfied by the disinterest or lack of action from the other party and turns to an external individual or entity to correct this action. She also added that the act of whistleblowing, itself, violates some ethical principles, such as:

- Confidentiality, because many individuals may have signed a non-disclosure agreement.
- Fidelity, because whistleblowing may involve conflicts between loyalty and trust between individual and individual as well as individual and organisation.

As for the individual vs. community dilemma paradigm, Mathes (2004) suggested that the desires and needs to serve the immediate self or group can conflict with the desires and needs of the larger community or group. In addition, short-term goals versus long-term goals can bring negative consequences. For example, giving a generous pay raise to employees can lead to endangering the future of the business and the long-term goals. Finally, for the justice vs. mercy ethical dilemma paradigm, Mathes (2004) argued that being fair can conflict with the personal desires to show compassion and love.

Although Kidder's model, in general, is considered by Dole and Hurych (2009), Mathes (2004) and Baker (1997) as a good model to help individuals choose one course of action over another when they face an ethical dilemma, it compliments Rest's model in a way. For example, Kidder's basic elements of his checklist model, such as recognising the ethical issue might align with Rest's ethical awareness stage. In addition, Kidder's points on determining who is the actor in this issue, gathering the relevant facts, testing for temptation and ethical dilemma characteristics and applying the ethical perspective to make the decision aligns with Rest's remaining three stages of his model. Thus, Kidder's ethical decision process resembles Rest's in which both begin with the individual identifying the ethical issue or dilemma, then making an ethical judgment, forming intentions to act ethically or unethically, and finally acting on the ethical intention. However, applying Kidder's four paradigms was not the focus of Dole's and Hurych's (2009) and Baker's (1997) studies, especially in developing case scenarios. Thus, Kidder's four paradigms can help provide more understanding of the possible ethical conflicts that the individuals might face when trying to solve an ethical dilemma. Baker (1997) also added that considering Kidder's four paradigm dimensions in developing

ethical dilemmas were useful in classifying and articulating the nature of the dilemma. Baker's suggested that her findings supported Kidder's (1995.p.185) proposals where his four-dimension model brings "*sharply into focus the fact that it is indeed a genuine dilemma, in that it pits two deeply held core values against each other*". Dole and Hurych (2009) added that Kidder's model provided a good method for analysis, and that the analysis of the scenarios represented a "right versus right" dilemma and not right versus wrong dilemma. The researchers also believed that their analysis highlighted the complex nature of ethical dilemmas.

2.5.2 Ethical decision-making contingency framework

Another relevant ethical decision-making model was developed by Ferrell and Gresham (1985). The authors indicated that their model mainly helps marketers in their ethical-decision making, and suggested that it can be applied to most of the functional areas in business organizations (Ferrell, Gresham and Fraedrich, 1989). Ferrell's and Gresham's (1985) model is illustrated in Figure 2.5.

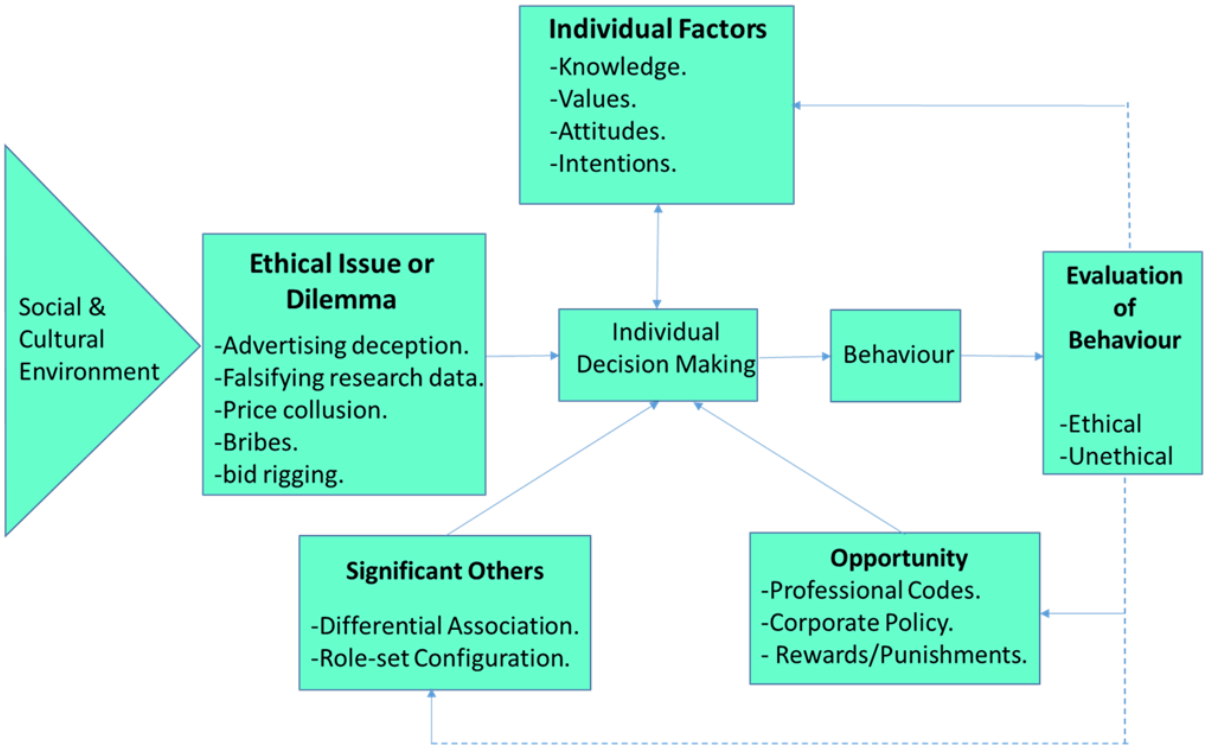


Figure 2.5 *Ferrell's and Gresham's (1985) model of ethical decision-making in marketing*

The model variables are categorized into individual and organizational contingencies. Individual contingencies are composed of socialization characteristics and personal backgrounds, such as business and educational experiences. The organizational characteristics, on the other hand, include the organization's external effects such as other organisations and customers, and the intra-organizational influences, such as supervisors and peers. They suggested that these influencers can affect unethical behaviour directly or indirectly. Ferrell and Gresham (1985) also signified that individual factors such as values, knowledge, intentions, and attitude also can interact with organizational factors. Individual and organisational factors with the influence of 'significant others' and 'opportunity factors', encourage individuals to be involved in unethical decision-making. They added that societal and environmental factors that define ethical issues are assumed external to their framework, and therefore are beyond the scope of their study. They explained that individuals develop rules and guidelines for their ethical behaviours based on moral philosophy, such as deontology and utilitarianism approaches, and the influence of cultural and group values and norms on the individual decision-making processes (Ferrell and Gresham, 1985). As for the organisational factors, they suggested that pressure for results is usually measured in terms of money and profits, therefore, any profitable performance is perceived by the management as an aim for organizational recognition and advancement. Thus, internal organizational pressures are considered a predictor of unethical behaviour. The other element they highlighted in the model is the effect of significant others. They believed that values, norms, and attitudes are learned from other individuals, whether these members are part of the same group or members of different groups (Ferrell, Gresham and Fraedrich, 1989). Each member brings his or her own distinct values, norms, and attitudes (Ferrell and Gresham, 1985).

Ferrell and Gresham (1985.p.63) then introduced the 'opportunity' component in their model as another important factor that can affect ethical decision making. They defined opportunity as *"results from a favourable set of conditions to limit barriers or provide rewards, where the absence of punishment facilitate unethical behaviours and/or not considering consequences*". They suggested that opportunity is related to rewards and incorporates codes of ethics. They believe that although rewards are considered external factors, they can still develop internal rewards such as esteem, social approval and feelings of worth and goodness which might all be felt internally when performing activities. External rewards, however, is what the individual expects to receive from

others in a social environment in terms of values and in exchange for an activity or set of activities performed, which are generated externally. Both internal and external rewarding systems can influence the individual to behave unethically. Buch and Rivers (2001) listed three forms of rewards:

- Intrinsic
- Extrinsic
- Social

Intrinsic rewards, according to Buch and Tolentino (2006), are individuals' perceptions that they receive internally as outcomes of their involvement in activities and enhance their feelings of satisfaction, self-competence, responsibility, growth and autonomy. Moreover, Allen, Lucero and Van Norman (1997) pointed out that intrinsic rewards include development and use of new skills, increased levels of responsibility, and control over work. Extrinsic rewards, on the contrary, are physical forms of rewards that individuals receive from their superiors, management, or organization as a result of their participation or performance. These rewards take the form of direct or indirect rewards. Direct rewards can include forms of recognition from superiors, appreciation tokens and acknowledgement such as key chains or movie tickets (Larson, 2003), and certificates (Shreeve et al. , 2002). Nevertheless, individuals may also perceive indirect payoffs as rewards, such as promotion, enhanced job security and better performance appraisals, hence, such opportunities can be perceived as avenues to higher payments. The third category of rewards are social rewards, which emerge from satisfying the social needs of belonging, relatedness and affiliation while being involved in any sort of groups, such as project, culture, study, or even a tribe, can be a source of social rewards (Alderfer, 1969). These forms of rewards can affect ethical decisions. As indicated in subsection 2.4.3, individuals hold different goal systems, and as discussed in 2.4.1, at different moral development levels, individuals demonstrate tendencies and desires to achieve both self-serving and others-serving goals. Balancing and achieving these two sets of competing goals is difficult, and the priorities of these goals and perceptions can be affected by the individual's perceptions of rewards and sanctions, therefore, rewards and sanctions can induce or reduce unethical intentions and behaviours.

Sanctions are usually associated with punishment for undesired behaviour, while a reward is to encourage a desired behaviour, both of which have an impact on ethical behaviour (Mulder, 2018). Mulder (2018) believed that sanctions, beside moral norms, affect behaviour, both positively and negatively based on various circumstances. In a similar vein, Treviño, Weaver and Reynolds (2006) explained that the presence of justifications for unethical behaviours increases this behaviour, while rewards for ethical behaviour does not necessarily induce this behaviour. Mulder (2018) emphasised that the psychological effects of punishments differ from that of rewards, in which punishments are more threatening in nature than rewards. This threat is related to the possibility of fearing harm, whereas rewards can result in a positive feeling. Yet, these two forces of rewards and sanctions drive individuals to act ethically or unethically (Mazar, Amir and Ariely, 2008), and occasionally, these competing motives can cause a win-lose situation. These two options force the individual to choose one path and sacrifice the other, which Shalvi, Gino and Barkan (2015) identified as benefits versus costs. Ajzen (1985) and (2002) added that individuals differ in how they perceive rewards and punishments, the potential consequences of these rewards and sanctions, and whether caused by external or internal factors. As discussed earlier in subsections 2.4.3, controllability and self-efficacy can also play roles in this equation where these two aspects can be rewarding motives or sanctioning motives to behave in certain ways.

On the other hand, professional codes of ethics and corporate policies are also considered to play an important factor in controlling or managing opportunity (Zey-Ferrell and Ferrell, 1982). Ferrell and Gresham (1985) believed that having codes of ethics as part of the corporate policies can influence the individual's beliefs and perceptions about ethics. Codes of ethics, usually identify the organization's standards of conduct, and are used to guide and define duties, obligations, and rights of the members of the society, as well as describe the organization's core values (Treviño, Nieuwenboer Kish-Gephart, 2013). Ferrell and Gresham (1985) demonstrated in their model that opportunity is related to rewards and incorporates codes of ethics. O'Leary and Stewart (2007) and Rottig, Koufteros and Umphress (2011), however, found that the bare existence of codes of ethics were not enough nor sufficient to influence ethical awareness or behaviour. This is because people still behave unethically despite these codes of ethics. In contrast, McKinney, Emerson and Neubert (2010) suggested that the existence of a written code of ethics in organisations increased individuals' ethical perceptions compared to those at

organisations without such codes. Likewise, Pflugrath, Martinov-Bennie and Chen (2007) indicated that the existence of a code of ethics significantly influenced participants' ethical judgements, and that such codes were essential in ethical decision-making processes (Deshpande, 2009).

Although Ferrell and Gresham (1985) might have focused on describing how marketers make decisions that can later involve them in ethical or unethical behaviours, yet, no consideration was given to the possible ways to improve marketers' ethical decisions and perceptions, which Torres (1998) indicated was being 'avoided'. This might indicate that the sole purpose of Ferrell and Gresham's model is to identify the factors that may be involved in marketing in order to prevent unethical behaviours. As stated by Torres (1998), this might suggest that Ferrell and Gresham's model failed to address relevant aspects that are related to ethics, and ethical behaviour is more than just avoiding an undesirable bad behaviour. This indicates that the model also has a limited scope in addressing ethics-related issues, due to the predefined sets of aims and focus, and it might fail to address the possible relevant aspects of ethical decisions. Failing to address these aspects resulted in narrowing interests, such as emphasising on preventing unethical behaviours.

This Ethical Decision-Making Contingency Framework might have been seen as the desired end or outcome to ethical decisions, such as ethical behaviour, which might suggest that considering ethical behaviours only as desired ends without considering the selection choices and the reasons behind these decisions, might be seen as a value-free approach in a value-laden area of ethics (Torres, 1998). The model might also suggest exclusion of the necessary natures of the decision maker, who is the main player in influence and socialisation. The model assumes that the individual is a static opportunist, who is after external profits, neglecting the individual's reliance on moral reasoning, intentions and the individual's morality as a human being. In addition, the model highlighted the influence of superiors on behaving unethically yet did not suggest the means and instructions for self-control. Moreover, ethics was mainly looked at as situational such as personal characteristics and differences rather than individualistic, and these situations are activated to affect ethical behaviour. Thus, based on the many limitations to this model, the researcher decided to use only some elements of this model such as opportunity and reward/sanctions systems and not to use this model as the main model that this thesis will be based on.

2.5.3 Moral intensity model (MIM)

Jones's Moral Intensity Model (MIM), provides the "*most comprehensive synthesis model of ethical decision making*" (Loe, Ferrell and Mansfield, 2000.p. 186). Jones (1991), in his model, combined several elements from previous models of ethical decision making such as the organisational factors component of Ferrell's and Gresham's (1985) model. Furthermore, Jones's (1991) MIM dedicated particular attention to Rest's model and used it as a basis to introduce his concept of moral intensity. Leitsch (2009) highlighted that Jones's model is imperative in increasing the knowledge of the process of ethical decision making. Jones (1991) developed the moral intensity model to explore "*the extent of issue-related moral imperative in a situation*" (Jones, 1991.p.372). Jones's model is illustrated in Figure 2.6.

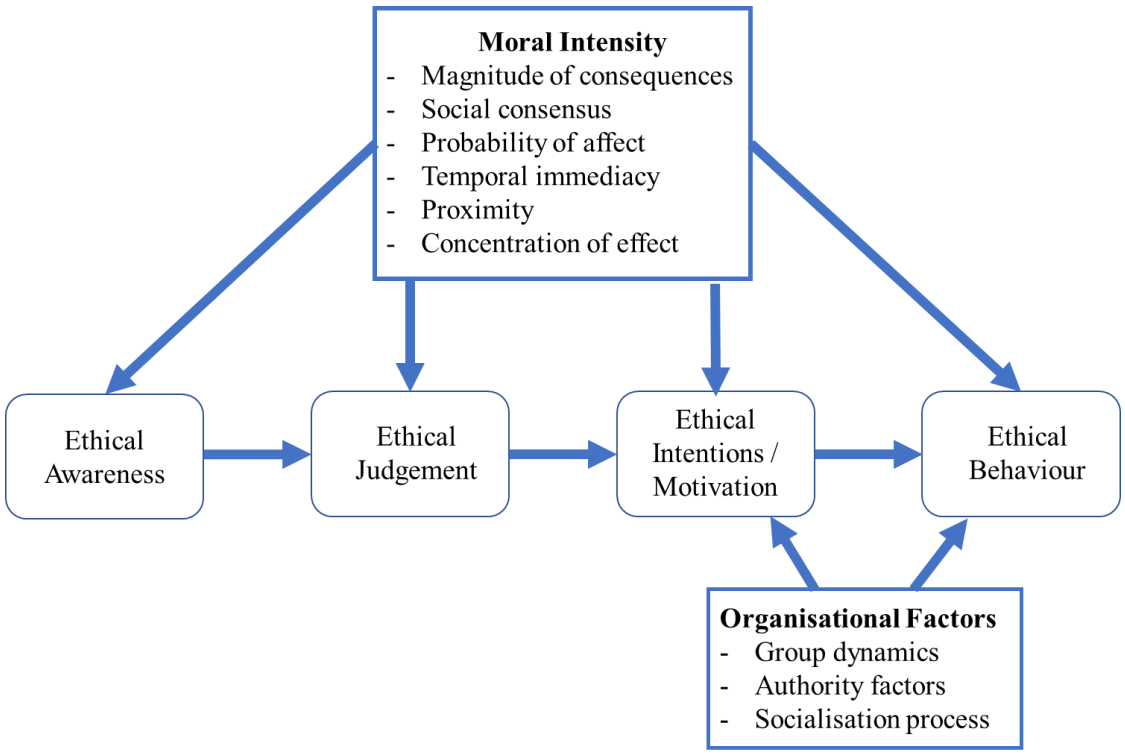


Figure 2.6 *Jones's (1991) Moral Intensity Model (MIM)*

This moral intensity model has an effect on each of Rest's four components model (Jones, 1991) (McMahon and Harvey, 2006). Jones (1991) argued that the moral intensity of an ethical issue varies from one person to another, and that introducing a model that is based

on ethical issues might cause them to behave in unpredicted and different ways. He explained how his model adds significantly to the understanding of moral decision-making processes. Moreover, he perceived his model as an attempt to identify the potential issues that may be related to ethical behaviour. Jones (1991.p.372) defined moral intensity as "*a construct that captures the extent of issue-related moral imperative in a situation*". As shown in Figure 2.5, Jones (1991) believed that for a decision-making process to begin, the individual must first recognize the moral issue, which is not always clear or possible. Failure to recognize the moral issue leads to failure in employing an ethical decision choice. Thus, moral intensity can influence the process of recognising the moral issue, eventually affecting the individual's ethical awareness. The author also highlighted that the reason for being unable to recognise unsafe future events is due to being less imaginative and failure to detect early symptoms of problems from possible consequences. He also indicated that high-intensity moral issues will elicit more sophisticated moral reasoning than those of low-intensity moral issues. This happens because high-intensity moral issues require higher levels of cognitive moral development than low-intensity moral issues. He proposed that any ethical situation individuals face is stimulated by their surrounding environment, which draws their attention. This attention will affect attributions, memory, assumptions, effect, judgements, intentions, and eventually behaviours.

After developing a moral judgement, a process that depends on the individual's cognitive, moral development takes place. Based on the individual's ethical development level, the individual will decide what is morally acceptable or correct. Then a process of balancing moral factors against other factors, including self-interest takes place to establish a moral intent. Establishing moral intent is essential to moral decision making and behaviour, and Jones referred to Ajzen's (2011) TPB here. Jones (1991) noted that although moral decision making and behaviour at an individual level present some challenges and are considered difficult, organisational factors, on the other hand, are more complicated. He believed that organisational factors, such as environmental influences, socialisation processes, and hierarchical relationships, obstruct moral behaviour. Group dynamics, such as authority, obedience, group thinking, and other organisational factors can create some distortions to an individual's ethical intentions. Moreover, various conflicts between the individual's morality and authority can arise, such as consequences of disobedience, fear of embarrassment, closeness to a victim and perceptions of personal

causations, all of which may influence an individual's behaviour. He added that he adopted Ferrell and Gresham's (1985) concepts of organisational factors. After Jones (1991) discussed the different links and theories to his model, he proposed his moral intensity model, and he categorised the characteristics of any moral issue into six main categories as illustrated and discussed in Table 2.3.

Moral Intensity Category	Definition	Example 1	Example 2
Magnitude of consequences	*"The sum of the harms (or benefits) done to victims (or beneficiaries) of the moral act in question"*	A behaviour that causes 1,000 individuals to be injured has a greater magnitude of consequences than a behaviour that causes 10 individuals to be injured.	A behaviour that causes a death of an individual has a greater magnitude of consequence than a behaviour that causes an individual to suffer an injury.
Social Consensus	*"The degree of social agreement that a proposed act is evil (or good)"*	Discriminating against minority job candidate has higher social consensus than refusing to behave affirmatively on behalf of minority job candidates.	Bribing a customs official in the individual`s own country has greater social consensus than bribing a customs official in another country.
Probability of effect	*"A joint function of the probability that the act in question will actually take place and act in question will actually cause the harm (benefit) predicted"*	Producing a car that may endanger its occupants during driving has greater probability of harm effect than producing a car that may endangers occupants only during rear-end collisions.	Selling a gun to a known armed burglar has greater probability of harm effect than selling a gun to a law-abiding citizen
Temporal Immediacy	*"The length of time between the present and the onset of consequences of the moral act in question (shorter length of time implies greater immediacy)"*	Releasing a drug that may cause 1% of the consumers to have anxiety reactions after consumption has a greater temporal immediacy than releasing a drug that may cause 1% of the consumers to develop nervous disorders after 20 years.	Reducing the current retirees` retirement benefits has greater temporal immediacy than reducing retirement benefits of current employees.
Proximity	"*The feeling of nearness (social, cultural, psychological, or physical) that the moral agent has victims (beneficiaries) act in question"*	Discharging a staff member from a person's work unit have greater moral proximity (physical and psychological) than discharging one in another unit or remote plant.	Selling pesticides in one`s own country markets has greater moral proximity (social, cultural, and physical) than selling of such pesticides in another country.
Concentration of effect	*"An inverse function of the number of people affected by an act of given magnitude"*	Denying the coverage of 10 individuals with $10,000 claims has a more concentrated effect than denying the coverage of 10,000 individuals with $10.00 claims.	Cheating one individual or small group of individuals has a more concentrated effect than cheating a government agency, a corporation or institutional entity.

Table 2.3 *Characteristics of MIM adapted from Jones's (1991)*

Craft (2013) further supported Jones's (1991) assumptions and confirmed that the characteristics of the ethical issues can affect individuals' ethical awareness, judgment, and intention differently. For example, ethical issues can cause disputes among patients, patients' family members, nurses and physicians about the futility or benefit of treatment options, or who has the most power or knows best (Robichaux, 2012).

In addition to Jones's moral intensity model, a moral intensity scale (MIS) was developed by Singhapakdi, Vitell and Kraft (1996) and Singhapakdi, Vitell and Franke (1999). This scale was based on the six moral intensity characteristics posited by Jones (1991). They believed that Jones's moral intensity model might be synthesized into two components; the perceived potential harm or no harm done to the victim, and the perceived degree of social pressure in the situation (McMahon and Harvey, 2006). Singhapakdi, Vitell and Franke (1999) agree that the moral intensity of the situation is significant when making decisions about whether an ethical problem exists, and when considering the courses of action to follow in ethical situations. Although Jones's model may represent the overall variables involved in the ethical decision-making process, the moral intensity model focuses on one factor that might affect ethical decision making and that is the ethical issue itself and not the other factors (Loe, Ferrell and Mansfield, 2000).

In Kelley's and Elm's (2003) review of Jones's MIM, they called for more focus and scope to be given to the organizational factors that can affect the moral agent's experience of the ethical issue. Jones (1991.p.391) asserted that organizational factors can affect "*moral decision making and behaviour at two points: establishing moral intent and engaging in moral behaviour*". Kelley and Elm (2003), however, claimed that this formulation reduces the impacts of the organizational factors on the experience of the ethical issue. Kelley's and Elm's conclusions indicated that organizational factors had direct impacts on the MIM of the ethical issue rather than only the moral intent and behaviour of the moral agent. This can be one of the shortcomings of Jones's model, that is focusing on one set of factors affecting ethical decisions, that is the characteristics and features of an ethical issue. In addition, Jones's MIM might have neglected the role of past experiences and information involved in past ethical decisions when facing similar ethical issues, which are used to recognize the information of a moral issue and consequently trigger the decision-making process. Thus, the concepts of moral intensity will be taken on board, when building the integrated model and later when developing the assessment tools, but it is not going to be used as the main model in this thesis.

2.6 Summary of the limitations of the previous models

The models and perspectives that have been outlined earlier in this chapter differ in their focus, aims and discipline. For instance, Rest et al. (1986), explained how a moral decision-making process takes place, and concentrated on the logical reasoning process of the ethical decision making (Carroll and Shaw, 2012). Kohlberg's moral development theory (Kohlberg, 1969) (Kohlberg, 1971) and the Neo-Kohlbergian approach (Rest et al., 2000) (Auger and Gee, 2016) described the process of moral reasoning development and maturation (Garrigan et al., 2018). On the other hand, Hiadt (2003) focused on the role of ethical sensitivity in moral decisions, and the role of intuitions as the main driver for moral decisions, and emphasised on the role of moral emotions in control of moral judgements (Carroll and Shaw, 2012). Whereas, Greene et al. (2001) believed that some ethical issues involve more emotional processing than others, and these different emotional engagements affect individuals' judgments. However, both Haidt and Rest failed to explain what happens if an individual failed to recognise a moral issue in a situation or if the individual became aware of it after conducting an unintended unethical behaviour. In addition, Jones (1991) and Kidder (1995) and (1996) , only focused on one aspect of ethical decision making which is the effect of the ethical issue's features and characteristics on the overall ethical perceptions, and how each individual might perceive the same ethical issue differently. Thus, both Jones's (1991) and Kidder's (1995) and (1996) models failed to explain how and to what extent other factors can affect the individual's ethical perceptions. The literature, in general, suggest that Jones's concepts are used in combination with Rest's four components process to identify the effect of Jones's and Kidder's concepts on ethical decision making and examples include Lincoln and Holmes (2011) who investigated moral awareness, moral judgment, moral intention, and their relationship with MIM components as on Rest's four components. Nonetheless, the literature lacks research employing Kidder's paradigms. Dole and Hurych (2009) stated that more research is needed on the application of Kidder's four paradigms as a vital instrument in investigating and developing case examples to teach ethics. In conclusion, none of the models or theories discussed earlier can provide a holistic and broad picture of the process of ethical decision, nor the factors that can affect ethical decision making if used individually. This indicates that a holistic approach which combines several moral development theories, moral emotions theories, and considers social factors models is required to get a fuller and better picture of the ethical decision-making processes. In addition, all the previous researchers did not indicate the role of

past experiences in shaping the individual's ethical perceptions, and how past experiences can teach individuals to develop their ethical behaviours. Moreover, these researchers did not specify the set of skills expected to enhance ethical awareness or judgements among individuals, and especially students.

2.7 Need for a new integrative model for evaluating ethics education

Ethics education tries to enhance and develop student's recognition and effective response to ethical issues in their careers. Examining different ethical approaches, evaluating ethical decisions and the potential consequences of ethical problems, and discussing ethical case scenarios are some of methods academics can use to test ethical decision-making skills. However, these approaches provide inadequate explanations of ethical decision-making processes and the possible factors influencing this process, causing limited abilities in providing students with the adequate tools needed to reason and evaluate ethical issues and dilemmas. Moral decision-making may share some characteristics with other decision-making processes, such as information processing, evaluating, making judgements, and taking responsive decisions, leading to behavioural action. However, both processes differ in that ethical problems have moral characteristics and rules attached to them, which elicit moral reasoning and the relevant schemas from memory. Like any other type of decision-making, ethical decision- making is subject to different influences and factors, such as environmental and individual factors and biases. Different models on ethics may be required to assist with ethical decision making, ethical reflection and recognizing biases in each situation. A model that has been proven to work effectively with graduates, may not be effective with undergraduates. Biases in some models can introduce obstacles for some decision makers, whether students or professionals. Moreover, excellence in education necessitates continual evaluation, from self, students, peers, and academics. Encouraging students to provide constructive criticism is difficult, because students are concerned about different negative factors and consequences that are possible, different cultural backgrounds, and individual differences factors. In response to the inability of the previous models and theories to critically explain ethical decision making, the researcher is proposing a new model which fixes the gaps identified in the previous models and provides a holistic way of understanding ethical decision making. Thus, all the previously discussed models and concepts have been integrated to develop a new model called "The New Integrative Model for Evaluating Ethics Education" as illustrated in Figure 2.7.

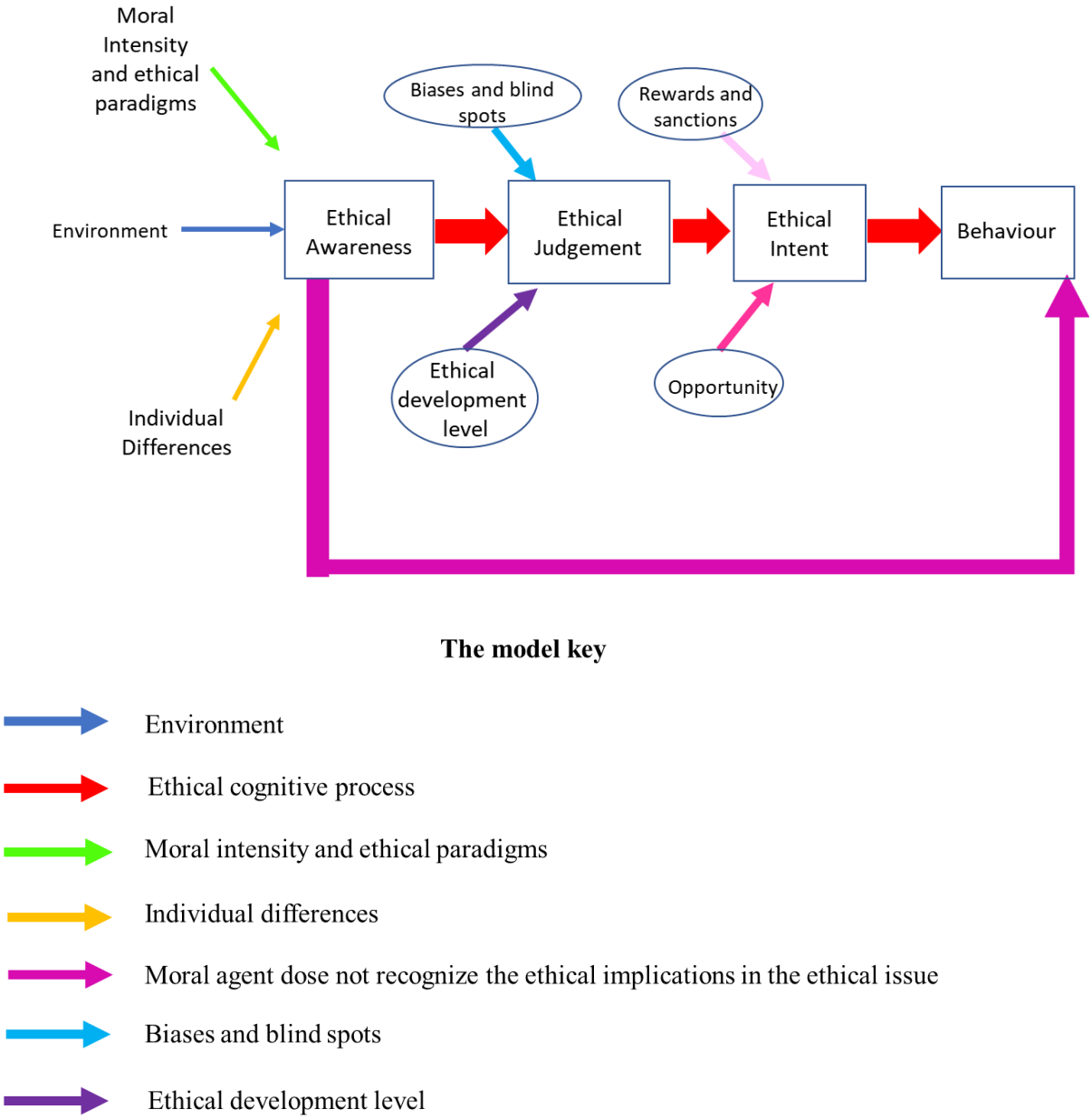


Figure 2.7 *The initial integrated conceptual model*

This initial conceptual model is based on Rest's FCM, which provides a useful framework for understanding how decisions are made rationally and can be adapted to include other components that are relevant to ethical decision-making and moral development. This supports what was discussed earlier in subsection 2.4.2 as Rest's FCM is considered an effective tool in exploring individuals' internal process of ethical decision making and it

includes all the key elements in moral decision making and moral behaviour (Jones, 1991) (Bebeau, 2002) (Kim, 2016) (Thoma, 2002). However, the new model includes the following elements, which are adopted from other previously analysed models:

- The first element of the framework is Environment. Individuals are affected by their immediate surroundings, and their moral perceptions are shaped by these. These environmental factors also play an important role in recognizing moral issues. These factors could be **s**ocial environment (Rest et al., 1986) (Beck and Ajzen, 1991), cultural values (Rest et al., 2000) (Haidt, 2007) (Ferrell and Gresham, 1985), and personal environment (Bommer et al., 1987).
- The second set of factors that affects the individual's ethical awareness is the nature of the moral issue. Moral intensity and characteristics of the moral issue affect individuals' ethical awareness (Jones, 1991). In response to these factors, individuals react to the ethical issue based on their cognitive moral development level (Kohlberg, 1984) (Trevino, 1986) (Dole and Hurych, 2009).
- Individual differences, such as demographics, ethical moral development and maturity, work experience and organisational factors, such as professional codes of ethics, also play important roles in recognising ethical issues. Rest et al. (1986) expressed concerns that many individuals face difficulties interpreting simple situations, and that can be a result of individual differences that play roles in the individual's awareness of welfare and the needs of others.
- If the individual does not recognise the moral issue, the whole process is then bypassed and an unintentional unethical behaviour is committed without the individual's own awareness (Gino, 2015), which might be the easiest choice to be anticipated, both psychologically and rationally (Butterfield, Trevin and Weaver, 2000) (Reynolds, 2006). Shalvi, Gino and Barkan (2015) and Gino (2015) outlined that unintentional unethical behaviour is usually committed because the actors have their attention shifted from the violations they are committing, therefore failing to supervise their behaviours.
- The other possibility is that if the individual recognises the ethical issue, ethical awareness is established. Fiske and Taylor (1991) suggested that the decision maker at this stage, receives and then encodes information, but aspects of the information receive more attention than other information, because of the information's accessibility, vividness, and saliency.

- After the individual recognises the ethical characteristics of the issue, the individual should be able to make a judgement or judgments about which course of action or actions is morally acceptable in that situation (Rest et al., 1986). Factors like ethical blind spots and bounded ethicality can affect ethical judgements, and these factors can cause individuals to intentionally bend ethical rules, either to serve their group or to serve themselves (Chugh, Bazerman and Banaji, 2005). However, in both cases, cognitive moral development level (Kohlberg, 1984) (Trevino, 1986) (Dole and Hurych, 2009) will influence the ethical judgement stage.
- At the intention stage, the individuals' ethical judgement is affected by their perceptions of rewards and sanctions (Ferrell and Gresham, 1985), whether an opportunity arises or not to conduct the behaviour. Also, some factors, such as the individual's perceptions of self-efficacy, controllability (Ajzen, 2002) and moral feelings can also play roles as perceived rewards or sanctions at this stage.
- After individuals form their ethical intentions, they take a course of action that reflects this intention but not always. This stage involves ethical courage, ability, and determination to follow one's own moral decision (Menzel, 2010).

The researcher proposes this model as a tool to help educators who are interested in teaching and assessing ethics. This model intends to provide an illustrative and conceptual framework of ethical decision making and the factors that affect this process. This model shows how different components of ethical decision making, that are discussed in the literature, can be integrated into one explanatory model and how ethical decisions are made, developed and mature over time.

This model integrates Rest's model with different elements from Hiadt's (2003) propositions, considering moral development concepts of Kohlberg (1969), Jones (1991) MIM and Kidder (1995) dilemma paradigms. The model also identifies other factors that have been discussed and mentioned in the other models and theories, such as moral obligation, self-efficacy and controllability, which Ajzen (1991) suggested as extensions to his Planned Behaviour Theory. Furthermore, the model incorporates other factors such as rewards, sanctions, opportunity, environmental and individual factors which were discussed in (Ferrell and Gresham, 1985). This model can be used by students, educators and professionals to help them learn, teach and assess professional ethics, and the researcher suggests that this model is applicable in any profession that requires ethics education. In the next chapters, the researcher will discuss how this model can be used in

evaluating ethics education and ensuring the effectiveness of ethics education in the field of Engineering Education.

2.8 Rational of the new integrative model

All professionals need to make decisions in their everyday lives. Given the potential limited time in addressing and solving some of the ethical problems they face, professionals are urged to practice their skills in weighing different priorities by planning, revising and engaging in decision making (Gianakis, 2005). Over the years, many researchers tried to develop decision-making models to help and facilitate understanding, enhance ethical decisions and enhance the effectiveness of ethics education. This model tries to fill in the gaps that the other models, that have been discussed earlier, neglected or did not explore, and tries to address and provide the following:

- The different individual and organisational factors that can affect ethical decisions and perceptions within one conceptual model.
- The skills that can enhance ethical decision-making abilities
- The set of skills that have been developed by educational programmes and the skills that have not been developed yet.

The previously discussed theories, concepts and models, focused on investigating and identifying one or a few of the factors that can affect ethical decisions and ethical decision-making skills. For example, Kohlberg's theory generalised his theory without addressing the importance of gender differences in framing ethical issues or considering cultural differences in shaping individuals' ethical perceptions. In addition, Rest's model neglected the impact of emotions in ethical decisions and indicated that ethical reasoning goes through a binary process, in which the individual is either aware or unaware, which ignored the other shades of ethical awareness such as ethical blind spots and biased ethical perceptions. In contrast, Haidt highlighted the effect of emotions on individuals' ethical decisions and perceptions stating that ethical decisions are chiefly driven by emotions. Yet, the literature so far did not provide a clear-cut description of the essential skills that can enhance ethical decisions and perceptions or state the skills that educational programmes should focus on to develop students' ethical perceptions and attitudes. Thus, the next chapter will look at the literature to identify what is considered important in ethics education and how engineering programmes specifically are teaching ethics in their curricula, and modify the model, if needed, in accordance.

2.9 Chapter summary

Ethics has many synonyms, as a result, ethics can be used as synonyms of morals, values and virtues. Thus, the researcher may use the two terms ethics and morals interchangeably. In this chapter, the various definitions of ethics are discussed and introduced. In addition, multiple frameworks and concepts that are used in different disciplines to assess ethics are presented as well as how multiple factors can affect ethical decisions. However, each framework and concept have its own limitations, if being used individually. Thus, a new integrated conceptual framework was developed by the researcher to promote the understanding of the ethical decision-making process and how different factors can affect this process. In the next chapter, Chapter 3, the researcher will discuss the importance of ethics education in the engineering discipline, and the major approaches to teaching ethics in engineering. Moreover, the meaning of professionalism in engineering will be discussed alongside the Royal Academy of Engineering's perspectives on ethics education.

Chapter 3 Literature Review: Ethics Education in Engineering

3.1 Chapter overview

The idea of professional standards may suggest the existence of broader and wider obligations. These obligations are defined and emphasised by almost all engineering professional organisations, such as the Royal Academy of Engineering (RAEng). In this chapter, the researcher will discuss the importance of ethics in the engineering profession, what is meant by professionalism in engineering, the RAEng's Statement of Ethical Principles (SEPs), and the reasons behind the development of SEPs. The importance of ethics education in engineering and the expected learning objectives of ethics education in engineering are also explored while the different approaches to teaching ethics in the engineering curriculum are discussed.

3.2 Ethics in engineering

From the previous chapter, it is evident that ethics play an important aspect in decision-making which is why it forms an important element of the curricula in many disciplines including engineering. Today, there is a rapid rise in the use of high technology solutions and cutting-edge engineering and innovation in our day-to-day lives. For instance, societies are witnessing a growing use of smart devices for everyday activities, facilities such as data storage in cloud and data sharing among multiple devices. The development in areas such as telecommunication and information technology has enabled such progress. A similar development is seen in other areas such as the nuclear power industry, nanotechnology, genetics and chemical technology amongst others. However, these developments raise many issues in relation to responsibility towards future generations, the well-being of the society and the sustainability of the environment (Galanina, Dulzon and Schwab, 2015).

During the classical development of science, the field of engineering mainly targeted the search and discovery of the objective and naked truth, without considering the moral aspects. However, in recent years, scientific discovery and research have become more socially orientated given its importance and impact in the society (Galanina, Dulzon and Schwab, 2015) (Cooley, 1995). The negative consequences of technologies and their impact on the society and the environment in the 20th century had already raised several questions on the ethical responsibilities and obligations of various professions including engineering. An example is the Challenger shuttle disaster which took place in 1986. This disaster is another prominent example that reflects the negligence of senior management

in respect of ethics and the failure of engineers to follow the protocols of ethical obligations. In this case, the design engineers did not follow their professional obligations in terms of maintaining their responsibility of keeping the design accurate, flawless and safe. NASA and the design engineers' team were working on a project to modify the design of a joint in the shuttle, which delayed the shuttle's scheduled missions. Due to time pressures, completing the project was not possible, and therefore, the management and the design engineers had rushed schedules. Prior to the incident, engineers had warned NASA management about several design problems that involved this joint but, in the end, this issue was ignored and eventually dismissed (Penn State Univesity, 2008). Such cases raise several questions and highlight the importance of ethical responsibilities in the engineering profession. Today, neglecting or ignoring ethical issues associated with a technology or a profession like engineering could lead to serious consequences (Lenk, 1983).

3.2.1 Professionalism

According to Flexner (2002), there are some characteristics that enable an occupation to qualify as a profession. For example, a profession should be based on knowledge and not just based on routine activities, and a profession should be based on theoretical comprehension and practical applications of the phenomena rather than hypothesizing. Moreover, a profession aims to add and improve knowledge, and should be based on personal responsibility along with intellectual action. A profession can be taught formally to novice generations, should be internally organized to establish admission criteria, and aims to encourage working for the good of the society.

The (RAEng), which is the U.K's national academy of engineering, realised the potential challenges that could arise in the engineering profession (The Royal Academy of Engineering, 2003). The Royal Academy of Engineering (2011.p.6) suggested that the term 'professional' refers to a person:

- Who has specialised knowledge and skills
- Who acquired such skills and knowledge through a period of study and training, and maintains and updates these skills and knowledge through professional life
- As a result of this, has the specialised expertise, and has the power to affect the individual clients and the wider community

- Belongs to a professional society or body, that regulates his/her practice
- As part of that self-regulation, follows and complies to the ethical principles, which are the professional bodies overseas.

The specialised expertise of engineering professionals, and the domains which they exercise their expertise over can give them power, either to cause people harm, or to improve their wellbeing. As a result of the power bequeathed through these expert skills and knowledge to professionals, society places its trust in professionals and expects them to exercise and practice these skills wisely. Thus, professional engineers have commitments, duties and responsibilities to use their expertise in pursuing the public good. As a result, engineering ethics became a critical part of the engineering profession, such as the importance of following and applying ethical principles into the engineering practice, which is essential for professional judgements. By practising professionalism, the professional engineer can earn the public's trust and provide enough reasons to maintain such trust. In other words, professionalism brings privileges with it in terms of affecting others, whether this involves accessing information about them, or having the capacity to affect their interests and needs. In turn, these privileges bring important responsibilities with them, therefore, professional bodies and professions require continuous efforts to earn the rights of being entrusted with such responsibilities. These efforts involve demonstrating that professionals exercise these rights in ethical manners (The Royal Academy of Engineering, 2011).

3.2.2 Code of ethics in the engineering profession

To address these issues and challenges in the engineering profession, the RAEng launched the Statement of Ethical Principles (SEPs) in October 2005. The Academy collaborated with the Engineering Council, which is the U.K's regulatory body for the engineering profession (Engineering Council, 2018), to produce the Statement of Ethical Principles (SEPs) (The Royal Academy of Engineering, 2017). The SEPs were produced through discussions that were held with engineers from several different engineering institutions, and philosophers specialised in ethics. The most recently modified version of SEPs was launched in July 2017. The Academy emphasised the importance of holding personal and professional commitments, and that professional engineers should adopt the highest standards of conduct. The SEPs aims to guide all individuals involved in the engineering profession and regulate engineering professions in the U.K under one

umbrella and different professional engineering institutions have supported and accepted these statements as guiding principles for all their members (Hunt, 2007) (Bowen, 2012). Engineering is an important profession in society, and as members of this profession, professional engineers are expected to exhibit the highest standards of professionalism. Such standards of professionalism include honesty and integrity which is paramount to the welfare, health and safety of the public (The Royal Academy of Engineering, 2012). The Statement is categorised into four main principles (The Royal Academy of Engineering, 2012), which were published on the RAEng website:

3.2.2.1 Accuracy and rigour. Professional engineers and technicians have a duty to ensure that they acquire and use wisely and faithfully the knowledge that is relevant to the engineering skills needed in their work in the service of others. They should:

- always act with care and competence
- perform services only in areas of current competence
- keep their knowledge and skills up to date and assist the development of engineering knowledge and skills in others
- not knowingly mislead or allow others to be misled about engineering matters
- present and review engineering evidence, theory and interpretation honestly, accurately and without bias
- identify and evaluate and, where possible, quantify risks

3.2.2.2 Honesty and integrity. Professional engineers and technicians should adopt the highest standards of professional conduct, openness, fairness and honesty. They should:

- be alert to the ways in which their work might affect others and duly respect the rights and reputations of other parties
- avoid deceptive acts, take steps to prevent corrupt practices or professional misconduct, and declare conflicts of interest
- reject bribery or improper influence
- act for each employer or client in a reliable and trustworthy manner

3.2.2.3 Respect for life, law and the public good. Professional engineers and technicians should give due weight to all relevant law, facts and published guidance, and the wider public interest. They should:

- ensure that all work is lawful and justified

- minimise and justify any adverse effect on society or on the natural environment for their own and succeeding generations
- take due account of the limited availability of natural and human resources
- hold paramount the health and safety of others
- act honourably, responsibly and lawfully and uphold the reputation, standing and dignity of the profession

3.2.2.4 Responsible leadership: listening and informing. Professional engineers and technicians should aspire to high standards of leadership in the exploitation and management of technology. They hold a privileged and trusted position in society and are expected to demonstrate that they are seeking to serve the wider society and to be sensitive to public concerns. They should:

- be aware of the issues that engineering and technology raise for society, and listen to the aspirations and concerns of others
- actively promote public awareness and understanding of the impact and benefits of engineering achievements
- be objective and truthful in any statement made in their professional capacity

In general, engineering codes of ethics are important, as per the New Jersey Society of Professional Engineers (2019), because engineers are trusted with projects that involve and impact the lives of many people, and the code of engineering ethics is "*a document that was put together to help us keep that fact in mind and be a guiding factor in making hard decisions during our careers*". Hanna (2014) remarked that the engineering codes of ethics oblige engineers to be considerate, sensitive and honest to the surrounding conditions of their projects. Seager, Selinger and Wiek (2012) highlighted that in the engineering profession, engineers often perceive and interpret most of their work-related problems in black and white, because engineering problems are quantified in nature. Hanna (2014) added that engineering codes of ethics oblige engineers to consider non-technical factors that surround engineering projects. This is because engineering is an activity that is exclusive to organisations and professionals who are trusted to maintain confidentiality, individual responsibility and professionalism (Alhemoud, 1995). However, the increase in the number of incidences that led to problems in both, the community and the environment, has led to rethinking the role of the engineer in the society, and the impacts of their work (O'Clock and Okleshen, 1993). Thus, an

engineering solution may not be considered ethical if it did not consider the stakeholders that are involved in the decision (Geistauts, Baker and Eschenbach, 2008). On the other hand, issues that are related to culture also get attention, because there are some situations involving engineering projects on an international scale. In these situations, engineers are expected to realise the dimensions of their decisions, such as cultural beliefs, values and attitudes, which may vary across cultures (Frey and O'Neill-Carrillo, 2008).

The reason behind the RAEng producing the SEPs for the engineering profession is to enable engineering professionals facing challenges to think through and solve ethical issues. Engineers often work with and for others, whether contractors and employers or clients, and as a result of this interaction, engineers may face conflicts between other people's demands and their professional ethical values. An example of this conflict is what happened in the Challenger Shuttle disaster, when the design engineering team revealed their concerns regarding critical safety issues about the joints designs to their manager, who then asked the engineering team to think like managers and not like engineers. Similar external pressures can exist and may contravene engineers' professional obligations, therefore, it is helpful to provide more clarity about these obligations and what they are (The Royal Academy of Engineering, 2011).

Accuracy and rigour are the first set of the ethical principles that are listed in the RAEng's SEPs. This is because accuracy and rigour show the importance of attention to details and ensuring accuracy in providing better engineering solutions. Carelessness and inaccuracies in engineering can lead to failures in and of engineering projects and potentially lead to accidents, financial failures, injuries and/or death (The Royal Academy of Engineering, 2011). Thus, the first ethical principle may be relevant to the technological aspects of engineering, such as mathematics, scientific knowledge and skills and how to apply and interpret these skills and knowledge. This principle emphasises the importance of technical skills and knowledge (Bowen, 2012). On the other hand, professionalism also includes being honest about the areas and level of engineering skills and knowledge, and the importance of not agreeing to work in areas that are out of the engineer's specialised expertise, in which the engineer is not skilled or not able to achieve competency easily. This can happen due to the temptations to do this such as for commercial considerations. For instance, a company bidding for high-paying contract despite them not having the appropriate skills, and the required technical knowledge among the company's teams. This principle also involves considering the risk factors.

The risk consideration here is the general assumption that engineers working on projects may and will make mistakes, which they may not be able to avoid, and these mistakes could have catastrophic impacts on engineering projects.

Engineers who employ their correct and specialist skills within their engineering area of expertise can make a positive and significant contribution to society. Nonetheless, it is important to understand and note that many engineering projects are original and novel, which will need previously untested methods and skills, and in these cases, the engineer's responsibility evolves. This responsibility is ensuring that risks are identified and managed, and necessary steps are taken to allow the teams to obtain the required and appropriate skills, but most importantly, is, to be honest about skills gaps and the unknowns (The Royal Academy of Engineering, 2011).

Engineers also have duties to maintain up to date knowledge and skill in their fields of expertise, because they are required to maintain the trust of their clients and the wider community and public. Engineers are expected to be aware of the different values that are given to their "*professional opinions*" (The Royal Academy of Engineering, 2011.p.10), and therefore, never give this opinion lightly or based on insufficient evidence. If the professional engineering opinion turns out to be mistaken, engineers may be held responsible for any negative consequences of the decisions and actions that have been taken. Although engineers may have used inaccurate information unconsciously and without awareness, they still hold responsibilities for these actions, because of their positions as experts. Conflicts of interest can also affect the accuracy of engineers' opinions. Engineers hold responsibilities to consider whether an opinion that they have given is correct, objective and to the best of their current knowledge, based on evidence, and whether this opinion is affected by other considerations that may have influenced their judgment. Examples of these other considerations include loyalty to other parties or commercial considerations.

The second set of principles that are listed in the RAEng's SEPs is honesty and integrity. The RAEng argued that honesty and integrity are two separate but related concepts, because it is difficult to imagine how an individual may exhibit one without the other, and that often a dishonest person is unlikely to be described as having integrity. Engineers often work for the benefit of different groups of people, and they have a duty of keeping these people informed about relevant facts. The public and society trust professionals to

provide accurate and complete information as much as possible and honesty do not simply mean not lying. This is because engineers, sometimes, may need to reveal information that has not been asked or requested directly, which in some cases, people may not want to know or hear. However, in cases where confidentiality is required, for example, maintaining a client's confidentiality, it may be considered unethical to reveal information that can and would jeopardise that confidentiality. Therefore, in these cases, failing to reveal such information may not necessarily be considered as dishonest (The Royal Academy of Engineering, 2011). Thus, the second ethical principle may be relevant to the business interactions and dealings of engineers, which may be challenging in the case of international engineering activities, because acceptable business standards may and can vary across cultures (Bowen, 2012).

Integrity, in line with The Royal Academy of Engineering (2011.p.28), is a more difficult concept to define, but it "*has to do with acting ethically"*, even if no personal gains are expected from doing so. A person of integrity will and can resist pressures that can compromise their ethical principles and values, whether these pressures come from other individuals, such as clients, employers, or anywhere else. They can also and will take steps to avoid potential conflicts of interest or, where this may be not possible, whistleblow and declare these conflicts, and do their best and utmost to avoid improper influences. Individuals with integrity should be reliable and consistent, and their actions should match up what they say, standing for something, trying to change attitudes or practices that may seem less than ethical. Integrity also might mean trying to impact and influence the adoption of improvements in employers' practices, the engineering profession, or the larger society. Based on SEPs, a professional engineer should "*take steps to prevent corrupt practices or professional misconduct*" in other individuals, and not only and simply avoid falling in such unethical practices individually.

The third set of principles, respect for life, law and the public good, is considered by the RAEng as the broadest of the three sets that constitute the SEPs. The RAEng argued that this is the set that most encompasses the issues that are most common and associated with engineering ethics. All individuals have general responsibilities towards life, law and the public good, but engineers have specific professional responsibilities to uphold and protect these. Several debates on engineering ethics focus, mainly, on major accidents, where people were either injured or killed, and particularly accidents that show that there was some level of negligence involved in them, such as the Challenger shuttle disaster

(The Royal Academy of Engineering, 2011). Ethicists, such as Davis (1998.p.85) considered the question of "*What is it to think like an engineer if not simply to use one's technical knowledge of engineering?*". He concluded that ensuring the health and safety of others is central to engineering since this constitutes a vital aspect of thinking like an engineer. Davis (1998) the analysis was based mainly on the investigations of the Challenger shuttle disaster, in which the head of the engineering design team was asked to think, not as an engineer, but as a manager. This set of ethical principles is not limited to health and safety only, but also covers respecting the law, respecting and protecting the natural environment, and respecting and protecting the dignity and reputation of the engineering profession. These set of principles encompass many aspects of the engineering profession's responsibilities. These responsibilities can affect other people and have other social and environmental dimensions due to the nature of the engineering function.

Engineering responsibility is also sensitive to change in political and social expectations and standards and considers the decisions that engineers are expected to take in order to protect others, which may change over time, and cross-cultural differences. For example, the risk workers were exposed to during the building of Brunel's Great Western Railway would not be relevant or tolerated now, especially if 100 workers died in one tunnel blast alone (The Guardian, 2017). An example of cross-cultural differences in engineering responsibilities could be seen in Scandinavia. According to Pandikow, Ruhe and Herzog (2007), typical Scandinavian managers do not give orders to their subordinates, but rather provide guidance and advice, and the responsibility of the engineering team members is to solve problems and report them back. These responsibilities are clearly understood by Scandinavian team members but maybe "*experienced as highly confusing for non-Scandinavians*" (Pandikow, Ruhe and Herzog, 2007.p.1921). Pandikow, Ruhe and Herzog (2007) believed that reasons for such confusions can be related to the cultural differences in perceiving the power and responsibilities that managers should hold and practice, which can present Scandinavian managers to non-Scandinavian subordinates as showing lack of leadership and indecisiveness. The authors also added that it can be equally frustrating and confusing for non-Scandinavian managers to manage Scandinavian groups, because decisions were routinely treated as providing guidance and advice only. These cultural differences in professional responsibilities led to confrontations whereby non- Scandinavian managers complained that the engineers were

not working but only meeting and having coffee, while, the engineering team members were solving work problems collectively in reality. However, these principles overlap with the previous principles. For instance, failures in accuracy and rigour can put others and the society at risk and failures in honesty and integrity failures can damage the engineering profession's reputation. The RAEng added that these examples are not only applicable to senior engineers only, who are in charge and responsible for decision makings, but also applicable to all engineers, ranging from technicians to managers (The Royal Academy of Engineering, 2011).

The fourth and final set of principles is responsible leadership: listening and informing. SEPs stated that professional engineers hold a trusted and privileged position in the society, therefore, they are expected to demonstrate that they are serving and seeking to serve the wider society, and thus should be sensitive and listen to public concerns. This set of principles focus on engineers' responsibilities in making decisions, often at certain times in their careers. For example, when presenting a report, the engineer is expected and required to be objective and honest. Furthermore, if an engineer is offered a bribe, s/he is expected and required to reject it. These responsibilities are always required from the individual engineer, however, if the engineer fails to be objective and honest, or if s/he accepts a bribe, then the engineer does something unethical and considered wrong. Professional engineers can engage with and in politics, promoting and campaigning for changes, such as a change in the law, political debates and so on. While it may be acceptable for an individual engineer to choose not to get involved in political debates and changing laws, there may be a wider obligation that involves the engineering profession as a whole, to engage in such wider activities. Issues, such as energy, security, climate change and protecting personal data are high profile issues that are related to policy, and the engineering profession can make important contributions to them. As for leadership, the RAEng believe that ethical leadership refers to the engineer's duty to be a responsible leader when managing other engineers. In this set of principles, the senior engineer has a duty to listen to the other engineers that s/he is working with, and to keep them updated and informed. Although the RAEng realised the importance of this principle, they believed that it does not refer to the responsibility of individual engineers, but the responsibility of the engineering profession, as a whole, where the engineering profession is obliged to provide responsible leadership, who listen to society and engage with the public. Nevertheless, it is the individual engineer's responsibility to make the

decision of following this principle, because if individual engineers do not engage with the wider debates in the society, then the engineering profession cannot accomplish this responsibility. Translating these responsibilities of the profession into individual responsibilities will depend on how well the engineering profession organises itself (The Royal Academy of Engineering, 2011).

3.3 Importance of ethics education in HE

In recent years, many unethical events and conducts in various professions have been highly publicized, and these included activities such as data falsification and stealing from government funds, to name a few (Sang-Hun, 2009). Research has shown that students who engage in unethical behaviours during their higher education studies are more likely to indulge in shoplifting activities (Beck and Ajzen, 1991), cheat in graduate and professional schooling (Baldwin et al., 1996), cheat on income taxes (Fass, 1990), engage in unethical behaviours in the workplace (Harding et al., 2004) (Sims, 1993), and abuse harmful substances (Kerkvliet, 1994) (Blankenship and Whitley, 2000). So, as evident in the earlier examples, the origin of some unethical behaviours can be traced to earlier low-level infractions that could increase or escalate over time (Welsh et al., 2015). Welsh et al. (2015p.1) referred to these future escalating unethical behaviours as the "*slippery slope of unethical behaviour*". Examples of the slippery slope of unethical behaviours are the Quentin Rowan plagiarized writings and the Enron scandal. In the first example, Quentin Rowan, a fiction writer, described how he gradually descended into increasing plagiarism acts, as he copied written pieces from different sources over the years. Rowan began these unethical activities by replacing some words of the plagiarised manuscripts with synonyms from other books that are more sophisticated. By the time he was caught several years later, he had already published dozens of articles and books which included several pages that were directly copied from other sources (Welsh et al., 2015). There are also examples of corporate scandals which started small and increased over a period time such as the Enron scandal (McLean and Elkind, 2003). McLean and Elkind (2003.p.132) highlighted that "*the Enron scandal grew out of a steady accumulation of habits and values and actions that began years before and finally spiralled out of control*". The CNN (2001) reported that Enron was an energy company that collapsed after a big accounting fraud. Enron's bankruptcy in 2001 was considered the largest scandal in the history of the United States of America, and the estimated loss was $74 billion. Just before the collapse of the company, lower-level employees were encouraged to buy shares in the

company stocks as their retirement savings. In 1985, Enron emerged from the merger of two companies and in 1989, Enron officially entered the gas commodities market. In 2001 Enron announced a loss of $618 million in their third quarter, however, it was later revealed that Enron's officials overstated earnings dating back to 1997. In January 2002, the U.S Department of Justice opened a criminal investigation, but the accounting company that handled Enron's audits disclosed that company documents had been destroyed. In March 2002, the US Department of Justice accused many employees of the accounting company that handled Enron's audits of obstruction of justice and they were found guilty. Finally, in 2004 several people were accused of being involved in this scandal and were charged with fraud, insider trading, conspiracy, and making false statements (CNN, 2001). Such examples prompted both industries as well as higher education organisations to focus on developing students' ethical and social responsibilities, and preparing them to understand the societal and global context in which professionals operate (Robinson et al., 2007) (May and Luth, 2013).

Education is at the centre of every human settlement, and education is vital for building and forming the characters of youths. This explains why education is considered the main priority in almost all the nations of the world. Nair (2014.p.231) defined education as "*transmission of values and knowledge accumulated by society to its members through the process of socialization or enculturation*". Singh and Stückelberger (2017) added that the word 'Education' is borrowed from the Latin word 'duco', meaning 'to Lead', and they assumed that in its wider meaning, education includes aspects of learning, leadership, knowledge acquisition, and acculturation. Singh and Stückelberger (2017) indicated that to lead others might imply the ability to lead others with the necessary knowledge, methods and objectives. Thus, the role of higher education institutions (HEIs) is to prepare and enlighten the citizenry to become 'civic-minded' individuals (Singh and Stückelberger, 2017.p.23). Henle (2006) admitted that leaders are responsible for building ethical value-based cultures and organisations, and Lau (2010.p.565) added that, in order to "*nurture ethical leader*", ethics education should take the lead. Wright (1995) also suggested that education is the best way to develop ethical and good behaviour in the modern business environment. Rest (1988) and Rohatyn (1987) also emphasised on ethics education and how it is essential in shaping students' ethical decision making, reasoning, and what is considered right and wrong. This is because the world is going through many transformational situations, which requires adapting the world's educational systems in

order to help students to transform and consciously evolve in order to adapt to the transitions and critical shifts that are happening around the globe (Singh and Stückelberger, 2017). Thus, one of the reasons to teach ethics to higher education students is to provide them with a vehicle through which they can effectively and actively reflect their ethical values when facing ethical challenges as future leaders (Lau, 2010) (Chambers and Ransom, 2015). Rohatyn (1987) noted that one of the main reasons for leaders lacking ethical values could be traced back to the lack of ethical education and guidance. One example of corruption in higher education that might be useful to consider is the scandal of Pennsylvania State University (Penn State). Penn State Assistant Football Coach, Jerry Sandusky, was accused of sexually abusing multiple minors and three of the university officials were also charged with obstruction of justice, perjury, and failure to report the crime while both, the university athletes and money were at stake (Chambers and Ransom, 2015) (Sandusky, Sporkin and Sullivan, 2012). The cover-up penalties included resignations and dismissals of several officials at the university, $60 million in sanctions, stripping the university of six bowl wins, losing half of the university's football scholarships, and other penalties (Chambers and Ransom, 2015). Accordant with the investigations, university officials neglected and failed to report the minors' sexual abuse incidents and engaged in concealing the coach's inappropriate actions (Chambers and Ransom, 2015). Further, they violated privacy rights by revealing one of the complainant's identity to the coach (Sandusky, Sporkin and Sullivan, 2012). Research on professional codes acknowledged the importance of awareness of ethical standards among leaders (Wood and Rimmer, 2003). However, considering the limited ethics education in higher education, leaders might find themselves with outdated information, and with limited resources to help them make decisions (Aziz et al., 2005) (Fullan, 2005). Thus, the literature highlighted several key ethical skills that should be considered in ethics education.

3.4 Key ethical skills

Rest's FCM allows researchers interested in ethics education to view ethical behaviour as a set of responses to particular features in a situation (Rest et al., 1986). As specified by Narvaez (2009), a member of the Minnesota Group, there are several types of ethical skills that can develop the individual's ethical and moral reasoning. He further explained that experts in ethical sensitivity can accurately and quickly read a moral situation to determine their responsibilities and roles. Narvaez (2009) added that experts in moral

judgment are individuals who possess several tools and solutions to complex ethical problems, while experts in ethical self-image or identity have abilities to cultivate ethical identities that could lead them to prioritize ethical goals. Ethical sensitivity is an individual attribute that can help someone identify ethical issues and shape the individual's mental and emotional perceptions of other individuals in vulnerable situations (Treviño, Nieuwenboer and Kish-Gephart, 2013). Ethical sensitivity is defined by Shaub (1989.p.7) as the individual's "*ability to recognize that a situation has ethical content when it is encountered*", and according to Hébert et al. (1990.p.141), it is "*the ability to recognise ethical issues*". Patterson (2001) clarified that cognitively, there are many factors that can affect the individual's ethical sensitivity. These factors include the environment in which an individual's live and work in, and the personal attributes of the individual. At higher education level, students are already exposed to some basic foundations of ethical principles but Cheruvalath (2019) and Batha and Carroll (2007) emphasised that students should also learn to develop their ethical sensitivity skills. Srivastava (2012) observed that the ethical reasoning process is initiated by the ethical sensitivity of an individual, and it happens when the individual identifies the ethical issue. Trevino (1986) suggested that the decision makers react to an ethical issue according to their cognitive moral development stage. It must be noted that Rest et al. (1986) used both terms 'ethical awareness' and 'ethical sensitivity' interchangeably to describe ethical awareness. However, Rest et al. (1986) explained that ethical awareness is when the decision maker becomes aware of the ethical implications of the situation and therefore has an "*awareness of consequences*" (Rest et al., 1986.p.6). They described the process as "*Moral Sensitivity*" (Rest et al., 1986.p.24) when a decision maker attempts to interpret and comprehend a situation as being ethical. Treviño, Weaver and Reynolds (2006) explained that ethical awareness can take one of two approaches:

- The first approach suggests that ethical sensitivity is "*one's ability to recognise that a decision-making situation has ethical content*".
- The second approach suggests that the decision maker is one of the many factors that shape moral awareness.

Pintrich (2002) explained that metacognition is also an important skill that can improve ethical sensitivity. Brandimonte, Bruno and Collina (2006.p.3) defined cognition as "*the mental process of knowing, including aspects such as awareness, perception, reasoning,*

and judgment. That which comes to be known, as through perception, reasoning, or intuition; knowledge". However, Pintrich (2002.p.219) defined metacognition as "*knowledge of general strategies that might be used for different tasks, knowledge of the conditions under which these strategies might be used, knowledge of the extent to which the strategies are effective, and knowledge of self* ". (Cheruvalath, 2019) (Batha and Carroll, 2007) added that metacognition influences decision-making and behaviour. Metacognition, as per Schraw, Crippen and Hartley (2006), supports the individual's self-regulated learning, which is one important element besides ethics learning and it helps to regulate the individual's ethical behaviour (Bollom, 1988), which will be discussed later in this subsection. Cheruvalath (2019) noted that one of the important skills in ethical cognition is having the ability to analyse reasons besides developing an ethical judgment and being aware of the strategies that are used to reach that judgment. She also stressed that knowing how to use moral theories and methods to come up with a suitable strategy to develop an ethical judgment, are also essential to improve ethical sensitivity skills. Gauthier (2014) also recommended that students should have abilities to analyse their own weaknesses and strengths in order to reach an ethical judgment and be aware of possible factors that can affect these ethical judgments. For example, factors such as one's emotions and culture, and having the ability to control and manage emotions can reflect one's ethical judgment, and how they regulate these emotions as needed (Cheruvalath, 2019). Kulju et al. (2015) suggested that ethical sensitivity must include skills of leadership and strong ethical character along with critical thinking while considering consequences. Leadership in its general term, consists of three categories, leading self, leading others, and leading performance and change. As reported by Zapalska, Jackson and Zelmanowitz (2016), leading self is having abilities in accountability and responsibility, aligning values, followership, self-awareness, personal conduct, and technical proficiency. Leading others involves having skills in effective communication, team building, taking care of people, mentoring, respect for others and diversity, and management.

As for leading performance, leadership should include abilities in leading one's own performance, willingness to change, ability to manage conflict, having skills in decision making and problem solving, being able to improve and implement improvements, vision development and implementation as well as being creative and innovative (Zapalska, Jackson and Zelmanowitz, 2016). Kulju et al. (2015) concluded that ethical and

professional leadership can provide individuals with guidance to aim at doing good and having strengths and abilities to support ethical processes. They also emphasised that without ethical leadership attributes, the individual will lack the desire and courage to conduct ethical behaviours.

Besides all these skills that contribute towards improving ethical sensitivity, Kulju et al. (2015) also included emotional skills, such as showing empathy and compassion when referring to ethical sensitivity. According to Segal (2011), empathy is the ability to understand other individuals' experiences and life situations, and gain insights into the disparities and inequalities that they are experiencing. Levenson and Ruef (1992.p.234) summarised empathy as "*the ability to perceive accurately how another person is feeling*". Although the literature does not agree on a single definition for empathy, most of them agree on three qualities that exist in the terminologies related to empathy (Eisenberg and Miller, 1987) (Levenson and Ruef, 1992). These three qualities are knowing what others are feeling (Levenson and Ruef, 1992) (Eisenberg and Miller, 1987), feeling what others are feeling (Dymond, 1949), and responding compassionately to other people's distress (Levenson and Ruef, 1992) (Gray, Exter and Krause, 2016). Gray, Exter and Krause (2016) emphasised that empathy is a frequently mentioned key skill and ability, which is something students should develop. Weaver and Mitcham (2016), Cronan and Al-Rafee (2008) and Bairaktarova and Woodcock (2017) added that ethical sensitivity involves decisions expressed through moral obligation and professional concern towards reducing suffering, protecting clients, and promoting public safety. Bairaktarova and Woodcock (2017) believed that moral obligation is the feeling of responsibility to decline or perform a behaviour. Therefore, these feelings can influence intentions and behaviours (Cronan and Al-Rafee, 2008).

Another factor that can influence ethical sensitivity is past experiences. Individuals also do learn from their past experiences, by recalling how they had felt after a similar event in the past, such as how they felt after they had cheated in an exam, or copied a piece of writing, and apply that knowledge to the future. The application of past knowledge involves predicting that the thrill of having higher marks or feeling guilty when conducting such behaviours can affect future perceptions and behaviours (Wilson, Meyers and Gilbert, 2001). Schwartz (2016) specified that learning feedback loops can have an influence on the ethical perceptions of an individual. The author suggested that after a behaviour is conducted, the decision that has been made produces an outcome and

consequences. These consequences are observed by the decision maker, and his or her learning experiences involve an internal evaluation that is based on the decision that has been made and undertaken. This internal evaluation then affects the individual's moral perceptions, and consequently the decision-making process for the next time when an ethical issue arises (Schwartz, 2016) (Ferrell and Gresham, 1985). However, the learning experience or residual impact and consequences are perceived either positively or negatively. This negative or positive perception is weighted through the perceived rewards or sanctions balance of the decision maker. For example, the decision maker would ask whether acting in an unethical manner is worth the risks that have been taken, or whether acting in an ethical manner was not worth the personal costs suffered (Schwartz, 2016).

In either case, these realizations impact the future ethical decisions and perceptions, because these perceived consequences and feedback loops will form the decision makers' personal experiences and history of ethical decisions (Schwartz, 2016) (Stead, Worrell and Stead, 1990). Research also indicated that individuals who partake in unethical behaviours during their higher education are more likely to cheat on income taxes (Fass, 1990), shoplift (Beck and Ajzen, 1991), cheat in graduate and professional schooling (Baldwin et al., 1996), engage in unethical behaviours at work-place (Harding et al., 2004) (Sims, 1993), and abuse harmful substances (Kerkvliet, 1994) (Blankenship and Whitley, 2000). These practices are repeated due to personal experiences and history of ethical decisions formations. This information is saved in the cognitive moral development schemas that are formed as the individual notices similarities and repeated experiences. Each schema consists of a representation of some previous and past stimulus, and it is then used to explain, understand and process new information (Rest et al., 2000). Schemas are then activated by current stimulus representations that may be similar to previous stimuli, therefore, these schemas are essential for humans to understand problem solving, and information processing (Rest et al., 2000).

Hence, recalling past behaviours may influence individuals' moral identities, intentions (Carpenter et al. , 2006) (Jordan, Mullen and Murnighan, 2011), and eventually encourage the individual to act ethically or unethically (Jordan, Mullen and Murnighan, 2011) (Mazar, Amir and Ariely, 2008). For instance, Ajzen (2002) suggested that past experiences can increase intentions to conduct behaviour. Cronan and Al-Rafee (2008) supported these notions indicating that factors such as past behaviour where one indulged

in acts such as digital piracy could influence them to repeat such unethical behaviours again. Another factor that results from learning feedback loops and past experiences is self-regulated learning. According to Cleary and Sandars (2011.p.368), self-regulated learning is a "*cyclical process whereby individuals proactively generate and use feedback about their learning to optimise their strategic pursuit of personal goals*". As discussed earlier, part of the internal reward system is self-image (Mazar, Amir and Ariely, 2008) and the challenge is between balancing motivational forces and maintaining positive self-concept and image. Self-regulation is one form of this balancing approach (Zhong, Liljenquist and Cain, 2009), and it takes place when individuals fail to reach a goal, and they are then motivated to exert more effort to compensate for this failure by experiencing moral obligation (Baumeister et al., 1994) (Tetlock et al., 2000) (Banerjee, Chatterjee and Sinha, 2012). Another form of self-regulatory is learning from mistakes and being open to new challenges in mastering and learning tasks while continuing to self-reflect, to improve and attain levels of these competencies (van Grinsven and Tillema, 2006). This form of self-regulatory behaviour boosts leadership skills and increases both, self-leading skills and leading performance and change (Barkhordari-Sharifabad, Ashktorab and Atashzadeh-Shoorideh, 2017). Also, feeling guilty can play an essential self-regulatory role by providing critical feedback to the individual's self-thoughts, intentions, and finally behaviours (Zhu et al., 2011). However, gaining all these ethical skills does not mean that the student will behave in accordance with what they know, because there are many factors that make up the equation.

Although many students can hold high ethical sensitivity skills, they may sometimes behave unethically. Research suggests that many factors can play a role in encouraging students to engage in unethical decisions and behaviours. For instance, Kocanjer and Kadoić (2017) stated that advanced high technology and availability of various applications and devices can all facilitate and allow unethical behaviours and decisions. These include smartwatches, glasses, appliances and applications that can solve physics and mathematical problems. Cronan and Al-Rafee (2008), Simpson, Banerjee and Simpson Jr. (1994), Triandis (1979) and Limayem, Khalifa and Chin (2004) also believed that factors, such as socio-legal and socio-cultural attitudes and computer and digital attitudes can impact ethical perceptions. They also indicated that situational factors, habits, fast internet connections, peer-to-peer internet networks which are difficult to control, and inexpensive high storage capacities, all can facilitate unethical perceptions

and behaviours. Such technological facilities can encourage some unethical behaviours, such as digital piracy, sharing illegally copied and downloaded software, movies, music, games, etc. and illegal movies streaming from web sites are some examples of unethical abuse of advanced technology (Phau et al., 2014). Gaberson (1997) also remarked that students may not always know that they are behaving unethically, and usually students turn to cheat due to pressures to be the best, emphasis on perfectionism, misconceptions about making mistakes, and time pressure. Moreover, Barnett and Dalton (1981) believed that factors, such as intelligence, definitions of cheating and personality characteristics will all influence ethical perceptions. For example, Rodzalan and Saat (2016.p.296) found that honesty could be perceived differently from one student to another, "*One person's bribe is another's gift*". Therefore, the level of importance may differ from one person to another. McCabe, Trevino and Butterfield (2001) suggested that increasing competition in the job marketplaces the pressure to do well on students. These pressures can lead to them engaging in various forms of unethical behaviours (McCabe et al., 1996). Examples of these pressures are fatigue, stalled or impaired moral development, and absence of role models (Gaberson, 1997) (McCabe, Trevino and Butterfield, 2001). Thus, LaDuke (2015) emphasised on the importance of assessing students understanding of different ethical issues. This perspective comes from some research findings that suggest some unethical behaviours, such as manipulating laboratory results are not perceived as cheating by some students (Arhin and Jones, 2009).

3.5 Ethics education in engineering

In engineering education, the RAEng highlighted that SEPs include several professional skills that are considered critical to the engineering profession which should be developed by professional engineers aside from ethical sensitivity skills. In recent years, engineering education has placed growing importance on the development of ethical skills among students which is why such skills are now viewed at par with other core skills like technical and generic skills. Perlman and Varma (2001) believed that ethics education started being part of various engineering programmes due to factors such as the nature of technologies, growing cultural differences, and the potential impact on the environment. They also suggested that other areas like social changes and new concerns towards ethical responsibility pushed engineering programmes to consider ethics education in their curriculum. Banik (2011) noted how ethics education is important for promoting the common good as part of one's personal actions and to avoid harming anyone including

oneself. Referring to some of the familiar scenarios of disasters, tragedies, and scandals, Harris Jr et al. (1992) stated that one of the objectives of ethics education is to prevent repeating such unethical cases where engineers had a major role. The main purpose of ethical education is to educate students about ethical decision making and getting them to understand the consequences of unethical actions in a profession. Moreover, Bucciarelli (1994) clarified that engineers are expected to do more than just solve problems rationally, they are also expected to construct systematic methods to reach the desired and specified outcomes. Bucciarelli (1994), Herkert (2001) and Bowen (2012), stressed how significant judgements and decisions are expected to be made all the time in the engineering profession. This includes judgments and decisions on the robustness of products, users, quality, responsibilities, societal benefit, risks, health and safety and cost among others.

Bucciarelli (1994) specifically noted how the nature of engineering practice often requires engineers to work in teams or groups. Team members bring different interpretations and perspectives to a given task. Each of them might have their own styles and ways of working on areas such as modelling and abstracting, infrastructure design, handling of instruments and tools, making prototypes, using hardware, reference, catalogues, regulations, and codes among many others. Each team member has different competencies, interests, and responsibilities, which may create varying perspectives for a given scenario/situation. Different team members will analyse, propose, react, and may make decisions differently. This might potentially lead to conflict in some situations.

Banik (2011) discussed that ethics education in engineering mainly aims to stimulate engineering students' ethical reasoning. For instance, young professionals often get caught by surprise when faced with a complex ethical issue in their professional lives. If they have never been exposed to such scenarios before, the situation will be difficult for them to manage and some of them might struggle to make a professional decision without compromising their ethical morality and boundary. In this context, ethics education might play an important role in training students to reflect critically on a situation and understand the various implications of ethics in decision making. Some of the studies suggest that students' ethical sensitivity can be increased by increasing their ethical awareness when exposed to ethics education. Students will realise, that as professional engineers, they will have to face certain ethical issues or conflicts at some point in their professional careers. Thus, exposing them and training them during their academic lives,

will help develop their ethical decision-making skills and how they work and make decisions under pressure or in conflicting environments. Macklin (1980.p.82) summarises that "*the teaching of ethics is a pedagogical activity that involves critical skills, analytical tools, and techniques of careful reasoning*". The RAEng further explained that ethics education can develop engineering students' skills in reasoning, communication and reflection. These skills can enhance engineering students' abilities and can help them engage effectively with other aspects of the engineering profession and programme, such as work placement and group work.

However, there is a debate on the level at which ethics education should be included in the curriculum: should it be part of an undergraduate or postgraduate curriculum? Colby and Sullivan (2008), Macnish and Lawlor (2014) and The Royal Academy of Engineering, curriculum map all recommended that ethics should be taught to engineering students at an undergraduate level. Colby and Sullivan (2008) illustrated that engineering programmes are obliged to prepare and help students to understand the central ethical values of wellbeing, and environmental safety and protection. For them, such approaches need to stem from an undergraduate level in order to make an impact. Newberry (2004) and Baker (1996), on the other hand, felt that engineering ethics should be taught at a later stage and should focus more on postgraduate students. Newberry (2004), Alpay (2013) and Duffour et al. (2010) mentioned that teaching ethics to engineering students can be problematic as it is influenced by different factors such as subjectivity, ambiguity, and has philosophical contents which may create high levels of ethical knowledge and intellectual engagement, but on the other hand low levels of emotional engagement. Newberry (2004) explained that the reason for such perspective is that at the undergraduate level, students are still not ready for serious emotional engagement with ethical issues. On the other hand, postgraduates are more mature and possess more experiences and responsibility, both personally and professionally, and their emotional engagement with the social and ethical issues will be deepened by ethics education. also, Newberry (2004) believed that engineering undergraduate students may perceive ethics as an irrelevant waste of effort and time and a common sense issue, moreover, these students join engineering schools to avoid these subjects and do more engineering things. Baker (1996) brought attention to the fact that in order to highlight the importance of ethics in the engineering curriculum, its significance should first be emphasised in the

graduate curriculum. However, Banik (2011) argued that the level of study when students are taught ethics does not matter, because, it should be taught wherever appropriate.

3.6 Learning objectives of ethics education

It is important for engineering academics and educators to present all their students with useful, meaningful and understandable information about ethics. This can be achieved by understanding and accounting for the diverse nature of students' values and perceptions (Bairaktarova and Woodcock, 2017). The Royal Academy of Engineering (2011) highlights the importance of developing ethical key skills that are essential for the Engineering profession. For them, these skills are about:

- Recognising the ethical aspects involved in engineering decisions
- Identifying the different, and, sometimes, competing ethical concerns they may face
- Analysing the issues that can underlie these ethical concerns
- Responding effectively to these concerns
- Fulfilling ethical expectations of the public

These objectives support Rest's model, which is discussed earlier in Chapter 2. Rest's Ethical Decision-Making Model explains that an individual's ethical decision-making process goes through four cognitive processing stages:

- Moral awareness,
- Developing a moral judgement,
- Prioritising moral issues over other issues or having a moral intent, and
- Acting on moral concerns or moral behaviour (Rest et al., 1986).

The RAEng's emphasis on improving certain ethical skills aligns with Rest's four components. For example, the RAEng highlighted that recognising the ethical aspects involved in engineering decisions and identifying the different, and, sometimes, competing ethical concerns they may face, are important ethical skills. Rest's Ethical Decision-Making Model's- moral awareness describes ethical awareness as the individual's ability to recognize the moral issue in a situation. In addition, the RAEng's recommendation on being able to analyse the issues that can underlie these ethical concerns in the engineering profession relates to Rest's et al. (1986) ethical judgement and motivation. Ethical judgement refers to the process of evaluating and formulating the

possible solutions to an ethical issue and developing a moral justification for it, while ethical motivation refers to the intention of choosing the moral decision over other different values and committing to the moral choice. Finally, The Royal Academy of Engineering (2011) highlights the importance of responding effectively to these concerns, and fulfilling ethical expectations of the public, which is in line with Rest's fourth stage of ethical behaviour which is acting in accordance with moral concerns. Thus, in this context ethics education in the engineering profession should aim to develop students' ethical awareness, reasoning, and ethical perceptions in general.

3.7 Approaches to ethics education in engineering

An 'approach' in this context "*is a way of looking at teaching and learning*" (BBC British Council, 2018). Ethics educators use a variety of approaches and methods, but the context of ethics education and its relationship to professional ethics is what influences students' ethical perceptions and behaviour. For the purposes of this thesis, three approaches have been identified. These are pragmatic, embedded and theoretical approaches. These classifications are based on a publication titled "Approaches to Ethics in Higher Education, Teaching Ethics Across the Curriculum" by the Learning and Teaching Support Network, School of Theology and Religious Studies at the University of Leeds (Illingworth, 2004).

3.7.1 The pragmatic approach

The pragmatic approach is the initial and starting point 'framework' of professionalism. These frameworks of procedures and sets of rules are defined by the bodies in charge of raising or maintaining professional standards. In Higher Education Institutions (HEIs), students begin with their institutes' codes of ethics. Students will need to be aware of their universities' codes and apply them to their own behaviours while the students who are required to do projects as part of their course works, or desire to pursue employment in scientific research professions should be familiar with the "Research Ethics Committees" and the required academic conduct. Most universities today have their own principles and codes of ethics. This is to ensure the members of the university, whether staff or students are committed to the highest standards of ethical conduct in all their activities (University of Birmingham, 2016-2017). According to Molander (1987), codes of ethics intend to compensate for deficiencies in the market and the law mechanisms and reduce ethical decisions' issues and dilemmas. They also intend to reduce and forbid unethical behaviours, foster a positive corporate climate, provide guidance to students and staff

members, generate external business confidence, and validate disciplinary conducts. Rezaee, Elmore and Szendi (2001.p.176) added that financial administrators in universities believe that codes of ethics "*can demonstrate the university's commitment to a set of standards that society expects them to meet*". They also indicated that codes are essential to resolve the ethical issues that may arise in the HEIs. For example, Ford and Richardson (1994) remarked that the existence of codes of ethics, rewards and sanctions can positively affect ethical behaviour. Moreover, McKay et al. (2007) noted that the presence of codes of ethics increased ethical sensitivity to unethical behaviours, but not the frequency of unethical behaviours. This can be related to the fact that ethical codes of conduct may not and cannot cover or resolve all ethical issues (Yahr, Bryan and Schimmel, 2009). Overall, HEIs in the UK share similar general ethical rules and regulations about academic misconduct (Bradfield, 2016). For example, the University of Birmingham provides a "Guidance" on plagiarism for students online (University of Birmingham, 2019). The university defined plagiarism and what they considered as types of plagiarism, the student's responsibilities, what happens if plagiarism is accidental, how schools deal with plagiarism, appealing the decision and confidentiality. In a similar way, the University of Dundee (2019) provide their students with what they consider as academic misconduct, types of misconduct, prevention and responsibilities, procedures and penalties and appeals. However, some details in these codes might vary. For example, the University of Dundee (2019) added more details about degrees of offences and their penalties. If the offence is minor, such as referencing or quoting the work of others, students will be provided with additional support to gain the required skills in academic writing. If it is a major offence covering all other offences other than referencing and quoting, it will be dealt with using the University's code of misconduct in research. This might suggest that all institutes follow similar general guidelines but differ a little in providing more details to their students.

In addition, Pinsent Masons Guidance for Higher Education Institutions states that the university can undertake certain disciplinary proceedings in relation to abusive behaviour and a new ethical regulation might be added to their code based on that incident (Bradfield, 2016). Codes of ethics are taught differently in each HEI, some use modules or online tutorials on integrity and academic misconduct (University of York, 2018), but all educational institutes agree that effective ethics education requires a supportive ethical learning environment (United Nations Office on Drugs and Crime, 2018). As stated by

the United Nations Office on Drugs and Crime (2018), interacting within an ethical environment while studying at university can enhance the students' moral sensitivity and ethical behaviour. It can also help them realise the importance of ethics in their daily lives, whether personal or professional and the important roles they are playing in society more broadly. In addition, when ethical values and principles are emphasized by academic and non-academic staff, the students can relate and observe the consistency of the ethics that prevail inside and outside of their classrooms, then ethics would more likely be considered as valid rules by the students (United Nations Office on Drugs and Crime, 2018). However, after graduation, the professional codes of conduct are the next level of these pragmatic approaches in ethics education. These approaches are considered pragmatic because the ethical considerations are considered and defined in accordance with their potential practical consequences for the student (Bradfield, 2016).

3.7.2 The embedded approach

The embedded approach involves some aspects of professionalism as well but in a different way. The embedded approach interprets professionalism in terms of the students' newly formed or prominent sense of self-identity, while in the pragmatic approach the concentration of professionalism is on the behaviour that is constrained by an agreed code of conduct. The modules that present ethics education to students are "embedded" and the ways of introducing ethical issues are holistic and integral parts of a broader area of ethical concern that has an important ethical dimension, such as "Fitness for Practice" (Bradfield, 2016.p.10). In other words, ethics education in this approach is taught as part of a general understanding of morality, therefore, ethical issues in a particular discipline or area are embedded in more general ethical concerns (Ozolins, 2005). In this way, students can exercise greater autonomy in their ethical decision making. The embedded methods foster the sense of self-identity and can expand to accommodate professionalism by being part of multidisciplinary teams, which makes this approach a good approach for interdisciplinary courses. Thus, this approach places emphasis on personal autonomy (Bradfield, 2016). This approach has the advantage of reaching the largest number of students, in a crowded curriculum programme. This is because it could be challenging to find enough time to provide sufficient and coherent coverage of ethics education or provide enough time in the busy schedules of academic staff members (Downie and Clarkeburn, 2005). An example is embedding ethics in introductory courses to students. In this approach, ethics and ethical issues are introduced

to students at the early stages of the engineering programmes and at the beginning of the curriculum, for two or three sessions mainly at an introductory level. However, this approach alone cannot provide students with enough knowledge about ethical issues and how to solve them in the engineering discipline. Moreover, fresh students do not have the necessary background to understand the ethical issues and implications involved in the engineering profession (Rabins, 1998) (Colby and Sullivan, 2008). An example of a university that provides this type of ethics education to their engineering students is Lancaster University (2019) in their BEng Nuclear Engineering programme. Students in their 1st year are taught different modules that ethics are embedded into. Examples of these modules are:

- Design, Innovation and 3D Thinking
- Heat transfer
- Manufacturing Fundamentals
- Programming fundamentals

In these modules, students are encouraged to solve real-world problems, using logical design ways, tools and techniques such as 2D and 3D CAD to reach a design that meets the initial requirements. To achieve this, students work in teams, learning about the life cycle of the product they are working on, starting from meeting customers' requirements, then designing the process and ending with recycling and or disposing of the product. The modules also cover other topics, such as the human brain, marketing, completing a statement of requirements and packaging. Students also learn chemical and nuclear reactions and how energy is obtained from renewable energy sources.

3.7.3 The theoretical standalone approach

This approach uses philosophical theories to revise classic ethical principles in order to apply them to the current practical and professional day to day ethical issues and problems (New World Encyclopedia contributors, 2016). This approach uses a combination of utilitarianism and deontological ethical theories, virtue ethics of religion while Aristotelianism and Confucianism can also be used and mixed with case-based projects or reasoning scenarios (Rabins, 1998) (Colby and Sullivan, 2008) (Bairaktarova and Woodcock, 2017). For example, at the University of Leeds (2019), the Civil Engineering BEng students receive ethics teaching equivalent to a 10-credit module, with lectures and seminars in each year of the study. Examples of the topics include:

- Professionalism and codes of ethics
- Environmental concerns, climate ethics and sustainability
- Whistleblowing
- Bribery and corruption

The engineering department coordinates their teaching with ethics specialist from the National Centre for Inter-Disciplinary Ethics Applied (IDEA), which is based at the University. On completion of the degree at Leeds, students should be able to:

- Understand the difference between legal and ethical issues
- Understand the meaning of being a professional, and the ethical implications of the profession
- Understand the difference between empirical and non-empirical considerations involved in engineering decision-making, and recognise the importance of ethical judgements,
- Articulate ethical considerations and justify decisions

As for case-based reasoning scenarios, these approaches include discussions' and sessions of ethics and professional responsibilities where the focus is mainly on public safety and incorporating what is related to the subject matter of other modules, such as discussing well-known cases and disasters of engineering failure. Using these cases can help students link between safety values and cost values (Colby and Sullivan, 2008) (Bairaktarova and Woodcock, 2017). The use of case-based scenario discussion methods are the most common and popular approach in ethics education in general and in engineering in particular (Martin, Conlon and Bowe, 2018) (Bairaktarova and Woodcock, 2014).

3.7.4 Case-based scenario discussion methods

These approaches usually interpret case-based instruction methods, and according to Colby and Sullivan (2008), Bairaktarova and Woodcock (2017) and Martin, Conlon and Bowe (2018), this is the most commonly used method to teach ethics to engineering students. The literature describes a variety of ways that case-based scenario methods can be employed to support ethics education and research, and sometimes it is referred to as the "case method" (Hilburn, Towhidnijad and Salamah, 2014) (Friedman and Sage, 2004). Case methods are viewed as learning tools and used to encourage debate,

participation and understanding. Case methods can be mixed with other pedagogies such as discussions, lectures, and project work (Hilburn, Towhidnijad and Salamah, 2014), and the usefulness of case studies in the engineering programmes has been documented in the literature for almost 20 years (Davis, 1993) (Brocato, 2007). In these discussions, students are exposed to escalating ethical case scenarios. These scenarios aim to provoke students ethical thinking and encourage them to realise whether they would behave in a way that is consistence with the way they believe and why. During these scenario discussions, students are encouraged to talk to other members of their groups and discuss the possible solutions and alternatives. Determining what is wrong and what is right in a situation would be influenced by the students' backgrounds, experience, influences of the other participants, and how each participant can closely relate to the situation they are presented with (Ashe, 2005). In accordance with Richards and Gorman (2004.p.1), a case is "*a narrative account of a situation, problem, or decision usually derived from actual*", and usually, a case reflects a real ethical issue in real-life engineering (Martin, Conlon and Bowe, 2018) (Bairaktarova and Woodcock, 2017). These cases are often dynamic, complex open-ended, with no clear-cut solutions, and the best solution to the given case problem depends on the relative importance students assign to various criteria. In engineering, for instance, cases can provide a technical issue, design challenge, or ethical dilemma (Richards and Gorman, 2004). Case methods can foster the development of ethical cognitive skills (Leake, 1994) (Kolodner, 2014), and address issues that require judgement, analysis, independent thought, perspective taking, decision making and critical thinking (Richards and Gorman, 2004). Shapiro (1988) stated that the cognitive in general goes through three stages to develop skills:

- Providing information and knowledge about different techniques, which is usually achieved by providing students with lectures and readings.
- Exposing students to different problem sets and exercises, which can provide the necessary tools for the students to explore the applications and the potential limitations of the different techniques.
- Promoting the development of philosophies, approaches and skills using case methods.

This approach is found to be one of the most effective ways to understand ethical issues, because it can help students recognise ethical issues in day to day life scenarios and to

develop the essential ethical abilities to analyse these issues. Pedagogically, case methods offer multiple advantages, one such example is allowing students to cooperatively and actively engage in problem-solving, rather than simply and passively listening to lectures (Dyrud, 2004) (Bagdasarov et al., 2013). Moreover, it allows students to learn from each other's experiences, exercise their ethical imaginations, and use their abilities to examine a given problem from multiple perspectives (Angelo and Boehrer, 2002). Case-based methods can take various forms, such as real-life cases (Colby and Sullivan, 2008) (Richards and Gorman, 2004), the most popular discussion case example is Challenger space shuttle disaster, and or fictional ethical case scenarios (Martin, Conlon and Bowe, 2018) (The Royal Academy of Engineering , 2011). Examples of these approaches are discussed next.

3.7.4.1 Challenger space shuttle case

The first example is the Challenger disaster. In January 1986, the US space shuttle "Challenger" exploded a minute after being launched, killing the seven astronauts piloting the shuttle. The explosion was due to a fault in the shuttle's boosters' rings' design, which caused combustion hot gases to leak from the ring's side and burn through the fuel tank (Lynch and Kline, 2000). Figure 3.1 demonstrates Challenger's rocket boosters design.

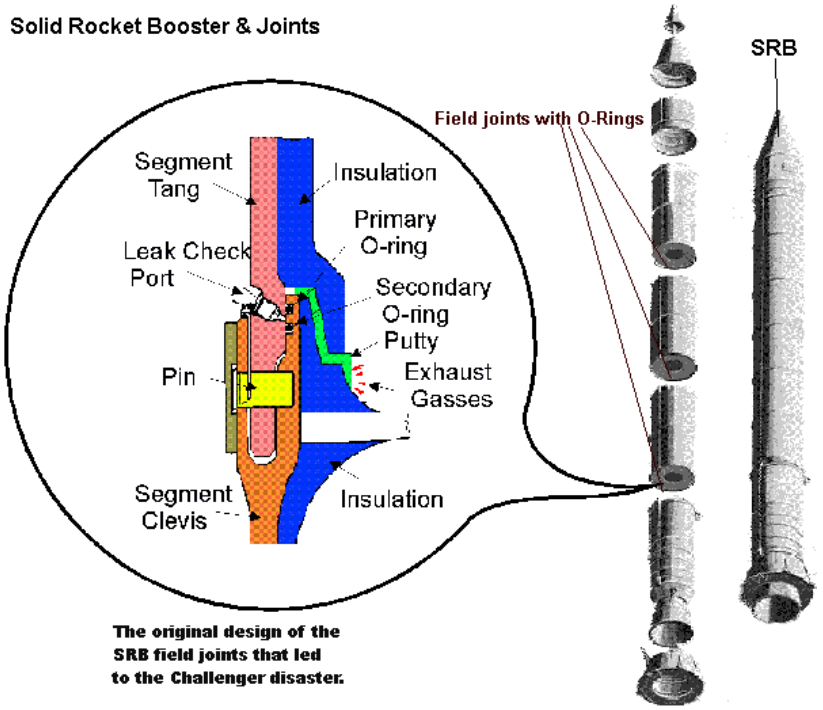


Figure 3.1 *Challenger's rocket booster design. Adopted from (Pics-about-space.com, n.d.)*

The head of the engineering design team had a teleconference with NASA, the evening before launching the shuttle. At the beginning of the teleconference, he was against launching because he had concerns about the seal design. Yet, his recommendations were reversed during the teleconference, with fatal consequences. This disaster involved several ethical issues:

- Professional responsibility,
- Ineffective communication,
- Meeting mission plan schedule versus safety concerns,
- Clearly unsafe weather conditions for launch,
- Relying on emergency backup rings, and
- Ignorance of the known design flaws and faults (Penn State Univesity, 2008).

In relation to the first ethical issue, the engineering design team was modifying the rocket boosters' rings in the shuttle. This process kept the shuttle from completing its scheduled flight missions, and the engineers had a very limited implementation period. Time limit pressures caused the management team to give less priority to the astronauts' safety. For example, the head of the design team at previous times had warned the management team about problems with the joint, but the management team asked him to think, not as an engineer, but as a manager (Davis, 1998). In the end, the management team stood in the way and this issue was simply dismissed (Penn State Univesity, 2008). The main issue was that the engineering team did not escalate this to avoid the loss of the astronauts' lives and leaving their families and friends bereaved. Leveson and Cutcher-Gershenfeld (2004) reported more details in relation to the engineering team's lack of professional responsibilities. For example, they reported that the whole situation was related to the engineers' lack of adequate resources devoted to safety, failure to report the requirements needed to resolve the problem and misrepresenting the criticality of the problem. They also added that the engineering team did not involve the safety personnel in discussions and decisions. All these shortcomings and deficiencies created one of the most horrible disasters as a result of the engineering design team's failure in their responsibilities, and the management's ineffective communication (Penn State Univesity, 2008).

Another ethical issue involved in this disaster was the lack of effective communication between NASA's engineering design team and the management team. The communication between the head of the engineering design team 'Morton Thiokol' and

NASA's management team was very poor. Boisjoly (2006.p.2) reported that after the accident, one of the engineering team members stated that the meetings before launching Challenger were filled with "*intense customer intimidation"*. This may have resulted in creating an uncomfortable atmosphere where everyone could not express their true opinions and make thoughtful decisions. In addition, Morton Thiokol did not have enough data on how the rocket's boosters' rings may perform at temperatures that are lower than 51 ºF, and the temperature on the morning the shuttle was launched was 36 ºF. Although some members of the engineering team believed that under these conditions, the boosters could still function safely, many of the members were concerned about the possibilities of the temperature casing a failure (Boisjoly, 2006). The failure of the engineering team to effectively express their concerns to NASA's management team and convince them to reschedule the shuttle's launch mission is another factor that led to this disastrous accident. Another example of failure in communication is when NASA's ground crew management were outside measuring the thickness level of the ice on the shuttle on the launch day. The ground crew used infrared cameras to allow them to measure and record the temperature of each part of the shuttle, and recorded 8 ºF a night before the launch, which is far below the tested temperature. Nonetheless, these essential information were not reported to NASA's management team nor to the engineering team, because the crew was instructed only to report the thickness of the ice measured on the shuttle (Penn State Univesity, 2008).

Another ethical issue in this disaster is related to the pressure on NASA to increase their flight rates, and this increase means ultimately reducing NASA's abilities to address any emergency issue safely. In other words, increasing flight rates lead to reducing personnel's dedications to launching schedules, and eventually, the extra launching missions' requirements. In turn, this also placed excessive pressures on NASA's management team to rush their judgements in relation to the potential and critical issues that may delay the launching schedules, which made it appear like sticking to the launching schedule was more important than the astronauts' safety. As (NASA) indicated in their report, the Presidential Commission's recommendation report suggested that NASA should establish flight rates that are consistent with its resources. Moreover, a strict payload policy was recommended which included controlling shuttles and cargo changes to limit the financial pressures, and these changes were to be applied to crew training and schedules. To address these recommendations, NASA implemented various

measures to reduce payload requirements for the National Space Transportation System (NSTS) launches and established other strict rules to prevent last minute changes or additions for NSTS requests. NASA's measures also included reducing their dependency on space shuttles to transport communication satellites since these satellites could be transported on vehicles that were developed by the Department of Defence (NASA). NASA also developed and conducted strict assessments of these vehicles' processing cycles, processes of mission plans to determine their flight rates capacities, and preparations of the payload process. After completing these assessments, NASA established a new control process with strict policies that could provide "freeze-points" series throughout the missions' planning phases. The control process strictly defined the vehicle, the payload of the vehicle, and the mission characteristics, such as the mission's planned timeline to reduce the chances of last-minute mission change or payload (Penn State Univesity, 2008).

As mentioned earlier, although some engineers believed that extremely cold temperatures could cause major problems, others believed that the boosters' rings would still work properly, and eventually, this inconclusive opinion led to launching the shuttle. The major ethical fault involved in the decision is NASA's choice to launch the shuttle regardless of the potential risks and the numerous proposals to reschedule the mission launch. Although delaying may not please NASA's management team, the safety of the seven astronauts onboard Challenger is more important than any financial penalties. According to the National Society of Professional Engineers (2019) "*hold paramount the safety, health, and welfare of the public*" is the first and most fundamental ethical principle. Yet, NASA did not give enough and enough attention to the engineering team's concerns about the rings function in cold temperatures. Due to the cold weather on the launch day, the rings were unable to seal the fuel within the rocket boosters properly, and as a result, the flames passed through the small hole. Eventually, this led to the boosters breaking loose from the shuttle's body, colliding with and piercing the external fuel tank, which allowed the liquid oxygen and the liquid hydrogen to be released into the atmosphere and mixed which caused an ignition. If a human's life is at stake, no corners should be cut, and any potential issue must be dealt with before launching any mission. The launching decision was made to save money and please the intimidating customers, but the results were extremely devastating (Penn State Univesity, 2008).

The engineering design team were already aware of the rings' design issues which were inspected previously. However, the situation was not considered critical because there was a secondary backup safety ring in case of the primary ring failure. Admitting there was a problem with the main ring and relying on an emergency backup ring to control and prevent a possible failure is not an ethical decision. The ethical decision in this situation would have been to stop all shuttle launch missions until the issue was resolved, because, it is not ethical to gamble and risk people's lives if emergency rings would function better and more effectively than the primary ring. If the sealing control process of the rings was originally perceived critical enough to include another backup emergency ring, then the issue with the primary ring design should have been addressed before authorising the shuttle launch. After the Challenger disaster, NASA started prioritizing astronauts' safety as their priority during any mission launch. Examples of their new safety measures for astronauts is developing new monitoring systems to measure the cabins' pressure and determine when oxygen should be supplied to the cabin, and ensuring astronauts have the necessary parachutes for in case of emergency skydiving (Penn State Univesity, 2008).

Another significant factor that contributed to the Challenger's disaster was the ignorance of the potential problems that could result from the rings' design, which were supposed to seal two sections of the rocket boosters. Boisjoly (2006) who was among the engineering design team, expressed his concerns about the rings' safety after discovering some damage in the components during an investigation test a year prior to the launch. The investigation found a critical flaw in the rings' design, which would result in preventing a proper seal of the rocket boosters at lower temperatures. Based on these results, Boisjoly (2006.p.1) informed the team leader, Morton Thiokol, that "*It is my honest and very real fear that if we do not take immediate action to dedicate a team to solve the problem, with the field joint having the number one priority, then we stand in jeopardy of losing a flight along with all the launch pad facilities*". NASA's response to this memo was forming an official team to investigate these issues. Eventually, a meeting was set up between NASA's management team and the engineering design team. However, NASA instructed Biosjoly not to express the urgent critical issues and the necessity to fix the issue, but only to emphasise on the necessity of improving the rings' design during the meeting (Boisjoly, 2006). Since Boisjoly could not express the critical issue and its nature during the meeting, NASA's experts ignored his concerns and decided

that they did not want to delay the shuttle's scheduled flight mission. As the situation indicates, both NASA's management team and the engineering design team leader were aware of the issues involved in the rings faulty design, at least six months prior to the disaster, but both teams decided to continue with the scheduled launch. Biosjoly, afterwards, repeatedly reported and stressed on the urgency of the issue and his concerns about the lack of managerial support. The evening prior to launch, a teleconference was held and Biosjoly repeated that the known faults with the rings were being ignored. He added that the focus of the meeting was based on the predicted temperature on the launch day, which was 18 degrees Fahrenheit, and the engineering team persuading them not to launch. At this meeting, the vice president of the engineering team was also concerned, and he supported Biosjoly's concerns and recommended not carrying out the launch. The engineering team then asked the management team for a few minutes off-line discussion to discuss and re-evaluate the data they had. A heated debate during the discussion took place between the engineering team and the team leader's executives regarding the data on the issues with the seals. Eventually, the engineering team was pressured to create a list of supporting data to be presented to the management team and recommend launching, and NASA accepted the 'to launch' recommendation without any further discussion and proceeded with the ill-fated launch preparations (Boisjoly, 2006).

The investigations afterwards suggested reviewing the Shuttle Program Management Structure and establishing a Shuttle Safety Panel to report any issues involved in the operational issues such as risk management, launch commitment criteria, flight rules and flight readiness. The investigation team also recommended that the management panel should include an astronaut who holds a space flight experience. NASA responded to these recommendations by making the required changes.

When this case is used, students are usually asked to examine the ethical issues involved with this disaster. They are asked to review the ethical responsibilities that were neglected in this scenario. They are encouraged to question what could have been done differently. Such discussions help students to understand that every issue has its specific causes, and that each issue should be considered and resolved through an adequate level of analysis and detail to reduce the risk, at least to an acceptable level to prevent an accident of such nature. The impacts and risks involved in this case study will demonstrate to the students why the work process and solutions should be detailed, and how efficient the solutions should be. In addition, Vaughan (1996) pointed out that in the example of the Challenger

disaster, the range and meaning of what was considered unsafe can be changed and altered during continuous interactions of multiple subjects involved, which, eventually, can lead to normalizing the deviance.

3.7.4.2 Fictional case scenarios

In this approach, students are exposed to escalating ethical case scenarios. However, these cases are not based on real-life case scenarios. Harris Jr et al. (1992) stipulated that real-life disaster case scenarios, such as Challenger, should be avoided, because they believed that students may think of these events as irrelevant to them and that they are incidents happen to other people. In light of this argument, other researchers suggested similar approaches, by creating fictional case scenarios that involved situations which students could better relate to (Wilson, 2013), and incorporating ethics as a consideration of design rather than a reaction to a catastrophe (Haws, 2001). For example, Vesilind (1996) used fictional academic dishonesty cases to teach engineering ethics, Santi (2013) used client/employer and billing fictional cases to teach engineering ethics, and Bero and Kuhlman (2011) employed the same fictional scenarios to design problems to teach solving ethical dilemmas in engineering. In addition, others developed cases on accepting gifts from suppliers (Pritchard, 1992), offers from a fellow engineer (Kansas State University , 2009), financial responsibilities (American Physical Society, 2009), patent ownership rights (Schrag, 1998), software protection and intellectual property (Massachusetts Institute of Technology, Department of Electrical Engineering and Computer Science, National Academy of Engineering, OEC, 2002) and many more examples. Martin, Conlon and Bowe (2017) explained that fictional case scenario methods are considered successful in engineering pedagogy, because it helps improve students' critical-thinking, reflection and ability to make connections across multiple areas. It also improved students' understanding of ethical concepts and allowed more connections and engagements to be made to the real world. According to Beder (1999), Vaughan (1996), Conlon (2011) and Davis (1991), case studies can help capture the metaphysical aspects of the engineering profession. For example, Beder (1999) specified that the engineering practice is not individualistic but involves social processes that take the form of social interactions between teams, the clients, and other stakeholders, which makes the process "*surprisingly open-ended"* (Beder, 1999.p.15). Conlon (2011) and Davis (1991) implied that the engineering work environment can form and contain constraining or enabling factors which can affect the engineer's perceptions and

performance. Similar to the historical cases, fictional cases aim to integrate wider contexts of aspects and issues that take place in the engineering profession and to address the complexity of the engineering practice (Martin, Conlon and Bowe, 2017). Some researchers prefer to adopt already existing scenarios, such as Martin, Conlon and Bowe (2017) who adopted their case scenarios from Pitchard (1992) with some modifications, while others prefer to design their own cases entirely, such as (Dyrud, 2004).

3.8 Examples of ethics education in engineering programmes

In order to enhance the development of ethics education, many U.K universities are encouraging ethics education in their curricula, and according to Illingworth (2004), all educational fields have ethical dimensions. She suggested that for an increasing number of students, ethics is becoming more and more essential as part of a curriculum. This growing essentiality is related to the growing interest of the media in shedding light on issues related to unethical professional and research conduct, which is a broad and growing area of HEIs' curriculum. Engineering education is not different from other higher education programmes and has applied this awareness in the engineering curricula. Some examples of ethics education in engineering programmes are illustrated in Table 3.1.

HEI	Degree	Approaches of ethics education (module, or part of a module)	Module overview
University of Sheffield	MSc (Eng) Process Safety and Loss Prevention	The department offers different modules for the students. Some of these modules include topics that discuss different ethical aspects. Modules such as: o Process Safety Management and Loss Prevention o Introduction to Hazard Analysis and Risk Assessment o Dissertation (for MSc) o Human Error and Human Behaviour	This course seeks to deepen students understanding and equip them with expertise and skills in process safety, loss prevention and risk assessment. They prepare students for careers in the chemical, oil and gas, nuclear and pharmaceutical industries, or any consultancies that service these sectors. They use a mixture of discussions and lessons, real-life case studies, and workshops computer sessions (The University of Sheffield, 2019).
University of Manchester	BSc Materials Science and Engineering	Students in their 2nd year, are taught different modules that ethics is	The modules in this level of study are designed to provide students with the fundamental concepts that are needed to understand materials synthesis, and the sustainability issues in processing and recycling. Moreover, they aim to improve students' employability by equipping them with the

		embedded in. Examples of these modules are: o Materials Synthesis and Sustainability o Design, Management and Team Project o Engineering Alloys in Service	important skills that are necessary for working in a commercial engineering environment. Students are introduced to different case studies in the power and transport industry, such as weight reduction strategies in future automotive designs, performance versus cost and economics of corrosion prevention in nuclear power generation (The University of Manchester, 2019).
Coventry University	BEng Aerospace Technology	Students in their 2nd year, are taught different modules that ethics are embedded in. Examples of these modules are: o Aircraft Engineering Management o Avionics and Instrumentation o Human Factors in Aerospace o Aircraft Aerodynamics	The modules in this level of study try to provide a broad introduction to each of the main aeronautical engineering disciplines. Covering these essentials aerodynamics technologies will provide the opportunity to develop skills in planning, performing, recording, analysing and evaluating experimentation within an aerospace environment. Also, the legal issues of relevance to the aerospace industry are covered. The course also attempts to provide a broad understanding of the human factors that are involved in the aerospace industrial environment and their impact, such as reliability, error, manufacturing, method, maintenance, and performance that shape these factors at this level (Coventry University, 2019).

University of Central London	MSc in Environmental Systems Engineering	The department offers different modules for the students. These modules include different topics that involve several ethical aspects. Some examples of these modules include: o Systems Engineering and Management o Systems Society and Sustainability o Politics of Climate Change o Natural and Environmental Disasters	This course aims to help students develop an understanding of systems engineering and environmental engineering. Environmental engineering is a multidisciplinary branch of engineering which is concerned with designing, implementing and managing solutions to protect and restore the environment within an overall framework of sustainable development. Systems engineering is the branch of engineering concerned with the development and management of large complex systems. This course also introduces students to the notions of wellbeing, health and comfort within the context of the environments (University of Central London, 2019).

Table 3.1 *Ethics education in some engineering programmes in the U.K*

As shown in Table 3.1, ethics education is introduced to engineering students at different stages and levels of studies, and in different ways, such as workshops, seminars, and group projects. Ethics is also taught by embedding ethical issues in engineering design modules or as standalone modules. However, almost all HEIs runs a number of compulsory online tutorials, workshops and sessions to develop students' ethical awareness and improve students' academic integrity (Graduate Prospects, 2019). This is done to support the changing aspects of research, health and safety, and ensure compliance with data protection and security standards (Coventry University, 2009).

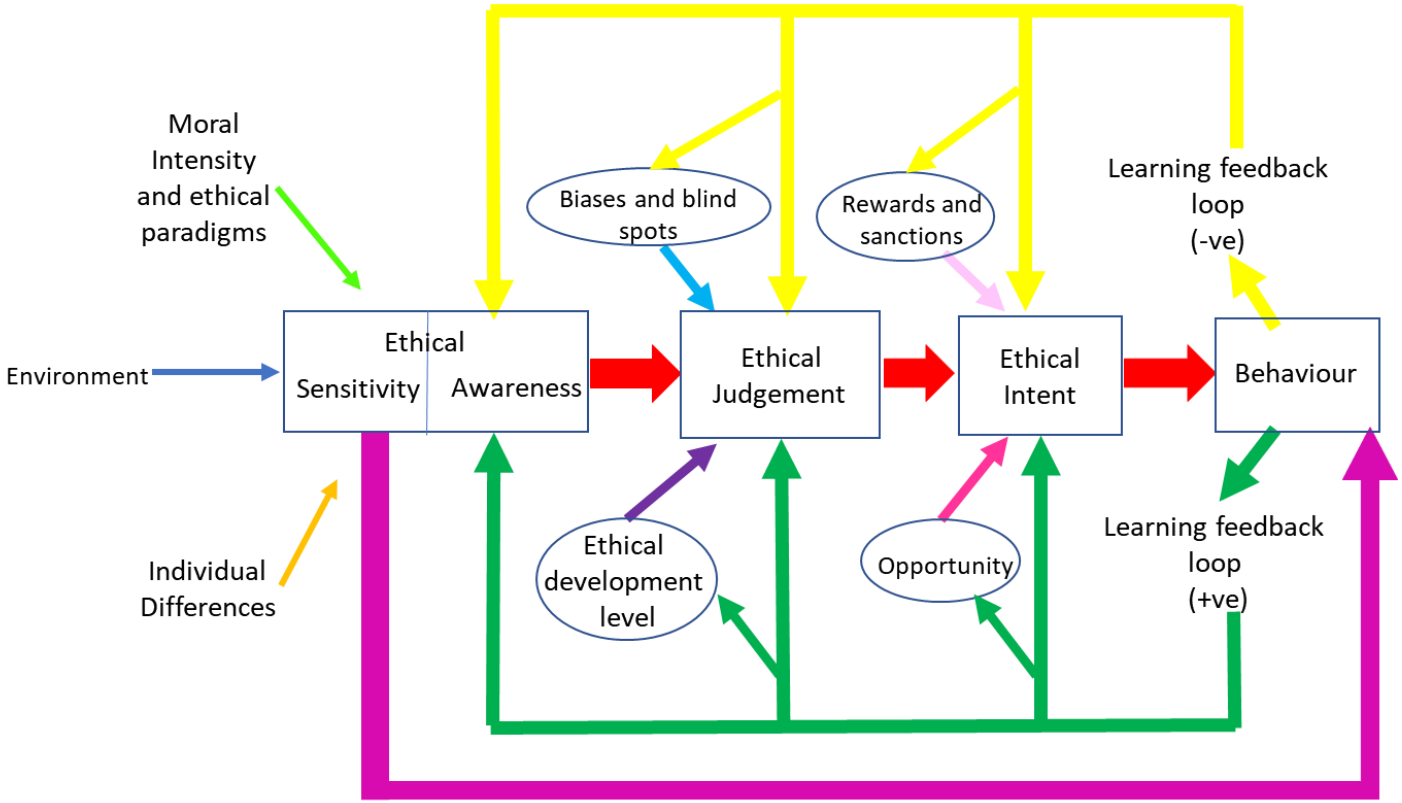
Another factor that adds to the complexity and variety of ethics education in the engineering programmes is the institutional differences in codes of ethics which might affect students' ethical perceptions (Rodzalan and Saat, 2016) (Harun et al., 2016). The culture in the engineering school or faculty towards ethical behaviour and ethical principles may vary from one school to another (Newberry, 2004). Besterfield-Sacre et al. (2001) traced these differences to the fact that faculty members and educators provide different opportunities as part of the curriculum (Mumford, Steele and Watts, 2015). In addition, the set of rules, policies, codes of ethics at different universities and schools play a role in shaping students' ethical decisions, and as a result, students might vary in their ethical perceptions and behaviours (Rodzalan and Saat, 2016) (Macfarlane, Zhang and Pun, 2014). Furthermore, educational institutions have different expectations and aims for their students' learning, and therefore they might be offering distinct educational experiences and environments, which eventually can result in different educational benefits and learning outcomes for their students (Carter et al., 2016). Another factor that is related to the potential effect of the code of ethics is the possible effect of different sub-disciplinary codes of conduct. Different engineering departments and schools provide different research programmes, and different opportunities as part of the curriculum, therefore, programs may differ in their educational and instructional approaches (Carter et al., 2016). For example, electronic engineers have responsibilities for manufacturing and designing communication systems, navigation systems, robotics (study.com, 2003), acoustics, mobile phones, defence, nanotechnology, and medical instruments (Graduate Prospects, 2019). The specific nature of the sub-disciplines of engineering requires different responsibilities that are associated with these fields. For example, some electronic engineers have responsibilities to work with other colleagues to design systems that are built from circuits and devices, develop an existing technology, or systematically

try to improve the design of electronic equipment (Graduate Prospects, 2019). On the contrary, mechanical engineers have responsibilities for manufacturing and designing engines, tools and various types of machines (Graduate Prospects, 2019), aerospace, construction, and automotive (study.com, 2003). Some mechanical engineers may have responsibilities for commissioning and monitoring plants and systems, recommending modifications of prototypes, or ensuring products' reliability, quality and performance in specified operating environments (study.com, 2003). Thus, the engineering field has various ethical responsibilities and includes various micro-ethics (Herkert, 2005). Herkert (2005.p.373) believed that micro-ethics considers the *"internal relations of the engineering profession"*; while macro-ethics considers the "*collective social responsibility of the profession and to societal decisions about technology*". In other words and in this case, micro-ethics are "ethics in engineering", and macro-ethics are "ethics of engineering" (Roddis, 1993) (Bielefeldt, 2018).

Based on the preceding discussions, it is apparent that engineering ethics cases created equal. Some cases were based on real events and issues while some are fabricated. Some involved students' ethical decision-making, while others involved general social considerations. Generally, micro-ethics focuses on "*the issues that affect individuals*" (Dyrud, 2004.p.2). Dyrud (2004.p.3) added that micro does not mean or imply unimportant nor small, but "s*imply that they are individual*".

3.9 Revisions made to the new conceptual model

After reviewing the literature on ethics education and pedagogy in HEI, two additional elements have been added to the new conceptual model "The New Integrative Model for Evaluating Ethics Education" presented in Chapter 2 Figure 2.7. The addition to these elements were added to address the importance of ethical sensitivity and the importance of the RAEng's SEPs as professional skills. The new integrated model after modifications is illustrated in Figure 3.2.


Moral Intensity and ethical paradigms
Biases and blind spots
Rewards and sanctions
Learning feedback loop (-ve)
Environment
Ethical Sensitivity
Awareness
Ethical Judgement
Ethical Intent
Behaviour
Individual Differences
Ethical development level
Opportunity
Learning feedback loop (+ve)

The model key

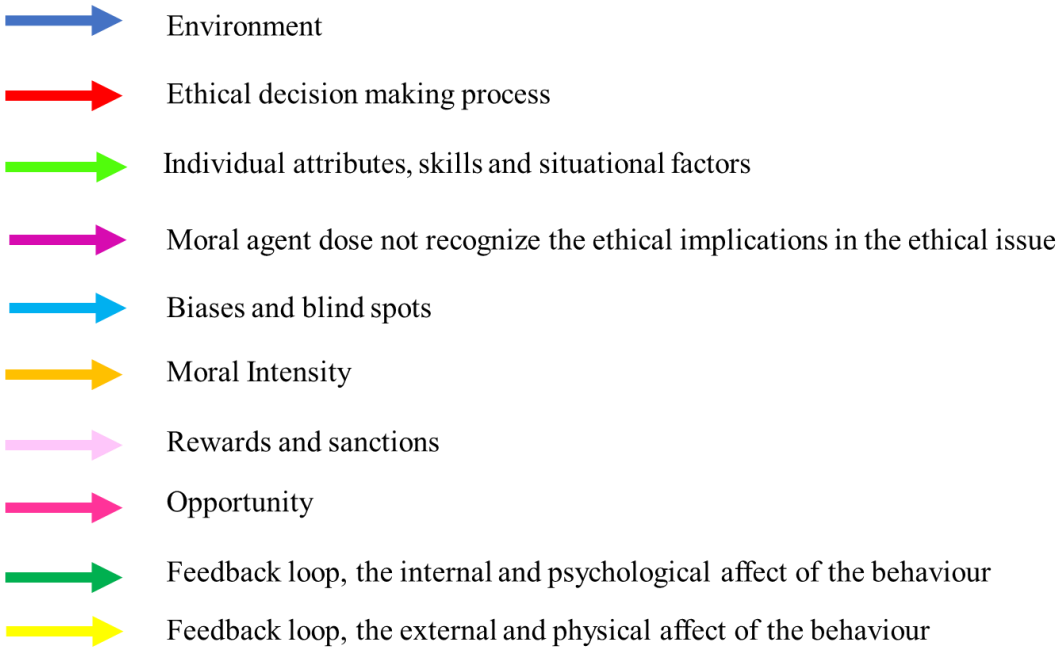


Figure 3.2 *Modifications made to the new conceptual model*

The same process of the ethical decision is assumed in Figure 3.2, the only two additions to the new conceptual model are the role of ethical sensitivity in affecting ethical awareness (Rest et al., 1986) and the effect of past experiences on the learning process.

As discussed previously in Chapter 2, recognising the salient ethical characteristics in a situation are related to ethical wisdom or sensitivity. Ethical sensitivity is shaped either from different life experiences or ethics education (Hursthouse and Pettigrove, 2016). Although Rest et al. (1986) used the two terms "ethical sensitivity" and "ethical awareness" interchangeably, other researchers, such as Srivastava (2012,) believed that ethical sensitivity is what initiates ethical awareness and the ethical reasoning process. Muramatsu et al. (2019) believe that individuals who show ethical sensitivity "can assess the responses and feelings of others and are aware of potential courses of action". On the other hand, Rest et al. (1986.p.6) explained that ethical awareness is when the decision-maker simply becomes aware of the ethical implications of the situation and therefore has an "awareness of consequences". Ethical sensitivity, therefore, contains emotional elements that can enhance ethical awareness. Hence, the researcher divided Rest's ethical awareness component to ethical sensitivity and ethical awareness. As discussed earlier in this Chapter, Rest et al. (1986) stated that many individuals face difficulties interpreting simple ethical situations. This is because of lacking ethical sensitivity towards the welfare and the needs of others. In addition, and as discussed in Chapter 2, Hursthouse and Pettigrove (2016) indicated that some individuals could be clueless about the ethical issue's ethical characteristics, simply because they are inexperienced. Thus, the researcher divided Rest's et al. (18986) ethical awareness component to ethical sensitivity and ethical awareness, as illustrated in Figure 3.2.

The second new addition to the new conceptual model is the effect of feedback loops generated from past learning experiences, which are the arrows highlighted in yellow and green, demonstrated in Figure 3.2. After the individual takes a decision, a learning experience or residual impact of the consequences produce a perceived positive or negative impact, which is weighted through perceived rewards or sanctions (Schwartz, 2016). This information is then saved in the cognitive moral development schemas.

Based on these two additions, the new integrated model is to be used as a snapshot of the ethical reasoning process when an individual face an ethical issue or dilemma. The process starts with different environmental, organisational and personal factors that can

affect the ethical reasoning process. The factors can impact the individual's ethical sensitivity. If the individual is not sensitive to the issue, then his or her ethical awareness is affected as well. Life experiences and ethical skills can shape the individual's ethical awareness. The first possibility is if the individual is not sensitive and not aware of the ethical implications of the ethical issue. The individual then will apply the most straightforward option and behave based on this premature awareness. This bypass possibility is indicated in Figure 3.2 by the purple arrow where the individual acts with little to no reasoning process. The other possibility is possessing ethical sensitivity and accordingly demonstrating ethical awareness, which is highlighted by the red arrow in Figure 3.2. However, this process is affected by different factors, such as different biases and blind spots, ethical development and maturity level, opportunities, rewards and sanctions and residual impacts of past experiences. These factors have different impact levels on each individual and consequently can lead to different decisions and behaviours. These different decisions eventually can cause negative and or positive experiences, which are indicated by the yellow and the green arrows. These experiences will work as new learning experiences in the future and can add to the individua's ethical sensitivity the next time the individual faces a similar ethical issue or situation. Thus, this model is to be used as a snapshot, where the process of moral reasoning changes every time a new ethical skill is learned.

3.10 Chapter summary

This chapter tried to provide a basis for understanding and conceptualising the topic within the context of the study. As indicated in the chapter and the previous chapter, the literature suggests that various educational contents, aims, practices, and methods are applied in engineering ethics education. The use of various approaches in teaching ethics gives rise to a gap through which ethics education can be assessed effectively. In the next chapter, Chapter 4 of the thesis, the researcher will introduce her research gaps and develop questions and hypothesis to fill the research gap.

Research Gaps, Aims, Questions and Hypothesis

4.1 Chapter overview

Robinson, Saldanha and Mckoy (2011.p1) defined a research gap as "*a topic or area for which missing or insufficient information limits the ability to reach a conclusion for a question. A research need is defined as a gap that limits the ability of decision-makers (policymakers, patients, practitioners) from making decisions*". In order to effectively assess ethics education in HEIs, this chapter will explore how ethics is assessed in HEIs, explore and identify the research gaps, and develop the research sub questions and hypothesis. The chapter starts by discussing the importance of evaluating ethics education effectiveness. This is followed by the exploration of the approaches used to assess ethics education in HEIs and then the general themes used by researchers to assess ethics education together with the criteria utilised. These discussions are then followed by the definition of research gaps and rationales, development of research sub questions and hypothesis, and finally summarising and restating the rationales of the new developed model.

4.2 Importance of assessing ethics education

Cases of scientific misconduct vary from extreme, such as fabrication of study results and findings (Resnik, 2003), to less serious but more frequent issues, such as inappropriate referencing, assignment of authorship and withholding details of a methodology or result in a publication (Martinson, Anderson and de Vries, 2005). Unfortunately, incidents of misconduct could hinder the progress of science and develop a sense of mistrust in sciences within and outside of the scientific community (Abbott, Dalton and Saegusa, 1999). The nature of science is increasingly becoming competitive, global and interdisciplinary, and as a result, new ethical issues and considerations are emerging and entering the scientific field resulting in significant scientific misconduct. Thus, it is not strange that the scientific community is focusing their attention on understanding unethical behaviour in science and scientific work, and what could be done to manage it (Antes et al., 2009). One of the solutions designed to address this growing concern is through providing ethics education to scientific researchers and practitioners. The importance of ethics education has been well recognised in disciplines such as medicine and business sciences. Yet, in engineering and its related domains, it is considered relatively new, and further research is needed in this area (Borenstein et al., 2010) (National Academy of Engineering, 2016). As discussed in Chapter 3, there are three

main approaches in ethics education; first, the use of codes of ethics which are provided by HEIs in general. The other two approaches, the stand-alone and embedded ethics education, are usually provided by the departments and specific educational programmes. As indicated in Chapter 3, for each of these educational approaches, there are several different methods and ways through which ethics education is introduced to students. When it comes to choosing the best approach there is currently no formal studies examining this question within the context of engineering education (Antes et al., 2009) (Borenstein et al., 2010). This lack of clarity and inconsistencies in identifying the best approaches to teaching ethics in HEIs is further reflected in assessing ethics education. At the American Society for Engineering Education conference, the meta-analysis of abstracts showed that most of the existing efforts toward ethics education in engineering focus on developing the curriculum and how it can be assessed (Haws, 2001). Herkert (1999) also indicated that the "Accreditation Board for Engineering and Technology (ABET)" in the United States acknowledged that assessing ethics education is considered a 'significant challenge' for programmes to address. Although addressing the question of how effective ethics education is in engineering might be a primary concern for researchers in the ethics departments and fields, Antes et al. (2009) argued that the approaches that are used in assessing ethics in educational programmes vary. Although it seems that there is a general agreement about the importance of ethics education in engineering, scientists and researchers, are in continuous debates about the most effective approach to teaching ethics, and the most appropriate and effective approaches to assessing these educational programmes (Kalichman, 2007) (Steneck and Bulger, 2007). Kalichman and Plemmons (2007) also suggested that the evaluation studies reported mixed findings regarding the effectiveness of ethics education. While some ethics interventions suggested an increase in the desired effects other findings suggested little to no effects of ethics learning outcomes. In the next subsections, a discussion of the meaning of assessing the effectiveness of ethics education is presented, to provide more understanding of the research gaps and problem.

4.3 Effectiveness of ethics education

Researchers used different terms to define the effectiveness of ethics education. Hughes (2010) and Hughes and Scott-Clayton (2011) used the term 'assessment' while referring to the quality of learning outcomes. Another researcher, Avci (2017) used the term 'quality' in ethics education stating that this term contains multiple debates. The first

debate referred to the time of Socrates, where the debate was centred around the argument of whether ethics could be taught. However, a general consensus regarding this argument concluded that ethics can be taught, regardless of the other arguments about the learning goals and methods of teaching ethics (Finch and McAfee, 2012) (Riper et al. , 1993). The second argument involved the quality of ethics education. Avci (2017) stated that through UNESCO's endeavours, humanistic perspectives have emerged, which suggested integrating the individual learning skills with the developed social skills (Tawil and Cougoureux, 2013). Thus, the quality of education should be considered in accordance with these skills as well as the objectives highlighted in the Delors Report. Delors Report suggested that education should be focused on the objectives of:

- Learn to know,
- Learn to be,
- Learn to live together,
- and Learn to do (Avci, 2017).

Hughes (2010.p.5), on the other hand, defined assessment as "*the making of judgements about the quality of learning based on consideration of evidence of achievement in relation to criteria and standards*". This process is often undertaken by academics, students, peers, or other stakeholders, such as workplace supervisors or industry representatives (Hughes, 2010) (Hughes and Scott-Clayton, 2011). In addition, Steele et al. (2016) and Watts et al. (2017) used the term effectiveness to indicate ethics education assessments. Watts et al. (2017.p.6) defined the process of evaluating the effectiveness of ethics education programmes as "*the extent to which observable improvements are made on the part of trainees with regard to ethics-related knowledge, skills, or attitudes*". Schwartz (2016) and Mumford, Steele and Watts (2015) added that one of the common methods of assessing the effectiveness of ethics education is by assessing students' moral reasoning and awareness which was discussed in Chapter 2, and professional skills which were discussed in Chapter 3. Attitudes, as claimed by Dörnyei (2003), is a broad category that involves criteria of attitudes, believes, perceptions, values as well as interests, and attitudinal questions are often used to find out the way respondents think.

Evaluating ethics education can provide several benefits (Steele et al., 2016) (Mumford, Steele and Watts, 2015), such as improving individuals' ethical behaviour (Goldstein and Ford, 2002), identifying the best and most effective approaches to teaching and delivering

ethics (Dörnyei, 2003) (Mumford, Steele and Watts, 2015). The evaluation process is dependent on what is measured, which is established during the time the educational intervention is developed, and it should align with the learning objectives of the educational interventions (Kraiger, 2002). Evaluation can help the industry to invest. One example is an illustration in some industry reports on the spending of different organisations which shows how billions of dollars and pounds are spent annually on employees to be trained on ethics and ethical behaviour (Allan, 2000). Kirkpatrick (1996) summarised that the main purpose of assessing educational interventions is to justify the function of an existing educational programme or to decide whether to discontinue an existing programme. Although there are many positive outcomes for assessing the effectiveness of ethics education, it is a challenging task, especially in ethics education domains, because the relevant criteria are ambiguous and highly sensitive. Therefore, no single method or approach is applicable in all situations, and most applicable solutions are not always feasible (Mumford, Steele and Watts, 2015). On top of that, the various debates and conflicts about the criteria and standards for assessing the effectiveness of ethics education can be misleading, misunderstood and misinterpreted (Turner et al., 2018) (Baldwin and Ford, 1988). The next section explores the efforts that have been made to assess the effectiveness of ethics education in order to clarify and address the research gaps.

4.4 Assessment criteria of ethics education effectiveness

As discussed earlier in Chapter 3, case scenarios are a common method used in assessing moral reasoning and professional ethics. Many Universities provide online case scenario 'Libraries' to help educators, particularly engineering educators, to assess their students' ethical skills. Examples of such institutions are McCombs School of Business, The University of Texas at Austin (2019), Center for the Study of Ethics in the Professions, Illinois Institute of Technology (2019) and Taper Hall of Humanities, University of Southern California (2019). The cases match ethical issues and dilemmas that could be faced by professionals, including engineers in their real-world day to day lives. These cases try to explore a range of ethical issues, dilemmas and statements, the motivations behind certain decisions, and the possible consequences. Researchers then set the aim and focus of the evaluation. However, establishing an outcome criterion for ethics education is challenging, because ethics education is concerned with the learning content and the development of ethical problem-solving skills. Such ethical problems or dilemmas do not

have definite clear-cut solutions, which makes the traditional forms of assessments of limited effect (encyclopedia.com, 2019). In the traditional assessments, students respond to question items that might have a single correct answer, while in performance tasks, which are usually open-ended, educators will need to use their judgments when evaluating performances. This involves using a set of established criteria that are aligned with intended or targeted learning outcomes (encyclopedia.com, 2019) (McTighe, 2016). According to McTighe (2016), criteria are the set of guidelines or rules that the assessor uses for judging students' responses and performances. Criteria can serve as a foundation for developing a tool or a rubric for assessing students work, based on a performance scale. The literature that focuses on assessing the effectiveness of ethics education provides numerous models and concepts, as discussed earlier in Chapters 2 and 3, and based on these models and frameworks, three main streams of assessments are identified:

- **Assessing perceptions**- What are the levels of importance and development of the ethical skills that have been taught (Kirkpatrick and Kirkpatrick, 2009) (Avci, 2017)
- **Assessing moral reasoning and knowledge**- What facts, principles, and techniques were learned from this programme? (Kirkpatrick and Kirkpatrick, 2009)
- **Assessing behaviour**- What has changed in their behaviour due to the programme? (Kirkpatrick and Kirkpatrick, 2009)

4.4.1 Perceptions

The first step in assessing ethics education is assessing students' subjective experiences and perceptions during the educational programme. Students' perceptions form a crucial part of ethics education because, without students' perceptions about the usefulness and effectiveness of the learning content, it would be difficult to meet students expectations (Avci, 2017). Students' participation in educational programmes is essential in assessing the effectiveness of ethics education (Maruyama and Ueno, 2010). Lau (2010.p.581) stated that "*if students are willing to learn and perceive ethics education as useful, learning outcomes are improved*". Moreover, Canary et al. (2014) stressed the necessity of developing students' confidence in ethical discussions and debates. Therefore, in order to establish a better framework for ethics education, academics' expectations, students' expectations, perceptions and feelings should be considered and taken into account (Avci, 2017). For example, Morgan and Casper (2000) incorporated this type of assessments to collect feedback on how the educational interventions can be improved, by telling

students that their participation and inputs are valued by the educational institute. Perception assessments can also be gathered from other stakeholders besides students, such as observers, academics, and instructors (Mumford, Steele and Watts, 2015). Although perception assessments should not be treated as an effective indicator, this assessment type can still provide valuable information (Steele et al., 2016). Campion and Campion (1987) pointed that depending only on assessments that rely on collecting perception that are filled by students are unreliable as evidence of a programmes' effectiveness, because the validity of such assessments is open to debate. Mumford, Steele and Watts (2015) noted that such assessments, although perceived useful in assessing the acceptance of one stakeholder group, such as students, these assessments are often affected by other factors, such as liking the instructor and time demands. Nonetheless, assessing students engagement and motivation were found to increase students' self-efficacy, which is essential to the success of educational programmes in general (Mann, 1996), and ethics education programmes in particular (Fisher, Fried and Feldman, 2009).

Mumford, Steele and Watts (2015) added that a more reliable way of evaluating educational interventions is by focusing on capturing perceptions of specific aspects of the educational programme. Such perception assessments can provide useful information that are proven to be useful in educational programmes' progressive refinements. This is reflected in studies conducted by Harkrider et al. (2013), Johnson et al. (2013) and MacDougall et al. (2014). In these studies, the researchers' aim was to investigate the way cases should be presented in ethics education interventions, and students were presented multiple questions, between 2-12, following the case presentations. The researchers in these studies focused on the students' engagements, their analysis of the given cases, and their overall perceptions of the case scenarios. The researchers found that different case presentations in ethics education resulted in different perceptions of the students. In addition, students' evaluation of the cases supported findings that were obtained from other assessments on cognitive and behaviour, which will be discussed in the next subsection. The researchers also added that students interacted effectively with cases that were presented in a simple and direct manner, and the presentation of these cases enhanced learning and performance. However, there is a generally agreed perception among researchers that individual differences and demographics can lead to

different ways of perceiving the world as well as differences in identifying and perceiving an ethical problem (Ho, 2010).

In general, ethical perceptions are looked at in two different ways in the literature. First, Vieth and Quante (2010.p.5) defined the ethical perception as "*providing inputs from the outside that are then processed by the active capacities of mind and understanding*". Vieth and Quante (2010.p.5) also added that an ethical perception is the individuals' "*responsiveness to situations that allow them to orient themselves in their lives*". Second, Karande et al. (2000.p.38) defined ethical perception as "*the individual's recognition of a moral issue, and the realization that he or she is a moral agent*". Thus, ethical perception can relate to ethical sensitivity or rating the relative importance. Individuals might assign different ethical dimensions to different ethical situations. For instance, when institutions monitor individuals' emails, individuals will vary in perceiving the relevant importance of the dignity of individuals and the privacy rights issues in each situation, at the same time, individuals will vary in their ethical sensitivity. This means measuring ethical perceptions can give an indication of ethical sensitivity or an opinion about the relative importance (Wittmer, 1992). This led to the second stream of assessing ethics education, that is assessing ethics learning criteria.

4.4.2 Moral reasoning and knowledge

The second category or stream in assessing the effectiveness of ethics education is assessing students' moral knowledge, which is the most discussed stream in this thesis research. This category refers to assessing moral reasoning, cognition, skills, and attitudes of the students. Many educational programmes aim at providing students with the necessary ethical knowledge by addressing certain types of ethical issues and problems (Mumford, Steele and Watts, 2015). Salas, Milham and Bowers (2003) stated that although reasoning assessments are often used to evaluate ethics education effectiveness, these assessment tools usually suffer a key weakness which is individuals not behaving in accordance with their knowledge. Furthermore, learning assessments represent only one example of a broader class of assessments that focus on moral reasoning within the education context. Although ethics knowledge and skills are both important in assessing what an educational programme has provided students with, what is more important is investigating changes in moral and ethical knowledge, perceptions and behaviour (Davis, Curtis and Tschetter, 2003). This is because students can demonstrate how they are applying these learnt skills when working with ethical problems (Thiel et al., 2013).

Mumford, Steele and Watts (2015) emphasised that a classical framework that can be used to evaluate the impacts of ethics education is examining how students use their knowledge of ethics to solve ethical problems. In other words, ethics education develops changes in students' ethical skills, reasoning and the overall way of thinking. For example, Brock et al. (2008), found that exposing students to ethics education intervention resulted in significant positive changes in their judgements and overall moral reasoning and thinking, even after six months of taking the intervention, compared to another group of students who had not been exposed to similar interventions. The students who were not exposed to ethics education approached the given case scenarios from maximizing self-serving goals framework, while those who had undertaken the educational intervention demonstrated enhanced ethical decision-making abilities, better evaluation and judgement skills when responding to the given scenarios. Brock et al. (2008) also suggested that students who participated in the ethics educational interventions demonstrated higher skills in reasoning and analysing the ambiguity and complexity that were present in the given ethical case problems. In addition, Thiel et al. (2013) discovered that predicting consequential effects of behaviours that are related to certain ethical situations, and employing appropriate emotional and self-regulation, are some of the skills that contribute to ethical decision-making skills.

In addition, , Antes et al. (2012), Stenmark, Antes and Thiel (2011) and Thiel, Connelly and Griffith (2011) stated that such assessments aimed at assessing professional ethical skills promote ethics education effectiveness, and clear ethical learning gains and abilities were observed by investigating such skills. Furthermore, Mumford, Steele and Watts (2015) revealed that other assessment forms can be applied to assessing the gains of learning ethics and abilities as a result of ethics education, such as asking students to reflect on certain ethical experiences and issues in depth. Mumford, Steele and Watts (2015.p.48) defined self-reflection as the "*process of recalling stored knowledge concerning oneself and one's personal experiences*", which can be relevant in the ethical issue or dilemma context as well as informing ethical decision making. In these forms of assessments, students are asked to reflect and report their emotional reactions and their self-regulation strategies before and after exposure to unethical case scenarios, to trace any changes in perceptions and attitudes (Stenmark, Antes and Thiel, 2011).

Another method of assessing students' ethical knowledge and learning is by using the Defining Issues Test (DIT) to measure the moral judgment (Rest et al., 2000) and moral

reasoning development (Christensen, Cote and Latham, 2016) (Kohlberg, 1969), as discussed in Chapter 2. Hauenstein, Findlay and McDonald (2011), Ostroff (1991) and Mumford et al. (2006) all suggested that using escalading ethical case scenarios and ethical decision-making assessments are the best methods for assessing ethical cognition and learning gains. These assessments involve asking participants to read a scenario describing a complex and ambiguous ethical problem or issue and respond to it. Participants are presented with a series of ethical issues that apply to their disciplines (Mumford, Steele and Watts, 2015) (Mumford et al., 2006), and usually, a series of three or four cases arise in the case scenario. Each case varies in its ethical content, professional practices and conflicts of interest (Bairaktarova and Woodcock, 2014) (Bairaktarova and Woodcock, 2017). These cases usually utilise Kohlberg's and Neo-Kohlbergian moral development concepts to assess students' ethical cognition (Mumford et al., 2006) (Mumford et al., 2007) (Mumford et al., 2008) (Antes et al., 2007). Street and Street (2006) also added that exposing individuals to escalation case scenario situations can encourage individuals to reveal their unethical intentions. Street and Street (2006) indicated that the reason for such indications is that ethical decision-making processes are affected more by economic, risk and opportunity considerations, rather than by ethical believes and perceptions. Therefore, individuals exposed to escalating case scenarios are likely to be more sensitive to economic costs and unethical options, which can induce unethical intentions and behaviour. These implications led to the third stream of assessing ethics education, and that is assessing ethical behaviour criteria.

4.4.3 Behaviour

The third stream in assessing the effectiveness of ethics education is behaviour. This set of criteria are used to assess the effectiveness of the educational interventions (Alvarez, Salas and Garofano, 2004), and the extent to which ethics education produce the targeted behavioural outcomes (Mumford, Steele and Watts, 2015). Many studies which focused on assessing ethical behaviour, sought to assess moral obligation to predict whether individuals will or will not commit unethical behaviours in the future. One of the classical theories used in assessing behaviour is Theory of Planned Behaviour (TPB) (Cronan and Al-Rafee, 2008) (Leonard, Cronan and Kreie, 2004) (Harding et al., 2007), which is discussed in Chapter 2 in more details. Some researchers used a modified version of this theory to add more details and originality to their findings. For example, Harding et al. (2007) used a modified version of the Theory of Planned Behaviour (TBP) as a

framework to assess cheating behaviours among students. Two variables were added to TPB which are moral obligation (Ajzen and Dasgupta, 2015) and moral reasoning based on Rest et al. (2000) 'DIT' test. The results indicated that this modified model can predict students' cheating intentions, and the inclusion of moral obligation and moral reasoning variables improved the understanding of the multifaceted nature of ethical decision making and behaviour.

Other researchers also assessed moral obligation in terms of moral self-image. Schwartz and Tessler (1972) stated that the strength of moral obligation can be used as a predictor of individuals' intentions and feelings to perform ethical or unethical acts (Cronan and Al-Rafee, 2008). From these notions, the psychological and physical sensory experiences and representations emerged. When an individual behaves unethically, the individual's moral self-image is threatened, and as a result, the individual may experience moral obligation feelings (Jordan, Mullen and Murnighan, 2011) (Banerjee, Chatterjee and Sinha, 2012) (Zhong and Liljenquist, 2006). As a result of these experiences, feelings and internal threats, the individual is pushed to engage in actions or sensory experiences that metaphorically represent their psychological condition. These metaphoric engagements are attempts by the individual to compensate for their unethical actions and maintain their moral self-images (Jordan, Mullen and Murnighan, 2011). Researchers, such as Fayard, Bassi and Bernstein (2009), Banerjee, Chatterjee and Sinha (2012), Zhong and Liljenquist (2006), Lee and Schwarz (2010) and Sachdeva, Iliev and Medin (2009) all stated that remembering past unethical behaviour can increase feelings of moral obligation, therefore inducing unethical behaviours. These researchers used metaphoric representation of psychological conditions, such as desires to cleanse, or sensory feelings of darkness or brightness. Zhong and Liljenquist (2006), Sachdeva, Iliev and Medin (2009) and Lee and Schwarz (2010) all noted that recalling past unethical behaviours can lead individuals to rate cleansing products, such as soaps or wipes, as more appealing than neutral products, such as pencils. These behaviours are related to metaphorical cleansing desires represented in the cleansing products, which reflects individuals' desires to wash away their sins.

Banerjee, Chatterjee and Sinha (2012) used a similar concept and investigated whether moral obligation feelings of shame and guilt are associated with exhibiting future unethical behaviours. They investigated whether these feelings can be predicted by choosing products that make a room brighter. Banerjee, Chatterjee and Sinha (2012)

reported that light and darkness often resemble good and evil in many religions and cultures. Like the 'Lady Macbeth effect', the dark and light metaphors were found to be useful in communicating sensory experiences. Banerjee, Chatterjee and Sinha (2012) also suggested that recalling unethical past behaviours have a sensory influence on behaviour in terms of the brightness and darkness.

Assessing unethical behaviour is a challenging task, which is why the previous two streams of assessing perceptions and moral reasoning, are the most dominant types researchers rely on when assessing ethics education. This is because explaining human behaviour in all its complexity is a difficult task and measuring behaviour will require all behavioural biologists and psychologists to collaborate (Martin and Bateson, 1993.p.4). However, some aspects of behaviour, such as ethical behaviour, can be approached by investigating social and environmental effects on ethical behaviours, which play important roles in understanding and explaining some aspects of human behaviour (Ajzen, 1991). Effectiveness in relation to this category can also be assessed ethical decision-making assessments (Deshpande, 2009). Hauenstein, Findlay and McDonald (2011) and Ostroff (1991) stated that assessing complex cases, such as ethical behaviour poses high risks of failure. Thus, in order to assess ethical behaviour in an educational context, Hauenstein, Findlay and McDonald (2011) and Ostroff (1991) recommended using indirect or 'low-fidelity' simulation assessment measures, such as ethical decision-making assessments. These assessments are considered optimal approaches for assessing behaviourally based criteria of educational programmes effectiveness. This is administered by asking respondents to read a case scenario describing an ethical issue or dilemma and respond to it by selecting one or more options from multiple possible choices (Mumford, Steele and Watts, 2015).

An example was given by Mumford et al. (2006) who introduced HE students to a series of ethical case scenarios, which relates to their disciplines. Some of the disciplines were physics, engineering, biological sciences, health sciences, art, architecture, social sciences, and humanities. After the students read the scenarios, they were presented with a series of events arising from each case scenario. For each event, students were presented with multiple potential responses each with varied ethical content adapted from the literature of different professional fields. Izzo (2000) summarised that Kohlberg's (1969), (1971) and Rest's et al. (1986) moral development and moral reasoning concepts can also be employed to assess ethical behaviour. Clarkeburn (2002) also added that moral

awareness and ethical sensitivity all can be assessed under this stream of assessments. One approach to assessing ethical behaviour using moral reasoning and development is investigating and assessing educational impacts on students' behavioural changes, and subsequent workplace behaviours. For example, Borman and Motowidlo (1992) and Podsakoff et al. (1999) assessed the skills gained from leadership and transformational leadership behaviours, and found a positive increase in these behaviours as a result of ethics education. Another example is Dalal, (2005) and Gruys and Sackett (2003) studies, in which they discovered decreases in counterproductive work behaviours, such as loafing and bullying, as a result of ethics education.

Another approach that is used to assess behavioural changes due to ethics education is examining improvements in students' subsequent self-management ethical conduct (Wells and Schminke, 2001). In these assessments, the effect of ethics education is measured, such as whether exposure to ethics education can lead students to better recognise and manage ethical situations. An alternative approach is assessing the degree of reduction in common biases that individuals' exhibit in ethical decision making, such as self-protection by blaming others (Mumford, 2017). However, Mumford, Steele and Watts (2015) argued that not all ethics education programmes aim to reduce decision-making biases and that such tests do not always provide an appropriate way for assessing the effectiveness of ethics education. Knight and Page (2007) showed that some aspects of students' achievements, such as behavioural intentions and change cannot be assessed effectively through normal, traditional or formal ways of assessment. This is because students can provide powerful claims to achievement based on information drawn from sources, such as learning portfolios, or reflective journals. Such approaches can allow ethics assessment tools to be based on evidence that is generated by students in response to the formal assessment tasks. Moreover, these approaches can allow the inclusion of evidence, that is generated, as they confront or observe authentic ethical issues, and apply their ethical skills and knowledge. However, for the reflective task to be assigned effectively, students are required to make claims that they have developed critical dispositions. Mumford et al. (2006) concluded that there is a deficiency in assessment designs that focus on behavioural ethics, and one way to fill this gap is by comparing a group of students who have undertaken ethics training to another who did not undertake ethics training intervention.

Given these three streams of assessing ethics education effectiveness in HE, Hughes (2010) stated that there is no specific type or form of assessment that is appropriate, inherently, for any specific ethical concept. Thus, based on this discussion, this PhD research will attempt to employ all three streams, to fill several research gaps. These gaps are defined in the next subsection.

4.5 Defining research gaps and rationales

As briefly discussed earlier in Chapter 1, the main research question (**RQ**) is "How effective is ethics education in the engineering curriculum?", and to answer this question adequately and in more details, two sub-research questions were developed:

RSQ.1 How do engineering students differ in their moral reasoning abilities?

RSQ.2 How do engineering students compare in perceiving professional ethics?

As also briefly indicated in Chapter 1, the first research sub-question will employ a classical moral reasoning framework that is based on Rest's model and the other theories, concepts and models that were discussed in Chapters 2 and 3. By using this framework, this thesis will endeavour to achieve its aim and fill the identified research gaps, which are:

- Extend the literature relating to Rest's FCM
- Confirm and or disagree with previous researches which tested the effectiveness of Rest's model in studying moral reasoning
- Confirm and or disagree with the arguments in the literature on the positive impacts of ethics education
- Extend the literature debating the effectiveness of ethics education in engineering
- Add more clarity to how ethics education can be assessed
- Fill the lack in assessment designs that focus on behavioural ethics, by addressing some skills that can affect behaviour, such as moral obligation, future intentions, the will to do good and self-regulatory skills, but not ethical behaviour itself.

As summarised in Chapter 1, the second research sub-question will employ a new and novel framework that is based on the RAEng's SEPs that was discussed in Chapter 3 exploring how Rest's FCM aligns with RAEng's SEPs, which makes these two frameworks compatible. By using this framework, this thesis will endeavour to achieve its aim and fill the identified research gaps, which are:

- Provide theoretical and empirical evidence on the role of ethics education using the RAEng's SEPs as a framework, thereby, introducing an original and novel approach.
- Confirm or disagree with the effectiveness of the RAEng's SEPs in exploring professional ethical perceptions.
- Extend the body of literature focused on exploring the effect of different individual differences on ethical perceptions.

In relation to the first gap identified in the literature, very few 'mainstream research' mentioned the RAEng's SEPs, and these studies did not directly use the SEPs. For example, Alpay (2013), an academic at the Chemical Engineering Department at the Imperial College London indicated that he considered the RAEng's SEPs. Alpay (2013) highlighted that the statements inspired him to develop an approach to engage engineering students' in ethical education, by taking their opinions on the topics that should be included in ethics interventions. In addition, Swingler (2008), an academic at the Mechanical Engineering Department at the University of Southampton, highlighted the importance of the RAEng's SEPs in teaching engineering ethics, but did not actually use the code in his assessments of ethics education. Thus, this research could be the first empirical approach to validate the RAEng's SEPs thereby filling the research gaps and limitation of the literature in this regard.

In general, these two frameworks contribute to the broader new conceptual model designed in this thesis, as the model aims to fill several gaps that were identified in Chapter 2 which will be explored later in the thesis. This conceptual model attempts to fill the gaps other models neglected or did not explore, and tries to address the following:

- The different individual and organisational factors that can affect ethical decisions and perceptions within one conceptual model.
- The skills that can enhance ethical and professional decision-making abilities

- The set of professional skills that have been developed or not developed yet by engineering educational programmes, and then targeting these skills for improvement.

By filling these gaps, this model can serve as a tool for educators to address the need and requirements of their students in terms of ethics education and help to provide and validate a reliable model that addresses all aspects of moral and professional decision-making skills and factors. To be able to address these research gaps, aims and answer the main and sub-research questions, the two sub-questions are further divided into further questions and hypothesis to contribute to the broader and holistic research answer. These further questions and hypotheses are discussed next.

4.6 Developing further sub questions and hypotheses

This research aims to answer one broad research question by looking at ethics education in engineering from two different, yet interactive, perspectives. The first perspective, represented by the first sub-research question explores students' moral reasoning, moral skills and factors affecting these processes. This first RSQ is further broken down to four further sub questions:

1.1 Is Rest's FCM suitable for assessing students moral reasoning abilities?

1.2 What are the factors affecting students' moral reasoning?

1.3 What skills contribute to moral reasoning?

1.4 Does ethics education change students' ethical perceptions?

The second perspective, which is represented by the second sub-research question, is a more professional related research sub-question which aims at exploring engineering students professional and ethical perceptions. This second SRQ is further broken down to further several sub questions:

2.1 Do gender groups differ in perceiving professional ethics?

2.2 Do British and Chinese students differ in perceiving professional ethics?

2.3 Do students with work experience and students without work experience differ in perceiving professional ethics?

2.4 Do students who have undertaken ethics education interventions differ from students who have not undertaken ethics education in perceiving professional ethics?

2.5 Do students from different HEIs differ in perceiving professional ethics?

2.6 Does the RAEng's SEPs form good scales for measuring ethical perceptions?

2.7 Do students' ratings reflect the RAEng's four SEPs of Accuracy and Rigour, Honesty and Integrity, Respect for life, law and the public good, and Responsible leadership: listening and informing?

2.8 What are the reasons behind the students' ratings in the survey in terms of the perceived level of importance and level of development in ethics skills?

As indicated, the RAEng's SEPs are used in the second framework to explore students' ethical and professional perceptions. SEPs consists of four main sets: Accuracy and Rigour, Honesty and Integrity, Respect for life, law and the public good and Responsible leadership: listening and informing. To reflect the second sub-question, several hypotheses were developed to explore the students' ratings of the relative importance and level of development of the sets of ethical and professional skills. These two item questions are explored in relation to the effect of gender, culture, work experience, ethics education and cross-institutional micro-ethics. According to Duke (2002.p.203) "*a key part of a program's evolution is understanding perceptions of the importance of learning outcomes and perceptions of the skill level achieved*". Many outcomes can be achieved when evaluating the effectiveness of ethics education as this evaluation can help to identify the most effective pedagogical interventions, and the possible ways to deliver them (Mumford, Steele and Watts, 2015) (Steele et al., 2016). Duke (2002) and Duke and Reese (1995) stated that this approach is criticised as being a weak approach to identify and convey students' needs, and some researchers, such as Neier and Zayer (2015) argued about the abilities to use such approaches to provide adequate indications on how well the educational programme is allowing the student to develop. However, Duke (2002), Hall et al. (1995) and Glynn, Rajendran and Corbin (1993) supported the use of students' ratings of the level of importance and level of development approaches. These researchers believed that even though some students may not have a clear and firm understanding of the realities of the workplace, students have a reasonable understanding of the quality of their programmes, even if it is biased towards wanting more from their educational institution. Based on the agreement and supportive believes of Duke (2002),

Hall et al. (1995) and Glynn, Rajendran and Corbin (1993), the researcher decided to use this approach to explore students' perceptions.

As discussed earlier in Chapter 3, each of the four main ethical principles that form the RAEng's SEPs includes several ethical statements. These statements are then broken down to create one ethical statement. For instance, the Accuracy and Rigour principle included six ethical statements, and these statements included fourteen sentences which will then be used as fourteen item statements in the survey design that will be discussed in Chapter 5. The second ethical principle of Honesty and Integrity has four ethical statements, which will be broken down to ten sentences to form ten item statements. The third ethical principle of Respect for life, Law and the Public Good has five ethical statements, which will be broken down to seven item statements for the survey. Finally, the fourth ethical principle of Responsible Leadership: Listening and Informing has three ethical statements, which will then be broken down to five item statements in the survey. These statements are further to be broken down to avoid any confusion related to double-barrelled questions, which will be discussed further in Chapter 5.

Comparisons across different classifications can provide insights into the educational programme developments for each learning outcome. The comparisons are used to determine the differences between students from different groups. Comparisons across different groups in researching ethical perceptions generally involve gender, cultural backgrounds, work experiences, the effect of ethics education, cross-educational institutions, and other different classifications (Newberry, 2004) (Bommer et al., 1987) (Tsalikis and Fritzsche, 1989). As will be discussed later in Chapters 5 and 8, a sample of engineering students from the Electronic Engineering Department at the University of York will be surveyed in addition to another sample from the Mechanical Engineering Department at Coventry University to increase the validity of the findings. These comparisons classifications were considered when developing the research hypothesis, which are discussed in the next sub-sections. Codes were used to indicate the hypothesis, such as 'H' indicating the hypothesis, 'HO' null hypothesis. The first number after the 'H or HO' indicates the number of the sub question which the hypothesis tries to explore, and the second number refers to the number of the RAEng's SEPs set, whether it is accuracy and rigour, honesty and integrity, etc. For example, **H1.1** refers to the first sub-question "2.1 Do gender group differ in perceiving professional ethics?", which explores the difference in perceiving the importance of accuracy and rigour. In addition, the

abbreviation of UoY will be used to indicate to the University of York, and CU to indicate to Coventry University.

4.6.1 Effect of gender on perceiving the level of importance

As discussed previously in Chapter 2, Gilligan (1977) proposed that females frame moral issues as care problems, while males frame moral issues as problems involving justice, fairness, and rights. Differences in ethical decision making based on gender are the most reported variable that has been explored and studied empirically as O'Fallon and Butterfield (2005) and Ford and Richardson (1994) systematic literature reviews indicated. Empirical research, however, produced mixed results (R. Ford and W. Richardson, 1994) (A. Michalos and D. Poff, 2012). For example, Betz, O'Connell and Shepard (1989) argued that males are more concerned with advancement and money, while females are more concerned with helping others and relationships. Marques and Azevedo-Pereira (2009) found that males are stricter than females in ethical decisions. Bielefeldt (2015), on the other hand, suggested that caring ethics were rated highest among females, while duty ethics were rated highest among males, but no significant differences were observed. Furthermore, Schuh et al. (2014) added that males possess stronger motivations for power than females, where power is inherently bonded to leadership (Yukl, 2013), and gender can influence leadership abilities and skills in students (Jensen, 2017). On the other hand, Posner (2012) reported no significant differences between gender on the leadership dimensions. Grosch and Rau (2017) also concluded that their research showed diverse results in terms of gender differences in the areas of academic integrity. Huang and Hung (2013) stated that there is no effect on gender differences in terms of ethical perceptions, because the changing and fast-growing modern societies make generalizing gender difference a difficult task. Huang and Hung (2013) argued that factors such as surroundings, contexts, immediate communities, and environment should all be considered when researching gender differences in ethical reasoning and perceptions. Based on this discussion, the researcher predicts significance differences between the two groups of students' perceptions, yet cannot indicate whether this prediction is greater or less, and does not take a stand about the direction of the relationship between the variables (Creswell, 2013). Therefore, a non-directional alternative hypothesis is the best way to tackle this issue, and based on this discussion, the researcher hypothesizes the following sub-hypotheses:

H1.1: There is a significant difference between female and male students in the perceived level of importance of accuracy and rigour at the UoY and CU.

H1.2: There is a significant difference between female and male students in the perceived level of importance of honesty and integrity at the UoY and CU.

H1.3: There is a significant difference between female and male students in the perceived level of importance of respect for life, law and the public good at the UoY and CU.

As for the perceived responsible leadership listening and informing, males possess a stronger motivation for power than females (Schuh et al., 2014), and power is inherently bonded to leadership (Yukl, 2013). However, demographic factors, such as gender, may influence leadership abilities and skills in students (Jensen, 2017). Some studies found no statistically significant differences between gender on the leadership dimensions (Posner, 2012). With respect to all these arguments and the previous regarding the reasons for the non-directional alternative hypothesis, the researcher suggests a significant difference between the perceptions of two groups of students. Based on these assumptions and the related literature the researcher hypothesizes the following:

H1.4: There is a significant difference between female and male students in the perceived level of importance of responsible leadership: listening and informing at the UoY and CU.

4.6.2 Effect of culture on perceiving the level of importance

As discussed earlier in Chapter 2, Haidt and Graham (2007) suggested that all cultures base and build their virtues on the same foundations of morality, but they may vary in their degree of emphasis. Honan et al. (2013) suggested that the practices, traditions and norms among societies and the different understandings of ethics across societies are different among people's epistemologies. Since the UoY has a high population of Chinese students, testing ethical perceptions among British students and Chinese students is worth exploring. However, when exploring the cultural effect on ethical perceptions, considerations, such as the effect of the Confucian orientation should be considered, as it can influence the traditional Chinese culture in general (Hofstede and Bond, 1988). In addition, Hofstede four cultural dimensions of power distance, individualism, masculinity, and uncertainty avoidance may also play different roles in students' ratings (McSweeney, 2002) (Vitell, S. Nwachukwu and Barnes, 1993). The researcher, therefore, predicts significant differences between the perceptions of the two groups of students,

and due to the reasons discussed in subsection 4.6.1 about the non-directional hypothesis, the relevant hypotheses are:

H2.1: There is a significant difference between British and Chinese engineering students in the perceived level of importance of accuracy and rigour at the UoY and CU.

H2.2: There is a significant difference between British and Chinese engineering students in the perceived level of importance of honesty and integrity at the UoY and CU.

H2.3: There is a significant difference between British and Chinese engineering students in the perceived level of importance of respect for life, law and the public good at the UoY and CU.

H2.4: There is a significant difference between British and Chinese engineering students in the perceived level of importance of responsible leadership: listening and informing at the UoY and CU.

4.6.3 Effect of work experience on perceiving the level of importance

Another issue which can influence ethical perceptions is work experience. As indicated in Chapter 2, Ferrell and Gresham (1985) explored the effect of ethical codes of conduct in the working environment and organisations on the individual's ethical perceptions. Stevens (1984) supported these notions empirically and found that professionals show higher ethical tendencies than students. In this context, work experience can play a role in influencing individuals' ethical decision-making skills and perceptions. O'Fallon and Butterfield (2005) , Kidwell, Stevens and Bethke (1978) and Craft (2013) argued that professionals with more years of experience usually score higher than professionals with less experience in ethical perceptions and reasoning measures. On the other hand, Lehnert, Park and Singh (2015) review of the Empirical Ethical Decision-Making Literature reported nine studies in the effect of work experience on ethical perceptions and recorded mixed findings. You (2014) found that ethical sensitivity was positively increased when students were exposed to internship experiences. Additionally, Hunt and Vitell (1986) and Hunt and Vitell (2006) argued that workplace norms can indirectly affect ethical judgments as a result of socialization. This implies that the longer the time spent on a job, the stronger the socialization outcomes. Nikoomaram et al. (2013) believed that, unlike education, which may improve individuals' abilities in applying ethical standards, workplace socialization can raise the individual's ethical standards themselves. Thus, the more work experiences a person has, the stricter the ethical

judgments they exhibit. On the other hand, Barnett and Valentine (2004) and Schepers (2003) expressed that work experience and stricter ethical judgments were unrelated and that no statistically significant effect of work experience and the level of experience on ethics have been reported so far. However, differences in perceptions among the two groups of students can be affected by the type of ethical climate and ethical experience exposure that they have experienced. The researcher, therefore, hypothesises significant differences between the two groups of students' perceptions, but due to the same reasons indicated in subsection 4.6.3 about the non-directional alternative hypothesis, the researcher hypothesis the following:

H3.1: There is a significant difference between students with work experience and students with no work experience in the perceived level of importance of accuracy and rigour at the UoY and CU.

H3.2: There is a significant difference between students with work experience and students with no work experience in the perceived level of importance of honesty and integrity at the UoY and CU.

H3.3: There is a significant difference between students with work experience and students with no work experience in the perceived level of importance of respect for life, law and the public good at the UoY and CU.

H3.4: There is a significant difference between students with work experience and students with no work experience in the perceived level of importance of responsible leadership: listening and informing at the UoY and CU.

4.6.4 Effect of ethics education on perceiving the level of importance

Ethics education was also found to be another factor that affects ethical decision making and behaviour, yet, there are contradictory opinions on the influence of ethics education among students. Colnerud and Rosander (2009) noted that learning ethics in general increases the students' ethical perceptions about academic misconduct, and Awasthi (2008), found that being exposed to ethics courses improved managerial and leadership skills, but not moral judgments. Cagle and Baucus (2006) supported these notions, where they found that students who undertook ethics education interventions were more likely to judge an unethical situation as managerially bad compared to other students. Cagle and Baucus (2006) justified these findings as a result of the in-depth ethics education introduced to students, which focused on scandals, and appeared to override students

doubts. They noted that studying ethics-based cases had a positive impact on students' perceptions of business ethics. Mayhew and Murphy (2009) also found that students who undertook a course of ethics were less likely to lie for extra money than the control group. Mayhew and Murphy (2009) suggested that ethics educational interventions which involved discussing academic dishonesty and misreporting financial reports encouraged honest reporting which emerged as a social norm within the group exposed to the intervention. In addition, Weber (1990) concluded that students' ethical reasonings and awareness developed after undertaking courses on ethics. Monteiro (2017) also found that before students undertook ethics interventions, most of them perceived the professional engineer as a person who exhibits good technical skills, but not as an actor who needs ethical values and is involved in the social construction. Monteiro (2017) suggested that after taking the educational interventions, respondents considered all ethical topics as important, such as Ethics for engineers, Engineering action consequences on society and the environment, Ethics historical evolution as well as Ethics and moral concepts. Moreover, Wells and Schminke (2001) maintained that educational programs improved participants' self-management of ethical conduct. Conversely, several other researchers argued against the impact of ethics education. For example, Borkowski and Ugras (1992), Davis and Welton (1991), Martin (1982) and Salmansaug (1987) argued that ethics education cannot affect student's ethical reasoning and decision making. McDonald and Donleavy (1995) justified these assumptions based on the notions that teaching ethical decision making is considered 'invasion of privacy', and that students usually learn ethical values from their peers, rather than from an educational programmes (Loui, 2005). For them, dealing effectively with integrity issues in professions at any HEI level is impossible, and therefore most of the ethics education courses at the university level would become useless exercises. Furthermore, some argued that by the time students reach higher education age their moral formation is someway complete, therefore, formal ethics educational interventions will have little effect on students' learning and behaving ethical (Martin, 1982). Arlow (1991) also argued that it is difficult to change someone's ethical formations after they have reached adulthood. In addition, some believed that ethics education is a new field that bridges two disciplines, professional and moral philosophy, therefore a fundamental issue arises regarding how it should be taught, and by whom (Salmansaug, 1987). Furthermore, McDonald and Donleavy (1995) also added that ethics is usually viewed as a personal and individual matter, because ethics are already set and shaped in individuals in their early years. In addition, Sweeney, Arnold

and Pierce (2010) added that ethics education had a limited impact on respondents' ethical views, and the relationship between the length of educational intervention and ethicality was complex. Based on this discussion the researcher predicts significant differences between the two groups of students' perceptions, and due to the same reasons discussed earlier in subsection 4.6.1 about the non-directional alternative hypothesis, the researcher hypothesis the following:

H4.1: There is a significant difference between students who had been exposed to ethics education previously and students who had not in the perceived level of importance of accuracy and rigour at the UoY and CU.

H4.2: There is a significant difference between students who had been exposed to ethics education previously and students who had not in the perceived level of importance of honesty and integrity at the UoY and CU.

H4.3: There is a significant difference between students who had been exposed to ethics education previously and students who had not in the perceived level of importance of respect for life, law and the public good at the UoY and CU.

H4.4: There is a significant difference between students who had been exposed to ethics education previously and students who had not in the perceived level of importance of responsible leadership at the UoY and CU.

4.6.5 Effect of micro-ethics on perceiving the level of importance

The Engineering Council (2014) stated that Engineering schools in the U.K. follow a similar curriculum. Alpay (2013) and Tomkinson, Tomkinson and Dobson (2008) added that Engineering departments integrate ethics education in their curriculum differently and that universities promote academic integrity differently. Furthermore, institutions might provide different educational materials to their students as part of the curriculum so do engineering departments and institutes provide different ethics educational interventions and educational opportunities as part of the curriculum (Carter, 2016). Moreover, the rules set, policies, codes of ethics, and students handbooks at different universities and institutions play important roles in affecting students' ethical perceptions. Hence, these rules will affect students from different educational institutions in diverse ways (Carter, 2016). Thus, students will vary in perceiving ethical self-sustainment, ethical knowledge and acquisition of knowledge (Hanson and Moore, 2013) (Macfarlane, Zhang and Pun, 2014). In addition, educational institutions may have different

expectations for their students' learning. This can, therefore, result in distinct educational experiences and environments, which may result in different educational benefits for their students (Carter, 2016). Moreover, sub-disciplines can develop different responsibilities and therefore different ethical perceptions (Carter, 2016) (Study.com, 2019) (Graduate Prospects, 2019). The researcher predicts significant differences between the two groups of students' perceptions, and due to the same reasons discussed in subsection 4.6.1 about the non-directional alternative hypothesis, the researcher hypothesis the following:

H5.1: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of importance of accuracy and rigour at the UoY and CU.

H5.2: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of importance of honesty and integrity at the UoY and CU.

H5.3: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of importance of respect for life, law and the public good at the UoY and CU.

H5.4: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of importance of responsible leadership: listening and informing at the UoY and CU.

4.6.6 Perceiving the level of development

Many studies highlighted mixed results in terms of the development of ethical skills in relation to gender, culture, work experience, ethics education and of course different educational institutions. These mixed results were stated in studies done by Varsavsky, Matthews and Hodgson (2014), Mercer-Mapstone and Kuchel (2015), Mercer-Mapstone and Matthews (2017) and Passow (2012). However, the researcher believes that developing these skills is related to individual differences in many aspects and in relation to many factors as discussed earlier in Chapters 2 and 3. There are also other factors that can affect the development of ethical and professional skills, such as lack of interest in ethics education. Colby and Sullivan (2008) stated that some engineering students perceive ethics as irrelevant, wasted effort and time, and a common sense issue. Newberry (2004) added that some students expressed that they joined engineering schools to avoid these subjects and engage in more engineering, technical, and mathematical tasks.

Additionally, Swingler (2008) argued that another factor which could play a role in students' development is learning preferences variation, which makes it difficult to assess ethical development. While some students may favour being involved in a learning activities, others may not. Eventually, this can affect students' engagements in ethics educational interventions, their ethical perceptions and the impact on each student differs from one student to another (Finelli et al. , 2012). Thus, the researcher predicts that no differences between groups in relation to gender, culture, work experience, and ethics educations effect will be observed among these groups. That being the case, the researcher assumes a null hypothesis for the development of ethical skills, and hypothesis the following:

HO1.1: There is no significant difference between female and male students in the perceived level of development of accuracy and rigour at the UoY and CU.

HO1.2: There is no significant difference between female and male students in the perceived level of development of honesty and integrity at the UoY and CU.

HO1.3: There is no significant difference between female and male students in the perceived level of development of respect for life, law and the public good at the UoY and CU.

HO1.4: There is no significant difference between female and male students in the perceived level of development of responsible leadership: listening and informing at the UoY and CU.

HO2.1: There is no significant difference between British and Chinese engineering students in the perceived level of development of accuracy and rigour at the UoY and CU.

HO2.2: There is no significant difference between British and Chinese engineering students in the perceived level of development of honesty and integrity at the UoY and CU.

HO2.3: There is no significant difference between British and Chinese engineering students in the perceived level of development of respect for life, law and the public good at the UoY and CU.

HO2.4: There is no significant difference between British and Chinese engineering students in the perceived level of development of responsible leadership: listening and informing at the UoY and CU.

HO3.1: There is no significant difference between students with work experience and students with no work experience in the perceived level of development of accuracy and rigour at the UoY and CU.

HO3.2: There is no significant difference between students with work experience and students with no work experience in the perceived level of development of honesty and integrity at the UoY and CU.

HO3.3: There is no significant difference between students with work experience and students with no work experience in the perceived level of development of respect for life, law and the public good at the UoY and CU.

HO3.4: There is no significant difference between students with work experience and students with no work experience in the perceived level of development of responsible leadership: listening and informing at the UoY and CU.

HO4.1: There is no significant difference between students who had ethics education previously and students who had not in the perceived level of development of accuracy and rigour at the UoY and CU.

HO4.2: There is no significant difference between students who had ethics education previously and students who had not in the perceived level of development of honesty and integrity at the UoY and CU.

HO4.3: There is no significant difference between students had ethics education previously and students who had not in the perceived level of development of respect for life, law and the public good at the UoY and CU.

HO4.4: There is no significant difference between students had ethics education previously and students who had not in the perceived level of development of responsible leadership at the UoY and CU.

As discussed earlier in Chapter 3, and subsection 4.6.5 in this chapter, the researcher hypothesised the following:

H5.6: There is a significant difference between Engineering students from the UoY and Engineering students from CU in terms of the perceived level of development of accuracy and rigour at the UoY and CU.

H5.7: There is a significant difference between Engineering students from the UoY and Engineering students from CU in terms of the perceived level of development of honesty and integrity at the UoY and CU.

H5.8: There is a significant difference between Engineering students from the UoY and Engineering students from CU in terms of the perceived level of development of respect for life, law and the public good at the UoY and CU.

H5.9: There is a significant difference between Engineering students from the UoY and Engineering students from CU in terms of the perceived level of development of responsible leadership: listening and informing at the UoY and CU.

4.7 Summary and restatement of the model rationales

As indicated in Chapter 1, the main objective of the new integrated model is to utilise two frameworks. The first is based on the classical models, theories and concepts of cognitive moral psychology and social psychology, while the second framework is based on the RAEng's SEPs. This model seeks answering a broad research question that will be driving the two sub-questions. This main research question for this thesis and that evolves around the new integrative model is:

RQ. How effective is ethics education in the engineering curriculum?

This main question will be driving the two research sub-questions and frameworks. As explained earlier in Chapter 2, this model tries to fill in the gaps that the other models, that have been discussed in Chapter 2, neglected or did not explore, and tries to address and provide the following:

- The different individual and organisational factors that can affect ethical decisions and perceptions within one conceptual model.
- The skills that can enhance ethical decision-making abilities.
- The set of skills that have been developed by educational programmes and the skills that have not been developed yet.

As stated in Chapter 3, the new integrated model is to be used as a snapshot of the ethical reasoning process when an individual face an ethical issue or dilemma, and this model is illustrated in Chapter 3, Figure 3.2.

4.8 Chapter summary

This chapter provides a basis of understanding and conceptualising the topic within the context of the study. As indicated in the chapter and the previous chapters, the literature suggests that various educational contents, aims, practices, and methods are applied in ethics education generally, and in engineering education. This chapter highlighted several research gaps and inadequate approaches to addressing these gaps. In this chapter, clarifying and defining the research questions, sub-questions, further sub-questions and hypothesis to facilitate proposing the research approach to solve these questions, and fill the identified gaps in the existing body of knowledge were the main aims. Based on the discussion presented in section 4.3, the researcher will be using the terms evaluation and assessment as synonyms and interchangeably. In the next chapter, Chapter 5, the research paradigm, design and approach will be discussed.

Chapter 4 Research Paradigm, Design and Approach

5.1 Chapter overview

The previous chapters reviewed some of the gaps in the literature concerning the evaluation of the effectiveness of ethics education in engineering programmes. This chapter will discuss the research framework and provide an overview of the research paradigms and approaches that will be employed in this project.

The initial sections look at the philosophical stance of this research, and the use of triangulation methods. The later sections discuss the credibility and evaluation of the research findings and the potential challenges with the chosen research methods.

5.2 Research Paradigm

Research, according to Williams (2007.p.65), is "*the process of collecting, analysing, and interpreting data to understand a phenomenon*". Once research questions are developed and defined, investigating the research topic and answering the research questions are the next steps. The research design depends on how the problem of the study is defined, how it can be approached, and how the findings can be credible to the researcher, other researchers and policymakers in the discipline. Researchers have their own views on what constitutes knowledge and truth (Chilisa and Kawulich, 2012). These views guide the researchers' thinking, beliefs, and assumptions about one's self and society, and these views frame how the researchers view the world around them, which is known as a paradigm (Schwandt, 2014). A paradigm, as per Chilisa and Kawulich (2012.p.1), is "*a shared world view that represents the beliefs and values in a discipline and that guides how problems are solved*". The term, research paradigm, is related to knowledge that has been developed, the nature of this knowledge (Saunders, Lewis and Thornhill, 2009), the philosophical assumptions that influence the research conduct (Creswell, 2013), and the way the researcher views the world (Saunders, Lewis and Thornhill, 2009), therefore, it must be identified (Creswell, 2013). A paradigm is a way that describes a world view, which is informed by philosophical assumptions. These assumptions are about:

- Ontology of research (Guba, 1990), "*what do we believe about the nature of reality?*" (Chilisa and Kawulich, 2012.p.1)
- Epistemology of research (Guba, 1990), "*how do we know what we know"* (Chilisa and Kawulich, 2012.p.1)

- Axiology of research (Guba, 1990), "*what do we believe is true?*" (Chilisa and Kawulich, 2012.p.1)

These three paradigms, then, will lead the researcher to ask specific questions and use systematic inquiry and appropriate approaches, which are known as the research methodology (Chilisa and Kawulich, 2012). A research methodology is concerned with what, why, where, when and how the data are collected and analysed (Guba, 1990) (Scotland, 2012). Other researchers added more details and sub-categories to explain a methodology of research, by which the research approach takes a sequential process. This process is illustrated in Figure 5.1, explaining the relationship between the three paradigms and research methodology are discussed next in more details.

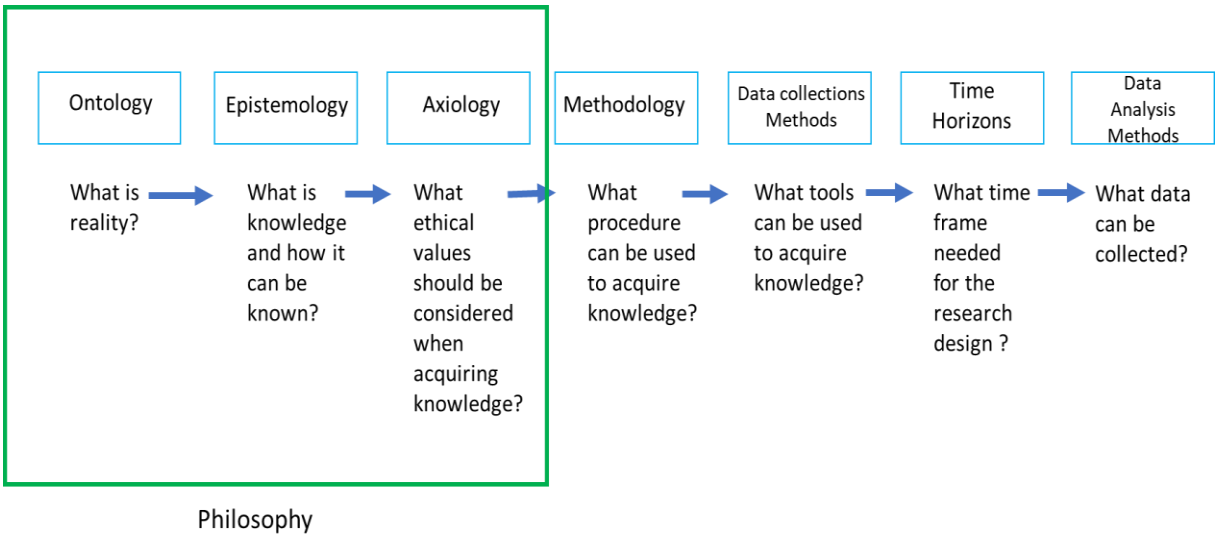


Figure 4.1 *Relationships between paradigms adapted from Guba's (1990), Chilisa's and Kawulich's (2012) and Saunders's, Lewis's and Thornhill's (2009) works*

5.3 Ontology

In ontological paradigm assumptions, the researcher should answer the question of what is the nature of reality (Creswell, 2013), and the premises of human nature are concerned with the questions about the role of the researcher or investigator in such a reality (Laughlin, 1995) (Chen, 2012). The researcher should also answer the question of whether the reality is objective or subjective:

- Objective assumptions believe that the world of natural phenomena is real, natural, and external. These assumptions also view reality as something concrete and something that is external to, forcing itself on, and determining the individual's behaviour, and that knowledge is real in the sense of having measurable and observable patterns (Chen, 2012) (Cohen, Manion and Morrison, 2013) (Burrell and Morgan, 1979).
- Subjective assumptions believe that human beings shape the world within their own experience, view reality as a product of the human mind, and knowledge is experiential and personal. Thus, research methods are developed to explore individuals' understandings and their subjective experiences of the world (Chen, 2012) (Cunliffe, 2010).

The view of ontology, however, is not merely either objective or subjective anymore. As Morgan and Smircich (1980) stressed, there are different ontological assumptions from the extreme objective at one end of a spectrum, to the extremely subjective point of view at the other end of the spectrum (Chen, 2012) (Cunliffe, 2010). In this PhD study, the researcher acknowledges the importance of the spectrum of both objectivism and subjectivism, yet, restricting her research conduct to one of those options is challenging; thus, she decided to follow a pragmatic paradigm, which is discussed later.

5.4 Epistemology

Epistemology paradigm includes assumptions which are concerned with bases, forms and nature of knowledge, how it can be investigated and acquired, and how it can be conveyed to others (Cohen, Manion and Morrison, 2013) (Scotland, 2012). In other words, it merely indicates the means of knowledge (Kivunja and Kuyini, 2017). The epistemological paradigm's assumptions, in the case of this study is to understand and explore the complex nature of the study of ethics and how it is influenced by factors such as technical, social, psychological, behavioural, and philosophical (Chatterjee, Sarker and Valacich, 2015) (Crossler et al., 2013). The epistemological view of the researcher regarding what constitutes adequate knowledge in the pragmatism paradigm is about the "*focus on practical applied research, integrating different perspectives to help interpret the data*" (Saunders, Lewis and Thornhill, 2009.p.119). Tashakkori, Teddlie and Teddlie (1998) believed that a pragmatism approach could help researchers avoid engaging in pointless debates about truth and reality concepts, because this view arises out of situations, consequences and actions. Additionally, the concern in pragmatism is more about what

works and how to solve the research problem using all the possible approaches to understand the problem, rather than the research methods (Creswell, 2013). Adopting a pragmatic approach allows the researcher to work with variations in epistemology, ontology and axiology paradigms, within a study (Saunders, Lewis and Thornhill, 2009). Creswell (2013) supported the notions of Saunders's, Lewis's and Thornhill's (2009) that pragmatism is not committed to one philosophical view or paradigm, it is a paradigm which enables greater awareness of the actual day to day moral and ethical activities (Serra, 2010). As this PhD study involves evaluating the effectiveness of ethics education, a pragmatic philosophy is justifiable. This stand was applied to the different aspects of the interactions between ethical reasoning and areas such as:

- Organizational, cultural, and social contexts of the engineering profession that can shape students' ethical perspectives, and how these perspectives are interpreted
- Students' differences in evaluating moral judgements, which are based on the social impacts of ethical issues.

Ethical perceptions are not fixed or ready to be applied, nor are they directly applicable across similar circumstances. The values of different moral viewpoints cannot be proved by their argumentations (Zhu and Jesiek, 2017). Instead, ethical perceptions should be treated as hypotheses that should be explored, tested and evaluated considering their actual consequences where they are tested while putting them into real-life practice. Like ethical perceptions, codes of ethics are generally abstract and do not provide engineering students or professional engineers with a clear direction on how they can behave in every specific ethical circumstance. Moreover, an adequate course of action in one situation may neither be applicable nor effective in another similar situation in the future, if the situational factors change. Thus, the circumstances usually inform the choice of ethical decisions and perceptions, depending on the most reasonable and psychologically preferable choice. In contrast to other traditional approaches to assessing engineering ethics education based on the individualistic moral reasoning, the pragmatic approach focuses on the broader contexts in which engineering is based on. Broader contexts include social and organisational aspects, among others, which can affect engineers' ethical decisions. Engineers are also encouraged to consider and employ different social and organizational factors and concerns, such as organisational cultures, work cultures, political cultures, professional relationships, and the social cultures of society, etc. Thus,

different circumstances play different roles in the moral reasoning processes. The pragmatic approach is also present in the broader impacts and consequences of moral decisions that surround individuals, communities and things. As argued by the pragmatic ethicist LaFollette (2014), all ethical inquiries are fundamentally social. Thus, a practical ethical approach should consider the human conduct in social, interpersonal situations, such as how certain behaviours are associated with other actors, and how to act per the interest and rights of different stakeholders. In this sense, a pragmatic stand in assessing engineering ethics education is based on consequences, by which it views the effects of the choices as what matters most rather than the impact of intentions (Emison, 2004). Besides, the pragmatic approach of ethics evaluation places more emphasis on the role of education in improving the individual's moral experience, improving and enhancing ethical skills, and cultivating their ethical leadership and character (Rosenthal and Buchholz, 1999). According to Zhu and Jesiek (2017.p.699) , the pragmatic stand in ethics education can help in evaluating a moral perception and behaviour based on "*the extent to which it helps enrich the learning experience of the decision-maker and improve the circumstance of the decision-maker*".

5.5 Axiology

Axiology, according to Saunders, Lewis and Thornhill (2009.p.116) is "*a branch of philosophy that studies judgements about value*". Axiology refers to the role of the researcher's values that encompasses the research process and stages, and the researcher's ethical stance in terms of the studied areas (Wahyuni, 2012). According to Mason (2017), implementing ethical considerations is based on four principles that should be considered when dealing with participants and data. These principles include Privacy, Accuracy, Property, and Accessibility (PAPA).

- Privacy is concerned with the safeguards and conditions about protecting information that individuals reveal to others about themselves and their associations, and the information they can keep to themselves and not be forced to disclose.
- Accuracy is concerned with the information's fidelity, and the person responsible for the authenticity and accountability for information errors.
- Property is concerned with information owners, fair judgements and costs of information exchange, responsibility for the channel through which information is transmitted, and how accessing this information can be accessed and allocated.

- Accessibility is concerned with the person with access to and the means of obtaining this information, whether individual(s) or an organisation and the conditions and safeguards of this access.

These ethical considerations, as stated in Kivunja's and Kuyini's (2017) and Wahyuni's (2012) publications, can help researchers demonstrate their ethical conduct, during their research work. These ethical considerations can help researchers demonstrate their understanding of respecting human dignity and participants' rights. The researcher followed these four critical ethical principles, along with the ethical research guidance of the University of York, in addition to the ethical principles and considerations highlighted in section 1.8 in Chapter 1. All four studies that were conducted in this PhD, the focus group discussion interviews, self-reflective writing interviews, the surveys and the semi-structured interviews, have been approved by the University of York (UoY) and Coventry University (CU) Ethics Committee. Before each study was conducted, the students were asked to sign a consent form to ensure their approval to take part in the study (Creswell, 2013). Participants were also given the full right to withdraw from the interviews or surveys at any point if they felt unconformable (Coolican and Coolican, 2014.p.286). Appendix 1, 2, 3 and 4 illustrate the consent form of Phase I of Study 1 as well as Phase I and II of Study 2. In addition to these procedures, extra ethical precautions were taken by the researcher for Phase I (see Appendix 2) in Study 1 to confirm that nothing participants write will be attributable to them personally in the research, and they were advised that if they experienced any disturbing emotions or distress by taking part in the study, they should contact the University's staff members to offer relevant information and help point referrals such as their own academic supervisors, York Night Line, students' College wellbeing support, Graduate Students' Association GSA, University of York Students' Union (YUSU) Advice and Support Centre, and Student Support Hub.

5.6 Pragmatism as a paradigm

Brierley (2017) claimed that a pragmatic view gives less control to philosophical assumptions of research methods in conducting the research, because by doing so, researchers are less restricted in the way they can conduct and carry out research. The researcher adopted Brierley's (2017.p.13) perceptions of pragmatic reality that is "*is a complex system, rather than a set of variables that can be tested by a series of hypotheses"*. In addition to the notions that the existing natural world is a mixture of the psychological and emergent social world, it also accepts the view of humans as social

actors (Cunliffe, 2010) (Morgan and Smircich, 1980). Collectively, these perceptions propose pragmatism as adopted views. Saunders, Lewis and Thornhill (2009), Brierley (2017) and Tashakkori and Teddlie (2010) emphasised that research philosophy is a continuum rather than an option, where pragmatism lies between the two ends of subjectivity and objectivity. Saunders, Lewis and Thornhill (2009.p.119) defined pragmatism as an *"external, multiple, view chosen to best enable answering of research question*". Johnson and Onwuegbuzie (2004) added that pragmatism is considering 'what works' to answer research questions, rather than making a choice between subjectivity and objectivity paradigms. However, that does not mean that conducting mixed method research can follow an 'anything goes' approach (Denscombe, 2008), but should be adopted thoughtfully, by choosing the appropriate methods that can answer the research questions, and integrate their results (Brierley, 2017). Tashakkori and Teddlie (2002.p.X) emphasised that mixed methods research *"is a separate methodological orientation with its own worldview*". Thus, the researcher's choice of a pragmatic paradigm is focusing and emphasizing on the methods of selection and how they can be used in exploring this topic area, rather than emphasizing ontological and epistemological philosophies.

5.7 Methodology and data collection methods choice of this thesis

As illustrated in Figure 5.1, defining the methodology is the next step in the research process. The methodology is the action plan or strategy which justifies the reason for choosing a method (Crotty, 1998). It is concerned with what, why, where, when and how the data are collected and analysed (Scotland, 2012). For this research, the methodology of choice is multiple methods methodology. Multiple methods methodology, according to Saunders, Lewis and Thornhill (2009.p.151), is using "*more than one data collection technique and analysis procedures to answer your research question*". Saunders, Lewis and Thornhill (2009) added that there are several types of multiple methods methodology, and for the purposes of this thesis, two of these multiple method approaches will be employed, the mixed method, and qualitative multi-method approaches. Schoonenboom and Johnson (2017) supported the notions of Saunders's, Lewis's and Thornhill's (2009) by stating that mixed methods are the 'siblings' of multi-methods. Saunders, Lewis and Thornhill (2009.p.153) defined a mixed method as combining "*quantitative and qualitative data collection techniques and analysis procedures as well as combining quantitative and qualitative approaches at other phases of the research such as research question generation"*. On the other hand, Saunders, Lewis and Thornhill (2009.p.152)

defined multi-methods as "*those combinations where more than one data collection technique is used with associated analysis techniques, but this is restricted within either a quantitative or qualitative world view*". Each type of the multiple methods will be used to answer a different sub-research question, which both will, eventually, contribute to answering the main research question. Schoonenboom and Johnson (2017) referred to the type of multiple method that employs multiple phases to answer one broad research question and theoretical drive as a multi-phase design. According to Schoonenboom and Johnson (2017.p.119), a multi-phase design is "*more than two phases or both sequential and concurrent strands are combined over a period of time within a program of study addressing an overall program objective"*. At root, triangulation is argued as a justifiable core principle of mixed methodologies (Torrance, 2012). Triangulation, as per Saunders, Lewis and Thornhill (2009.p.146), refers to "*the use of different data collection techniques within one study in order to ensure that the data are telling you what you think they are telling you*". Wolf (2010) added that triangulation is a terminology that is often referred to when data are contrasted, compared and generated using different methods. Wolf (2010) referred the reason for using multiple methods is because the researchers believe that the "*one-size-fits-all*" (P160) concept cannot be applied to the area of research, but rather it should be "*tailor-made*" (P.144) to adequately fit the research questions and aims. Thus, the author of this thesis will be using the terms 'triangulation', 'multi-phase method' and 'mixed methods' or MMs interchangeably to refer to the overall multiple method that she will be using in this thesis research. This will be done with respect to the terminology differences between mixed methods and multi-methods.

Schoonenboom and Johnson (2017) suggested that a mixed methods methodology (MMM) is a type of research, in which elements of qualitative and quantitative viewpoints, data collection and analysis are used to broaden the depth and breadth of research's understanding. Saunders, Lewis and Thornhill (2009) and Wahyuni (2012), indicated that mixed methods allow results to be generalised and include new ideas and perspectives, and Johnson and Onwuegbuzie (2004) argued that MMM is increasingly becoming recognised as a third research paradigm beside the quantitative and qualitative. Sieber (1973) outlined that combining quantitative and qualitative methods are effective in research designs. Guion, Diehl and McDonald (2002) also suggested that triangulating methods, data analysis and results are considered useful tools to be used in qualitative research and are usually used to establish and check validity by analysing a research

question from multiple angles and perspectives. For example, at the initial stage of any research design, qualitative data components can support, assist and boost quantitative data components of the same study and vice versa, as well as for two or more qualitative or quantitative data collection methods. This can be achieved by providing conceptual and instrumental suggestions and development. However, at the data collection stage, qualitative data can enable the data collection process, while quantitative data can enable obtaining the baseline data and information. Finally, in the data analysis stage, qualitative data can facilitate analysing, describing, clarifying, validating, grounding and modifying data collected from the previous stage, whether quantitative or qualitative. Alternatively, during the data analysis stage, quantitative data can enable generalising qualitative data and shed light on these qualitative findings. Given all the potential benefits of using MMM, there are some limitations associated with such methodologies. For instance, Harris (2013), Hoyningen-Huene (1990) and Jackson and Carter (1991), argued that using MMM can reduce the efficiency and purity of either methods when used together. Harris (2013) also noted that using such methodologies can create a philosophical conflict at an epistemological level, due to the difficulty in equating one school of thought to another, causing incommensurability. The concept of incommensurability questions the validity of the MMM (Hoyningen-Huene, 1990) (Jackson and Carter, 1991), and argued that mixed methods could reduce their individual efficacy. These arguments are related to issues to do with lacking common standard measurements, and difficulties in equating the results between two or more different methods. Harris (2013.p.157) further clarified that findings resulting from a single method "*can become less pure when merged with the results from a different method with its own*". Incommensurability is not a "*philosophical problem*" in research only (Hoyningen-Huene, 1990.p.482), as different disciplines' perspectives can also affect research approaches (MacCleave, 2006). For example, MacCleave (2006.p.40) expressed concerns about this problem "*different disciplines have their own way of doing things …and different specialized languages … Some of these differences might be incommensurable; in other words, one discipline's research traditions, practices, and languages cannot be understood or explained in terms of the research traditions, practices, and languages of another discipline without considerable distortion, incoherence, or confusion*". Besides, Jarratt (1996) implied that some researchers consider that MMM within a single discipline can be incommensurable as well (Harris, 2013). Jarratt (1996) compared two alternative interviewing methods within one integrated research design, which was a case study using semi-structured and

unstructured interviewing methods, and then integrated the results with a quantitative method. She reported that the inherited weaknesses of the collected data within each method "*contribute collectively and separately to the development of a questionnaire for quantitative assessment*" (Jarratt, 1996.p14). On the other hand, Johnson and Onwuegbuzie (2004) argued that given all the benefits of MMM, there is no general consensus about the stages of the research where MMM may occur or the most effective approach for integrating methods at each stage of the research.

Despite the concerns raised by some researchers, several other researchers, such as Saunders, Lewis and Thornhill (2009), Johnson and Onwuegbuzie (2004) and Creswell (2013) insisted that pragmatism is an attractive and well-developed philosophy for MMM and perspectives. A pragmatist may claim that paradigms can remain separate, or even be integrated into another research paradigm, or reject an incompatible research method. Although incommensurability can be an issue in MMM research, Saunders, Lewis and Thornhill (2009), Creswell (2013), MacCleave (2006) and Jarratt (1996) emphasized the potential benefits of such methodologies, such as bringing them together to compensate for the risks and weaknesses of each method alone. Moreover, Johnson and Onwuegbuzie (2004) and Oliver-Hoyo and Allen (2006) believed that MMM choices are more appropriate and preferred over single methods, but only if these approaches can be justified as complementary or necessary to answer particular research questions and objectives. While both sides of the argument appear to have justifiable arguments, MMM can still offer a pragmatic way to answer complex research questions, and potentially provide the opportunity to develop new knowledge. Nonetheless, considering the essential condition for using this methodology, which is justifying the reasons for this research, in which mixed methods are employed, the researcher considers MMM, in the case of this research as exploratory, confirmatory, complementary, and makes it easy to verify results.

5.8 Research design and approach

Research design is the set of proposals, plans and procedures for conducting research (Creswell, 2013). In this subsection, the research design and approach for this thesis is illustrated in Figure 5.2, and the role of each method in this design is discussed. In addition to discussing the time horizon choice, rationales, objectives of the methodology, method choices and potential significance of this approach.

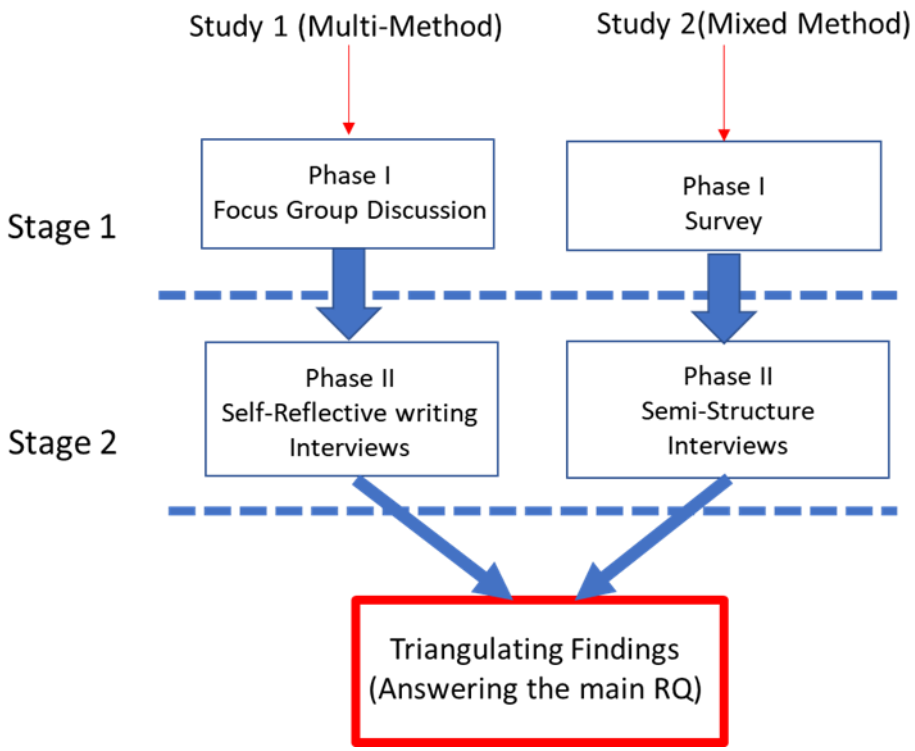


Figure 4.2 *Thesis research approach*

As highlighted in Chapter 1, the research aimed to answer one broad question, that is "How effective is ethics education in the engineering curriculum?", and to answer this broad question, two sub-questions were developed. With these two sub-questions, two frameworks were proposed to answer these sub-questions, and accordingly, two different study designs and data collection methods are to be used. Study 1 is aimed at exploring and investigating engineering students' moral reasoning, factors and skills that can affect their ethical perceptions, and whether ethics education can change students' ethical perceptions. Thus, a moral reasoning framework was applied to this study. Study 2, on the other hand, is aimed at exploring engineering students' professional perceptions of the relative level of importance and level of development of the Royal Academy of Engineering's (RAEng's) Statement of Ethical Principles (SEPs), the fit of the RAEng's SEPs to measure these perceptions, and the reasons behind students' ratings. As illustrated in Figure 5.2, Study 1 and Study 2 are designed in a 'partially' concurrent, where both phases will be executed, simultaneously (Schoonenboom and Johnson, 2017)

(Guest, 2013). The reason for this is to develop a complete understanding of the research problem and question, by obtaining different perspectives of the problem, and complementing the data collected from each phase (Wiliams, 2007). In this thesis design, limited interactions between Study 1 and Study 2 during the data collection stages will be provided, yet, the findings from both studies will be complementing and validating each other (Morse, 2002). Study 1 and 2 are two independent studies, but the data will be collected and analysed at the same time and in a single stage, and both methods will be given the same priorities, and the data analysis will be kept independent (Wiliams, 2007). The purpose of using different methods of quantitative and qualitative is to triangulate the findings obtained from each phase and study for integration together into one overall study interpretation (Creswell and Clark, 2006). The type of the concurrent design that will be employed for integrating Study 1 and Study 2 is a Concurrent Transformative Design (CTra) (Creswell, 2013).

The design of Study 1 is based on using a multi-method design (Saunders, Lewis and Thornhill, 2009), where two different qualitative data collection methods will be used (within-method triangulation (Denzin, 2017) (Casey and Murphy, 2009) (Bekhet and Zauszniewski, 2012)). This study will employ a Concurrent Triangulation Design (CTri), in which the qualitative data will be collected concurrently in each phase, then the data will be analysed separately, and finally compared and/or combined. This design method is usually used to cross-validate, confirm and or corroborate the study findings. This design also used to overcome any potential weakness that one method may have and integrate the strengths of both methods (Creswell, 2013). This study will be using focus group interviews and self-reflective writing interviews, which are introduced in the following two subsections.

5.8.1 Focus group interviews

In Phase I of this study, an exploratory approach will be used, and according to Butler (2014) exploratory research aims to address ‘why’ questions that are usually associated with cause and effect relationships. In this exploratory study, the researcher will be using focus group interviews. In focus group interviews, participants are encouraged to talk to each other, discuss, ask questions, comment on each other’s point of views (Kitzinger, 1995), and build on each other’s ideas (Leung and Savithiri, 2009). This method has some limitations, such as participants feeling insecure and unprotected anonymity feelings. These feelings are related to sharing personal information in front of other participants

and in the presence of the recording devices, which can limit participants from speaking openly (Woodyatt, Finneran and Stephenson, 2016). Another limitation, indicated by Acocella (2012), is individuals not being fully in control of their answers during focus group interviews, even if they intend to be as honest as possible and to meet the interviewer's expectations. This is because the personal characteristics of one group member can affect other participants' behaviours during group discussions, and their reactions to his/her actions and words. This effect can encourage others in the focus group to respond favourably to ideas or comments of the concerned group member (Krueger and Casey, 2015). Additionally, participants might sometimes use defensive strategies to protect themselves from being tested due to increased stress ad or effort (Stodel, 2015), or from being judged, not meeting expectations and other feelings of anxiety about being in a group. All of these feelings can lead focus group participants to conform, at least publicly, to the most popular opinion in the group, as it is considered socially accepted (Acocella, 2012). Furthermore, the possibility of outspoken students dominating the discussion can influence the other group members' perceptions and affect what they say during the group discussion (Stewart, Shamdasani and Rook, 2007) (Leung and Savithiri, 2009). However, according to Saunders, Lewis and Thornhill (2009), conducting focus group interviews is one of the principal ways to conduct exploratory research, and the research focus starts broad and becomes progressively narrower as the research progresses. Applying this method can facilitate data collection and constructing frameworks, particularly in the initial stage of the research and especially if the topic has not been extensively studied before, and the researcher is new to the area (Freitas et al., 1998). In terms of time, compared to individual interviews, focus group interviews are less demanding to researchers. However, the time and effort required to analyse the complex data elicited from this method might ultimately negate any time savings (Carter et al., 2014) (Mansell et al., 2004). Thus, despite the limitations, the method is fit for this research, and that is why it will be used.

5.8.2 Self-reflective writing interviews

In Phase II of this study, a confirmatory approach will be used that will establish an idea about what is going on based on several indications from the previous study phase and to support the theory that has been established earlier by facts (Butler, 2014). In this confirmatory study, the researcher will be using reflective-writing interviews. This data collection method can be challenging, due to difficulties in splitting between reason and

emotion, but using predefined emotional and rational skills criteria can help in overcoming this challenge. Moreover, reflecting and sharing these reflections may also cause respondents to feel vulnerable for exposing their thoughts and findings; therefore, it is expected that a lot of students might not feel comfortable exposing their feelings and behaviours truly and honestly (Helyer, 2015). According to McCarthy (2003), self-reflection are rich methods to collect qualitative data, and reflective writing involves writing personal stories about unique experiences in lives. Reflective writing can help to explore experiences that deal with ethical issues. In addition, Harsh (2015), Hersh (2016) and Morris (2001) implied that self-reflective writing interviews contain both rational and emotional elements. This approach can be effective in terms of capturing students' reflections and experiences on their ethical maturation. Ethical maturation involves students being conscious of their thoughts, prejudices, feelings, and judgments, and how they intend or did use these personal experiences and knowledge to act in the future (Harsh, 2015) (Helyer, 2015). Thus, regardless of the few limitations expected in using this method, the researcher will be using it to confirm the results and findings of the earlier phase.

The design of Study 2 is based on using an explanatory sequential mixed method, in which quantitative approach will be conducted first, then a qualitative approach. In this way, the qualitative method will be used to explain the quantitative results (Subedi, 2016) (a cross-method triangulation) (Denzin, 2017) (Casey and Murphy, 2009) (Bekhet and Zauszniewski, 2012). The quantitative data collection method that will be used is a survey design instrument, and the qualitative method will be using semi-structured interviews which are discussed in the next two subsections.

5.8.3 Survey

In Phase I of this study, an exploratory approach will be used to explore engineering students' perceptions, using a survey instrument that will be designed and constructed by the researcher. According to Aiken (1997), surveys are often known under different names, such as "questionnaires", "inventories", "tests", "forms", "scales", "studies, "indexes", or "indicators". Dornyei (2003) added that researchers have used the general rubric of a survey in a broad sense as self-administered questionnaires. However, Brown (2001.p.6) defined surveys as "*any written instruments that present respondents with a series of questions or statements to which they are to react either by writing out their answers or selecting from among existing answers*". The survey item pools will be

adapted from the RAEng's SEPs (The Royal Academy of Engineering, 2012), which will result in four scales being generated based on these statements' of four fundamental principles. The first scale is Accuracy and Rigour principle which contains 14 items, the second scale Honesty and Integrity has ten items, the third scale is Respect for life, Law and the Public Good having seven items, and the fourth scale is Responsible Leadership: Listening and Informing which has five items. The researcher decided to adopt this approach due to reasons that were discussed earlier in Chapter 4, and that is to do with the originality in adapting the framework, and the lack of the availability of such instruments. General considerations will be followed by the researcher when developing the survey items, such as writing survey items in short and simple forms, avoiding jargons and abbreviations, and avoiding negative constructions (Dornyei, 2003). Also, double-barrelled statements will be avoided, in which two or more questions in one are asked while expecting a single answer (Dornyei, 2003), and avoiding words, such as "no", "not" or words beginning with "un" (Ellard and Rogers, 1993). After generating the pool of questions and constructing the survey instrument, the researcher will test the survey by conducting a pilot study stage to validate the instrument (Atesh, Baruah and Ward, 2017) (Baruah, Atesh and Ward, 2017). However, several considerations regarding the survey's design, placement of the demographic section in the survey, type of Likert scale to be used, and the mode of data collection should be considered, and these considerations are discussed in the next subsections.

5.8.3.1 Survey design

The first concern in developing a pool of survey items is wording. Gillham (2008) claimed that when assessing perceptions, the questions' wordings can produce a different selection of answers or different levels of agreement or disagreement. To solve this problem, Dornyei (2003.p.33) suggested using the multi-item measures, which refer to "*a cluster of several differently worded items that focus on the same target*". Based on this argument, the researcher will be using multi-item measure design to explore students' perceptions, because, according to Elliott and Shin (1999), the single-item measures are considered weak approaches to use. Elliott and Shin (1999) believed that single-item measures fail to identify the quality attributes and outcomes of an educational experience and fail to recognise the students' varying degrees of satisfaction in each attribute. Moreover, Vavra (1997) suggested that multi-item measures are more reliable statistically than the single-item measure. This is because single-item measures can only indicate a

participant's overall perception of a service, yet, multi-item measures assess the participant's perceptions for each dimension or attribute of service, then sums up the overall service score (Elliott and Shin, 2002). In the multi-item measures, both, ratings of the level of importance and level of development will be assessed at the same time, with importance measured on one axis and development on the other. Then, both constructs will be measured on the same numerical scale (Ward, Jasenek and Thiriet, 2008), where the assumed ideal results from the two scales would be similar to the two measures (Duke, 2002). Based on this discussion the researcher will use a multi-item survey instrument, to assess engineering students' ethical perceptions in terms of their ratings of the level of importance and their ratings of the level of development of the RAEng's SEPs. The RAEng's SEPs items will then be transferred into a question with one set asking students to rate the level of importance (Q1) and the other asking them to rate the level of development (Q2) in their current degree programme (Baruah, Atesh and Ward, 2017).

5.8.3.2 Placement of the demographics section

Surveys are expected to produce different types of data that are related to respondents' demographics (Dornyei, 2003), and the demographics are the basic information that is used to identify survey respondents (Dornyei, 2003), such as gender, culture, marital status, and so on. This information enables the researcher to group the concluded results by the demographic categories (Goodwin and Goodwin, 2016). However, there is a disagreement among researchers on whether to place the demographics section at the beginning or the end of the survey. The choice of the researcher is to place the demographic at the beginning. One reason is that placing the demographic section at the end of the survey can cause participants to be bored and they could fail to complete all the key items of the survey (Goodwin and Goodwin, 2016) (Lavrakas, 2008). The other reason is that the demographics questions that will be used in the survey are not sensitive, and will not ask respondents about medical histories or sexual activities that may cause them discomfort or cause them to decline to participate in the survey (Teclaw, Price and Osatuke, 2012).

5.8.3.3 Five Likert-scale

Likert scales are widely used to assess perceptions and other quantitative data (Brown, 2001) (Sullivan and Artino Jr, 2013). There is a debate among researchers about the ideal number of choices in a Likert scales (Croasmun and Ostrom, 2011), but Leung (2011) and Cronbach (1959) expressed that there is no right or wrong in whether a finer scale

will give more valid results. Another debatable point in Likert scales is adopting a midpoint or neutral position scales (Croasmun and Ostrom, 2011), where an even number scale can force respondents to commit to a certain position in the scale (Croasmun and Ostrom, 2011) (Leung, 2011), either the bottom or the top of the scale, causing the instrument to capture untrue and errored opinions (Passmore and Parchman, 2002). On the other hand, odd-numbered Likert scales can provide an option for neutrality, and in this way, respondents are not required nor forced to decide one way or the other on an item choice or an issue, therefore, this type of scales may reduce the response bias chance (Croasmun and Ostrom, 2011) (Cronbach, 1959). Five-point Likert scales are considered effective in increasing response rate and response quality (Babakus and Mangold, 1992), and some researchers have reported that five-point scales have higher reliabilities (Jenkins and Taber, 1977) (Lissitz and Green, 1975). Putting these issues into consideration, a five-point Likert scale will be applied to the survey design.

5.8.3.4 Data collection mode

The literature indicated several modes of survey data collections, but for the purposes of this thesis, two modes will be used, paper-based and web-based surveys. Although combining data from mixed-mode data collection can increase differences in the results, mixed mode data collection method is a popular way to collect data (Van Vaerenbergh and Thomas, 2012) as it can increase the response rate, is considered more dynamic, and can compensate each mode's weakness (Greenlaw and Brown-Welty, 2009). Another reason for choosing mixed mode data collection is that no conclusive or major differences were found between web-based and paper-based surveys (Looij-Jansen and Wilde, 2008). Another benefit of the mixed mode of data collection is its abilities in reducing the total survey error in the research, which can result from several sources, such as non-response errors, an measurement errors (Babakus and Mangold, 1992). Also, Leeuw (2005.p.235) stressed that mixed-mode designs are considered the "*best affordable method*". Moreover, the mixed-mode approach, as indicated by Guise et al. (2010), can enhance and increase representativeness by making the survey study more accessible to a broader and larger group of respondents. However, paper-based and web-based surveys may influence research results differently (Van Vaerenbergh and Thomas, 2012), due to different visual perceptions and different pattern of eye movements during reading (Tourangeau, Rips and Rasinski, 2000). Also, respondents with paper surveys are free to look ahead and back, while they can be less free to do so with web-based mode (Tourangeau, Rips and

Rasinski, 2000). Also, due to privacy and security concerns associated with the internet (Manfreda et al., 2008), respondents might have concerns about online surveys and confidentiality, therefore participating in surveys may be discouraged. Based on this discussion, the researcher will be using a mixed-mode of data collection, which will consider using paper and web-based surveys.

5.8.4 Semi-structure interviews

In Phase II of this study, an explanatory approach will be used, and this phase will use semi-structured interviews methods. These interviews will seek to establish causal relationships between the variables, and the purpose of this phase is to study the situation to understand the relationships between variables. The interview questions will attempt to build on the previous phase's findings and will try to explore the explanatory contextual justifications and reasons perceived by the engineering students. According to Fontana and Frey (2000), individual interviews are considered a powerful method and tool to understand and explore topics concerning human's ways of thinking in more depth. These interviews range from structured to the unstructured and can elicit rich information about personal perspectives. Semi-structured interviews are qualitative data collection strategies (Wahyuni, 2012) (Ayres, 2012), and it can enable interviewees to share their experiences and perspectives about a certain phenomenon under study, where the interviewees will pass their stories to the researcher through a conversation interview (Wahyuni, 2012). The main issue with interviews, in general, is the numbers of interviews a researcher should conduct. Guest, Bunce and Johnson (2006) and Mason (2010), suggested that sampling should continue until researchers feel that they have reached saturation in the knowledge. In the semi-structured interviews, the researcher asks interviewees a series of predetermined open-ended questions and has some control over the topics of the interview. However, compared to questionnaires that use closed questions, there is no fixed range of responses to each question (Ayres, 2012). The researcher, therefore, needs to keep the interview questioning adaptive and flexible, to enable the emergence of new information and accommodate unexpected direction (Wahyuni, 2012). In semi-structured interviews, if the interviewee has difficulty answering a question, the interviewer can encourage and prompt the interviewee to consider the question further (Mathers, Fox and Hunn, 1998). Given these benefits and limitation of this method, it will be used as part of the explanatory sequential mixed method.

After the phases are conducted, and the data are analysed, the findings of each phase of each study will be triangulated to form an overall triangulated result of the study and form an answer to the sub-research question and validate its framework. Findings of Study 1 and Study 2 will also be integrated to answer the theoretical research question. However, there are theoretical justifications that support the researcher's choice of each choice of the mixed methods methodology, and these justifications are discussed below.

5.8.5 Roles of the qualitative and quantitative methods in this thesis

Qualitative methods are described as the work done to understand the meaning of the social constructs that individuals establish when interacting with their worlds or realities. These interactions are not fixed, agreed-upon, single, or measurable as assumed in quantitative research (Jarratt, 1996). Watts et al. (2017) suggested that the *why* and *how* questions are best answered qualitatively, because the necessity of developing views about impacts and implementations in educational fields or lacking them, led to different research designs (Torrance, 2012). These designs also seek details about participants' experiences (Torrance, 2012). Qualitative methods produce data that are manifested by the individual's spoken or written words and observable behaviours (Taylor, Bogdan and DeVault, 2015). Thus, the primary purpose for collecting qualitative data in this research is to gain insights of the unique perspectives of different groups of engineering students (Watts et al., 2017), and try to present a holistic and full picture of students' feelings, thoughts, and experiences, which allow for a more direct and clear view of moral reasoning process and sensemaking (Watts et al., 2017) (Parry et al., 2018). Qualitative methods are also suitable for informing and describing the development in students moral reasoning and development (Mumford et al., 2008), which can help in contributing to more effective ethics education (Watts et al., 2017), and is essential to explain differences between groups, if any (Greene, Caracelli and Graham, 1989).

Quantitative research designs usually aim to determine the relationship between independent variables and dependent or outcome variables within a population sample (University of Southern California, 2018). These designs are useful in terms of answering 'if' questions that are related to ethics instructions. Surveys are considered the most common way to collect quantitative data (Creswell, 2013) (Saunders, Lewis and Thornhill, 2009) (Watts et al., 2017). The main purpose for using surveys in this thesis is that it can provide a structured way of using a scientific method for data collection and analysis, which makes generalization easier and possible to do, and it can obtain quick

responses for data collection (Eyisi, 2016). Another advantage is that it enables collecting data at certain points in time to describe characteristics of a phenomenon in different environments which can be compared, and therefore, can highlight the relationships between particular events (Cohen, Manion and Morrison, 2013). Watts et al. (2017) remarked that quantitative methods are usually emphasised on in ethics education, because these methods can offer many benefits, such as comparisons between groups, quantifying the degree of change attributed to ethics education, and the possibility of being replicated. Thus, this method will be used by the researcher.

5.8.6 Time horizon choice in this thesis study

The researcher chose the cross-sectional design to be used as the research approach for both qualitative and quantitative methodologies (Saunders, Lewis and Thornhill, 2009) (Ekanayake, Ahmad and McKenzie, 2012) that be used in the research approach. This choice is based on Creswell's (2013) suggestions that cross-sectional designs have abilities to measure current practices, attitudes, opinions, and beliefs. These perceptions and beliefs are important when students are trying to solve ethical issues, and cross-sectional designs can provide the necessary data in a short period. Cohen, Manion and Morrison (2013) also emphasised that cross-sectional designs can provide data for indirect measures of the rate and the nature of the intellectual and physical development of student samples from different levels.

5.8.7 Rationales and objectives for using mixed methods

Generally, researchers, such as Cook (1985) and Houts, Cook and Shadish Jr. (1986) advised that assessing educational programmes should be examined from different angles and perspectives, which is something that can be done by combining different methods. Balakrishnan and Tarlochan (2015), Byrne and Mullally (2013) and Tomkinson et al. (2008) highlighted that mixed methods (MMs) are usually used to explore perceptions and behaviours related to ethics education in engineering education. This belief is based on the notions that MMs are considered the best and most appropriate way to "*do good research*" (Johnson and Onwuegbuzie, 2004.p.1). MMs are also used to provide an additional and richer context for ethics development and programme effectiveness, a richer context for analysis (Rodzalan and Saat, 2016), and to validate findings (Balakrishnan and Tarlochan, 2015). According to Greene, Caracelli and Graham (1989), educational programmes' evaluations have routinely employed different methods to investigate these programmes' specifications and interpretations, parallel to surveys

based on the programmes' implementations and outcomes across sites. This approach, based on Tudor's, Penlington's and McDowell's (2010) indications, can allow different elements of the factors that affect students' learning to be fully explored, which is essential in investigating ethics education (Creswell, 2013) (Subedi, 2016). Nonetheless, Johnson and Onwuegbuzie (2004) generalised that the field of evaluation is moving rapidly towards MMs research. They justified that it is due to the pragmatic and practical nature of research in evaluating educational effectiveness and the necessity of obtaining evidence from multiple data sources when judging and evaluating the social constructs of educational programmes. To summarise the researcher's methodological objectives for employing multi-phase MM design:

- Triangulation: the researcher intends to use several forms of triangulation types in one study, such as methodological triangulation, data source triangulation and environmental triangulation (Carter et al., 2014). The methodological triangulation will be achieved by using the within-method design, as in the multi-method, and the cross-method design, as in the mixed method approach. Data source triangulation will be employed whenever possible, because data triangulation involves collecting data from different student groups, such as collecting data from Mechanical engineering students, Electronic engineering students and groups at different study levels, etc. The purpose of doing so is to gain multiple perspectives and validate data (Carter et al., 2014) (Guion, Diehl and McDonald, 2002). Finally, achieving environmental triangulation, by collecting data from two different universities, that have different settings (Guion, Diehl and McDonald, 2002). Another general form of triangulation that will be achieved in this thesis is integrating results from different data collection methods that will be studying the same phenomena.

- Complementary: the researcher will try to enhance, clarify, elaborate, and illustrate the results coming from one method with the results coming from the other.

- Development: the researcher will be using results coming from one method to inform the other method.

- Initiation: the researcher will explore contradictions and paradoxes that might lead to reframing the research questions.

- Expansion: the researcher will try to expand the range and breadth of the research inquiry by using different methods for different research inquiry components (Greene, Caracelli and Graham, 1989) (Rossman and Wilson, 1985).

This research approach is and will be different from the previous approaches done to assess the effectiveness of ethics education, especially in engineering education, due to several reasons stated in the next subsection.

5.8.8 Significance of this research

As briefly indicated in Chapter 1, using multiple methods in evaluating the effectiveness of ethics education is considered the best and the most appropriate way. This is because this methodology enables researchers to explore perceptions and behaviours related to ethics education in engineering education and investigate changes in ethical perceptions and attitudes. However, what makes this PhD research approach unique and novel is using the multi-phase design, which employs two broader studies that reflect two distinct but interrelated frameworks. The researcher believes that this thesis approach has not been used in the 'mainstream' research previously. Due to the word limitations of this thesis, two examples will be discussed to conclude why this research approach is perceived better than other approaches that have been done in the past in this area. The reason for choosing these two examples and not others is that these two studies employed qualitative and quantitative methods, which is not very common in assessing ethics education in engineering education. This assumption is made as most of the empirical works reviewed in this area relied on statistical analysis, such as Rodzalan's and Saat's (2016) work. Rodzalan and Saat (2016) highlighted that their study, that incorporated multi-methods of two surveys had one main limitation, that is not including a qualitative aspect by considering students' justifications for their choices in the survey, and that using mixed method would be a better approach. Another more recent study conducted by Bairaktarova and Woodcock (2017) who employed a multi-method approach using a series of statistical analysis tests to develop a model that can eventually help to improve ethics education in engineering. Thus, this approach will be different in the field of engineering education as it will consider both qualitative and quantitative methods in the research and attempts to involve and engage students in the assessments' activities.

The first example is a work done by Byrne and Mullally (2013), who used a mixture of a reflective survey, module feedback survey and engineering ethical cases and problems

assignment to assess students' ethical perceptions and knowledge. The survey sought to explore students' degree of agreement with some given ethical statements in line with the ideas that were presented in the module, and whether the module helped them to change their views. Following the module completion, students were given an electronic survey to measure how the module helped and stimulated students' ethical thinking. Finally, the engineering ethical cases assignment sought to assess the extent to which students managed to incorporate in a practical way, the aspects of engineering ethics that were covered in the module. The first point to address is the work of Byrne and Mullally (2013) as this thesis will try to look at engineering ethics in two different ways. For example, this thesis will not only focus on one specific module that is taught and try to assess the students' learning outcomes from that which could be the main limitation of their study, as it is not generalised to include students beyond the module they were teaching. This thesis approach, however, will try to look at a more general professional aspect and more specific and personal moral reasoning aspects, which can be applied to a broader population of students in many HEIs. Another limitation of the reviewed work of Byrne and Mullally is that they did not address the importance of moral psychology in assessing students' ethical perceptions, and they only focused on assessing students social and professional responsibilities. Secondly, Byrne and Mullally (2013) highlighted that engineering ethical case assignment was challenging for the students as they found that it was challenging to figure out exactly how to approach the case problems. The authors also mentioned that many students struggled to incorporate and integrate the ethical concepts they 'claimed' to maintain in addressing real-life engineering ethical problems, which resulted in contradictory views and a lack of coherence. However, this PhD research approach will try to incorporate different strategies to encourage students to give more information and reflect indirectly on what they have learned. This will be done by providing students pointers and directions to reflect on certain aspects of their learning to be able to extract the attributes that have been changed in their behaviours and self-regulation. For instance, asking them to look back at an unethical deed they have done in the past, and whether they think they have the right thing or not and why, without forcing them to try hard to connect theories they have learned in classrooms to what they did and what they will do now and in the future. Another point that could be seen as a limitation in this work is the module feedback survey, in which Byrne and Mullally (2013) used a single-item measure (refer back to subsection 5.8.3.1 Survey Design), whereas in this PhD research approach a multi-item measure will be employed.

A second example is a work done by Balakrishnan and Tarlochan (2015), who used a mixed method approach to measure Electrical, Electronics and Telecommunications Engineering students' attitudes towards socio-ethical issues in engineering. This study was conducted in Malaysia, at the University Tunku Abdul Rahman. The survey contained ethical statements and students had to rank these statements and indicate their perceptions on the level of agreement and disagreement, and the survey items reflected an engineering ethics module they have been taught. Several interviews were conducted after the students completed the survey to capture their perceptions on their experiences of the module and their perceptions of their future roles and responsibilities as engineers. The authors of this work indicated that the survey statements items that they have used were adopted from a previous study that is done was done in a different country (U.S.A), the University of Vermont, to assess Civil and Environmental Engineering students, and designed by various authors (Lathem, Neumann and Hayden, 2011). Several limitations in this approach can be made in comparison to this thesis's research approach and design. First, the adopted survey statements were initially designed to assess Civil and Environmental Engineering students' attitudes, while Balakrishnan and Tarlochan aimed to assess Electrical, Electronics and Telecommunications Engineering students' attitudes. As discussed previously in Chapter 3, micro ethical differences can affect results, as sub-disciplinary professional codes of conduct can vary between engineering sub-disciplines. Another limitation is that the primary ethical statements to measure students' attitudes towards socio-ethical issues in engineering were initially being designed in the United States, which indicates that what is socio-ethically acceptable in the United States might not be so in Malaysia. The effect of both previous limitations was evident as Balakrishnan and Tarlochan's findings yielded very low overall scores for attitudes among students towards the socio-ethical issues in engineering. In contrast, this research approach will employ a national professional standard, that is recognised by all professional organisations and HEIs in the U.K, to avoid cultural misperceptions. In addition to more scientifically valid and reliable theoretical bases such as using Rest's FCM, moral and sociology theories and concepts from business and ethics education will also be used.

The listed studies showed that there is a void in the literature on study approaches that can provide rich data and contexts. Moreover, many educational programmes' researchers have emphasized that the literature lacks variations in the assessment methods and

approaches. Thus, this PhD research will be a valuable addition to the literature and the scientific community aiming to improve ethics education.

5.9 Data analysis methods and ensuring data credibility

Data analysis in qualitative research requires analysing the patterns that result from the observations that are made through the entire phase of data collection. The form of the qualitative analysis method is determined by the specific qualitative approach that has been used, such as ethnography, or field studies, and on the type of the collected data, whether as documents, field notes, or audiotape. On the other hand, data analysis for quantitative research is a systematic process of applying statistical techniques to illustrate, describe and evaluate data (University of Illinois, 2018). Evaluating research findings and ensuring the quality of results is essential, therefore reducing biases across research designs and outlining strategies to minimise these biases are also essential (Saunders, Lewis and Thornhill, 2009) (Noble and Smith, 2015). Saunders, Lewis and Thornhill (2009.p.156) referred to this credibility as reliability "*the extent to which your data collection techniques or analysis procedures will yield consistent findings*". Messick (1989.p.6), on the other hand, defined validity as "*the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of interpretations and actions based on test scores*". Heale and Twycross (2015) believed that these two terms are different in qualitative and quantitative methods. This research will utilise data analysis methods such as thematic analysis, Independent t-test and exploratory factor analysis, and credibility will be applied to each method to ensure the quality of the data and results.

5.9.1 Thematic analysis

The researcher will be using thematic analysis to analyse all the qualitative data from the transcripts of the interviews, and texts from the self- reflective writing. According to Braun and Clarke (2006.p.79), thematic analysis is an analysis method that is used for "*identifying, analysing and reporting patterns (themes) within data*". Watts et al. (2017) stated that thematic analysis is used for "*situation specific purposes*", such as informing the development of an educational intervention. Although thematic analysis is widely used (Benner, 1985), there is no explicit agreement about how to do it (Braun and Clarke, 2006), nor sufficient literature that describes a pragmatic process of the thematic analysis (Aronson, 1995). The researcher, however, will be following Braun and Clarke (2006) process of thematic analysis to ensure that the generated themes are acceptable, as it is

flexible, easy to follow and provides a pragmatic approach on how to carry our qualitative data analysis (Maguire and Delahunt, 2017). Table 5.1 illustrates the thematic analysis approach.

Phase	Description of the process
Familiarizing yourself with your data	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
Reviewing themes	Checking if the themes work in relation to the coded extracts and the entire data set, generating a thematic 'map' of the analysis.
Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Table 4.1 *Thematic analysis approach used in this thesis, which is adapted from Braun's and Clarke's (2006) work*

Thematic analysis approach will start with examining each qualitative case, e.g. interview and self-reflective writing separately (Eisenhardt, 1989). According to Eisenhardt (1989), this analysis involves going through extensive narratives to enable a detailed understanding of the separate aspects, and to document the dynamics of individual elements (Milewski, 2015). However, there is no standardized way for the write-ups of the analysis (Eisenhardt, 1989) (Milewski, 2015), therefore, the analysis will begin with initial codes, that have resulted from the researcher's theoretical considerations, and the

rest of the codes will emerge during the data analysis stages from the analysis (Milewski, 2015) (Gläser and Laudel, 2013). The initial code lists will be based on the researcher's conceptual frameworks, and aim to help stay focused, but at the same time offering space for additional emerging complementary codes (Saldana, 2015). These emerging codes will be revised or rejected as the analysis proceeds (Milewski, 2015). These codes help in organizing and then categorizing the collected data. Codes, according to Milewski (2015.p.127), are "*meaningful labels that are assigned to textual data in order to structure it*". These codes will be the primary forms of the analysis and will help in categorising and structuring the large amount of data into meaningful categories and sub-categories (Saldana, 2015).

After analysing the qualitative data, a cross-case analysis check should be conducted to ensure the credibility and the quality of the research findings (Braun and Clarke, 2006) (Eisenhardt, 1989). This approach is aimed at identifying emergent patterns across each interview to enforce a rigorous analysis (Saldana, 2015) (Eisenhardt, 1989). A cross-case analysis is an approach used to overcome the potential limitations and boost the accuracy of the information generated from the data (Milewski, 2015), and helps in reducing the risks of false or premature conclusions (Eisenhardt, 1989). Given the objective of this study, each participant's responses in all aspects of the research will be analysed separately. Then these individual data will further be analysed collectively as groups. This step is necessary to identify the characteristics of each interview individually and to identify the crucial components within each interview transcript. The data will then be categorised into structured word document matrixes, to make it possible to display the results from all interviews for a specific category within a scenario next to each other. For example, ethical awareness for group 1, in scenario 1 versus ethical awareness for group 2, in scenario 1. This structure enables the second round of data reduction to extract more emerging patterns within the different categories and groups (ethical awareness, ethical judgment, ethical motivation, moral obligation, etc. in a specific scenario and across all groups. The code patterns will then be identified by looking for similarities and differences across scenarios and in different groups (Eisenhardt, 1989). Evaluating research findings and ensuring the quality of the results is important, therefore reducing biases across the research designs and outlining strategies to minimise these biases are also essential (Saunders, Lewis and Thornhill, 2009) (Noble and Smith, 2015). Noble and Smith (2015) and Cypress (2017) outlined that qualitative research is usually criticised

for lacking scientific details and structure, reasonable justification of the methods adopted and transparency in the analysis. They added that the findings of qualitative data are a collection of personal views, which are subject to researcher biases. Hence, demonstrating rigour in qualitative research findings is challenging, because there are no accepted standards by which research design findings can be judged (Noble and Smith, 2015) (Cypress, 2017), and the researcher will adopt several approaches to ensure the quality of the qualitative data. These approaches are summarised in Table 5.2.

Qualitative research
Truth value • Outlining personal viewpoints and experiences that may have resulted in methodological biases. • Presenting accurately and clearly participants' perspectives.
Consistency or Trustworthiness • Recording decisions that have been made by the researcher regarding: design planning, sampling, data collection methods and analysis decisions. • Transparently communicate the data analysis process in a systematic approach to the readers. • Being able to arrive to similar or comparable findings. • Acknowledging the complexity of engagement with participants . • Linking findings and methods undertaken to the philosophical position of the researcher, away from the participants views.
Applicability • Considering whether findings can be applied to other contexts, settings or groups.

Table 4.2 *Approaches to ensure quality of the qualitative data (Noble and Smith, 2015) (Sandelowski, 1995) and (Nowell et al., 2017)*

Approaches to ensure truth value, consistency and trustworthiness will be reflected on and discussed more clearly in the next chapters. As for ensuring applicability, qualitative research has, often, been criticized for lacking analytical rigour, overly descriptive, and lacking generalizable conclusions (Vakulchuk, 2014). To enhance the findings of the

results of the qualitative method of data collection, the researcher will attempt to conduct the reflective writing interviews in another educational institution, that is Coventry University, to improve the validity of the findings of the results. Cross-institutional evaluation is an approach that is recommended by Watts et al. (2017) and Goldstein and Ford (2002) to enhance the validity of research findings. Cross-institutional evaluation can also fulfil the environmental triangulation concepts, in which different locations, settings and key factors that are related to the environment in which the study took place, will be considered and identified. Investigating the existence of such environmental factors and addressing their potential influence on the collected data during the study research (Goldstein and Ford, 2002), can increase the validity of these evaluation assessments, therefore, boosting the test applicability.

5.9.2 Independent t-test

The statistical analysis technique that will be used to analyse the survey data will be the t-test method. The t-test methods are used to test differences that are statistically significant between two means of two independent samples. Hypothesis testing, or t-testing, can help researchers assess whether a particular theory is valid for a certain data set or a population (University of Southern California, 2018) (Thompson, 2009). After conducting the t-tests and reporting the results, the numerical difference between the rated importance and rated level of development for each set of ethical skills will be computed to find the 'gap' between the two ratings. The algorithm that will be used is:

Difference = Rated level of importance – Rated level of development (Ward, 2013).

Concepts, such as reliability, validity and generalisability, are associated with quantitative research (Noble and Smith, 2015). Heale and Twycross (2015) stated that testing Homogeneity, what is also known as internal consistency, reliability, and or Cronbach's α are two of the main tests considered to ensure reliability (Heale and Twycross, 2015) (Pallant, 2013). Table 5.3 summarises these concepts based on Noble's and Smith's (2015) proposals.

Quantitative research terminology and application to qualitative research
Validity The precision in which the findings accurately reflect the data
Reliability The consistency of the analytical procedures, including accounting for personal and research method biases that may have influenced the findings
Generisability The transferability of the findings to other settings and applicability in other contexts

Table 4.3 *Approaches to ensure quality of quantitative data (Noble and Smith, 2015)*

According to Messick (1989.p.6), validity is "*the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of interpretations and actions based on test scores*". Heale and Twycross (2015) suggested that validity is usually represented in three ways:

- Content validity is "*the extent to which the items on a test are fairly representative of the entire domain the test seeks to measure*" (Markus and Smith, 2012.p.2).
- Construct validity is "*the experimental demonstration that a test is measuring the construct it claims to be measuring*" (Brown, 2000.p.9).
- Criterion validity is the "*strength of the relationship between measures intended to predict the ultimate criterion of interest and the criterion measure itself"* (Borneman, 2012.p.2).

In the first type of validity, the content should be defined clearly at the beginning of this process, including justifying items' specifications in terms of the content domain definition. Moreover, justifying and guiding items' construction using these items' specifications are grounded by the overall test approach, which builds the test from the items pool (Markus and Smith, 2012). In other words, and according to Heale and Twycross (2015.p.66), validity is "*The extent to which a research instrument accurately*

measures all aspects of a construct", and whether the instrument covers the entire content domain that is related to the construct or variable construct that it was designed to measure. The researcher believed that she accomplished this validity as demonstrated by the literature review, research frameworks and conceptual model. The second type of validity involves the research approach and methods of data collection and analysis (Brown, 2000). Heale and Twycross (2015) added that construct validity is the extent to which a research tool or instrument measures the intended construct. This type of validity can be demonstrated using t-test analysis and factor analysis (Brown, 2000), which the researcher will be discussing in the next chapters. As for the criterion validity, Borneman (2012), Steele et al. (2016) and Mumford, Steele and Watts (2015) suggested that this can be achieved using pre/post designs or triangulation designs, and in this thesis, a triangulation approach is intended to be used and employed to construct maximum validity. Reliability, on the other hand, reflects the instrument's accuracy (Heale and Twycross, 2015).

As illustrated in Table 5.3, generisability is another vital aspect of ensuring the quality of the quantitative data. Guion, Diehl and McDonald (2002) argued that testing the effect of different locations and settings that are related to the environment in which the study took place should be considered. The key to this triangulation type is identifying which environmental factors if any, might influence the data that are received during the study research (Guion, Diehl and McDonald, 2002). In this thesis, environmental triangulation will involve exposure to ethics education, in two different engineering educational institutions in the U.K, which are the University of York (UoY) and Coventry University (CU). Engineering students will be surveyed from both institutions and from two different engineering departments, the Electronic Engineering Department at the UoY, and Mechanical Engineering Department at CU. Although, Ary, Jacobs, Razavieh and Sorensen (2010) stated that most of the research done on education employ convenient population samples and that it is totally acceptable, Steele et al. (2016) and Mumford, Steele and Watts (2015) emphasised that cross-institutional assessments can improve and enhance the survey instrument's validity. Convenient samples are samples that are drawn from a larger population that are readily available to the research and is close to hand, such as researchers testing a group of students that they teach or are from the same educational institute or school (Ary, Jacobs, Razavieh and Sorensen, 2010). For the given

reasons, the researcher will try to test the developed survey instrument at the Mechanical Engineering Department at CU beside UoY.

Before starting the data analysis, the researcher should take several steps to ensure the validity and reliability of the research data, For example, defining the study variables and giving them names, specifying their types, and the values these variables might take, whether these variables are associated with numbers, labels, etc. The researcher should create a codebook, which is provided in Appendix 5, that documents and contains each variable's information in the dataset the researcher will be using. Before starting the data analysis procedure, the data should be checked for any errors.

5.9.2.1 Data errors

Capturing data involves preparing the data in a form that a computer or computer software can read before data entry into the computer. The literature suggests that there are several types of errors that are associated with data entry (Doyle, 1985). Rieder and Lauritsen (2011) indicated one possible reason for such errors being manual keypunching and typographical errors, which is known as transcription errors. These types of errors usually take place when transferring data from paper-based surveys to computer programmes (Wahi et al., 2008). Another common human error is transposition, in which the data entry operator misremembers the position of the source documents and enters a wrong value digit(s) or puts them in an incorrect order (Doyle, 1985.p.44). These errors can be checked by running a frequency distribution on each variable on SPSS, to sort the cases either by ascending or descending value base, to check whether the values fall into the defined range, which will be between 1-5 in the case of this thesis survey. If an investigated error does not fall into the range, the value should be corrected, and when the value is not known, for any reason, then it can be left empty indicating it as missing data (Allen, Bennett and Heritage, 2014.p.23).

5.9.2.2 Missing data

Another essential test before starting the analysis is checking the data sets for any missing data, which is the first important step that is needed to be done. Missing data is a common problem in research, and the way to solve it depends on the amount of the missing data and why they are missing (Soley-Bori, 2013). When several items in a scale are not completed or are missing in the total scores, the entire instrument is not filled out, and consequently, the missing item scores will impair the calculation of the overall score

(Eekhout et al., 2014). Thus, identifying the type of the missing data and whether it is a single item or multiple items, a full questionnaire or a single variable, or whether the missing data are random or non-random are all very important. Missing data could be due to arbitrary reasons, such as missing values due to not answering some questions accidentally, or respondents not paying attention or being tired and missing the question. Also, random missing data can result from data entry errors and mistakes that were discussed earlier (Heymans, 2015). On the other hand, non-random missing data can occur due to several reasons, such as respondents purposely not answering some questions, or due to social desirability issues or concerns about the content of the questions (Heymans, 2015). The following Table 5.4 summaries a typology for missing data.

Type of missing values	Description	Example
MCAR: Missing Completely at Random	The missing value is considered **MCAR** if: the probability of missing data on Y is unrelated to the value of Y itself or to the values of any other variable in the data set. However, it does allow for the possibility that missingness on Y is related to the missingness on some other variable X.	Respondents accidentally skip questions.
MAR: Missing at Random	The missing value is considered **MAR** if: the probability of missing data on Y is unrelated to the value of Y after controlling for other variables in the analysis.	Younger respondents have less missing values than older respondents. However, this cannot be tested because the values of the missing data are unknown, and thus, comparing these values cannot be done with and without missing data to see if they differ systematically on that variable.
MNAR: Missing Not at Random	The missing value is considered **MNAR** if: missing values do depend on unobserved values.	Low-income respondents skip on intentionally their low-income scores due to their privacy violation, and in that case, the probability for missing values depends on information that is not observed, like the value of the income score, because low values are missing only.

Table 4.4 *Missing data typology (Soley-Bori, 2013) (Heymans, 2015)*

Based on the type of missing data, one of the following assumptions should be fulfilled:

- MAR assumption is met, then the missing data type is ignorable.
- MAR assumption is not met, then the missing data type is nonignorable and, therefore, must be modelled to get better estimates of parameters of interest (Soley-Bori, 2013).
- To check whether the type of the missing data type is MCAR or not, an analysis for Little's MCAR test should be executed, and the results will indicate whether data are or are not missing completely at random. If the Sig. value is > .005; the data are considered not missing completely at random or not MCAR. Eekhout et al. (2014) proposed that if the MAR assumption is not met the pattern of the missing data or incompleteness should be identified to complete the set of the missing data. Eekhout et al. (2014) suggested that this is done to complete the cases for meaningful analysis and identify whether the sample size would be affected by omitting few cases. Thus, selecting the estimation or imputation method is based on this missing data patterns, and finally expecting how results might be biased or distorted due to failure of meeting necessary assumptions about the randomness of these missing data. The missing data patterns can be checked using the 'Tabulated cases display', which illustrates the frequency of each missing value, patterns of the tabulated variables, and their numbers and are sorted based on the similarity of the missing data patterns (Enders, 2010). The technique that can be used to deal with the missing data issue depends on the percentage level of that missing data. If the overall percentage of the missing data for each item, if the missing data for the item variable is lower than 5%, then conventional imputation methods can be applied, which involves substituting the missing value and then carrying out the analysis. Conventional imputation methods can be done either using:
- Marginal mean imputation: that is using the non-missing values to compute the mean of X and then use it to impute X missing values. The limitation of this technique is that it may lead to biased variances and covariance estimations, and Soley-Bori (2013) suggested that it should be avoided generally.
- Conditional mean imputation: Suppose we are estimating a regression model with multiple independent variables. One of them, X, has missing values. Based on the type of the missing data pattern we select those cases with complete information and regress X on all the other independent variables. Then, we use the estimated equation to predict X for those cases it is missing.

However, Conventional imputation methods have main limitations, that is the potential overestimation of results, because the model completely determines imputed values applied to the observed data, which contains no missing data, and therefore assumes no errors in the data sets (Soley-Bori, 2013). Consequently, it is not recommended to be used if the percentage of the missing data is more than 5%. Thus, if the missing items exceeded 5%, calculated mean imputation cannot be used in this case, and more sophisticated statistical techniques should be applied. These techniques include advanced imputation techniques, like the Multiple Imputation (MI), the Maximum Likelihood (ML), Listwise deletion and Pairwise deletion. Imputation techniques, in general, provide data that are not genuinely provided by participants, but data that are provided by SPSS (Bannon, 2014). Since the aim is to collect students' ethical perceptions, imputing missing data while testing ethical perceptions does not make much sense to some degree, because imputation can produce data patterns that are not based on the actual responses of the students. In addition, missing values in data sets might already come with some degrees of errors, and accordingly, the item variables, and eventually, the scale properties will be based on inaccurate data. In addition, Enders (2010) expressed that as the sample sizes grow large, missing data techniques tend to produce similar results. Therefore, imputation is excluded as an option, and the choice is left between Listwise and Pairwise deletion. Listwise deletion will remove the case completely if it has a missing value in one of its variables and not include it in the analysis (Statistics Solutions, 2018), so if the missing data are minor, then this technique is a tolerable option (Little, 1992). Hence, using listwise deletion means risks of losing significant amounts of data due to the missing cases that will be removed, and that can reduce the population sample size (Statistics Solutions, 2018). Pairwise deletion option excludes cases from the analysis only if the missing data are the data required for the specific analysis, but still be included in the other analysis that they have the necessary information for (Pallant, 2013). In other words, this method tries to maximize all data available on an analysis by analysis basis, and the main advantage of this technique is that it increases the analysis power.

5.9.2.3 Other related tests to Independent t-test

Before conducting the t-test, normality should be investigated first, but if the sample size in the study is > 50, then normality is assumed, and no normality test will be needed (Allen, Bennett and Heritage, 2014). On the other hand, if the sample size is < 50 then a Shapiro-Wilk, Skewness and Kutosis test should be conducted to check normality, and if

the normality is violated, then non-parametric tests should be used (Pallant, 2013). After assessing normality, homogeneity assumptions also should be tested. Homogeneity assumptions are that each group of scores should be approximately equal in variance or variability, and usually, it is found in the table produced as the Independent Samples Test in the Lavene's Test for Equality of Variances (Allen, Bennett and Heritage, 2014) (Field, 2013). If Sig. > 0.05 then the assumption of homogeneity of variance has not been violated, but if Sig. < 0.05 the assumption of homogeneity of variance is violated, and a modified version of t-Test can be used. This modified version is the Welch's t-Test, and it is provided in SPSS along with the standard t-Test and referred to as Equal Variances not assumed (Allen, Bennett and Heritage, 2014). Another important test in the independent samples t-Test is testing the null hypothesis. The null hypothesis is the assumption that there is no relation between the prediction variables and the outcome variables in the population. It is considered the formal basis for testing statistical significance difference and by starting with the no relationship propositions, any observed relationship can be related to chance. Starting with relationship propositions is known as the alternative hypothesis, which can only be accepted by rejecting the null hypothesis (Banerjee et al., 2009). The one-tailed hypothesis defines the direction of the relationship between the predictor variables and the outcome variables, and it represents the positive relationship or effect. On the other hand, the two-tailed hypotheses show only that a relationship does exist without giving details on the direction of this relationship, and it represents the negative relationship or effect, and the phrase 'tail' refers to the end tail of the statistical distribution (Banerjee et al., 2009). Nevertheless, the one-tailed hypothesis is useful when testing a small sample, and only if the one direction relationship is important or biologically meaningful, otherwise researchers believe it should never be used (Banerjee et al., 2009) (Bland, 1994). As Pallant (2013) stressed, the main aim for t-tests and variance analysis is to test a hypothesis, and with this kind of procedure, there is a possibility of reaching a wrong conclusion. She noted that there are two main errors, the first is rejecting the null hypothesis when it is true, which involves believing that a difference between two groups exist, which does not. In other words, Type 1 error or false positive (Pallant, 2013)n(Banerjee et al., 2009), and to minimize this, the alpha level should be set at 0.05. Type 2 error or false negative (Pallant, 2013) (Banerjee et al., 2009) occurs when the null hypothesis is not rejected, which means believing that the groups do not differ when in fact they do. Banerjee et al. (2009) believed that these type of errors cannot be avoided entirely and that the two errors are inversely related, as when

attempting to control Type 1 error, the possibility of committing Type 2 error is increased (Pallant, 2013). However, increasing the sample size may solve these errors (Banerjee et al., 2009). The details of these tests results are reported in Chapter 7. Cohen (1990) noticed that hypothesis testing had been overemphasised, and he proposed using effect sizes including mean differences or correlations as alternatives (Pillemer, 1991). The probability that a study may be able to detect a relationship between variables depends on the actual magnitude of that relationship and the targeted population, as it is easier to detect a relationship in large sample populations. However, if the number of available respondents is limited, the researcher may work backwords and workout whether the available number of subjects will be able to enough to detect the effect size (Banerjee et al., 2009). According to Field (2013.p.93), the significance of the null hypothesis for assessing scientific theories does not inform researchers about the importance of an effect, therefore, measuring the size of this effect is a standardized way to solve this criticism. Moreover, measuring effect size is measuring the strength of the relationship between variables. Statisticians believe that assessing the importance of the study, is reflected in the study effect size, which indicates the relative magnitude of the difference between means (Pallant, 2013). Pallant (2013) proposed that the most commonly used effect size to compare groups is Cohen's *d*, which presents the difference between groups in terms of standard deviation values. Cohen's *d* is a measure of the separation between two groups' means and expressed in terms of their standard deviation (Allen, Bennett and Heritage, 2014), that is in the case of independent samples t-test, and can be calculated using the formula:

Cohen's $d = (M_2 - M_1) / SD$

Where M_1= mean of group 1, M_2= mean of group 2, and SD is the standard deviation, which is calculated as:

$SD = \sqrt{((SD_1^2 + SD_2^2) / 2)}$

$SD = \sqrt{((n_1 - 1)\, S_1^2 + (n_2 - 1)\, S_2^2) / n_1 + n_2 - 2}$

Where n_1 is the size of group 1, n_2 is the size of group 2, S_1^2 is the variance of group 1, and n_2 is the variance of group 2. However, the guidelines in Table 5.5, adapted from Cohen's (1988) and Pallant's (2013) works, and are followed to determine the strength of different effect size in each study.

Size α	Cohen's d (standard deviation units)
Small	0.2
Medium	0.5
Large	0.8

Table 4.5 *Effect size guidelines (Cohen, 1988) and (Pallant, 2013)*

Davies and Crombie (2009) highlighted that hypothesis testing usually produces results about any observed difference, whether statistically significant or statistically nonsignificant. Confidence intervals, on the other hand, can provide information about the possible range of effect size. Thus, the confidence interval is "*a range of values for a variable of interest…. constructed so that this range has a specified probability of including the true value of the variable*" (Davies and Crombie, 2009.p.4). If a study is designed with α = 0.05, the researcher has set 5% as the maximum chance of incorrectly rejecting the null hypothesis (Banerjee et al., 2009). Field (2013p.234) and Pallant (2013.p.65) indicated that trimming the data is one way to reduce bias. Usually, the output data set is trimmed by 5%, which means that the output shows a 95% confidence interval surrounding the mean. This value is obtained by trimming the top and bottom 5% of cases and then the new mean value is calculated. Both researchers also indicate that the default setting is for a 95% confidence interval but choosing a 99% confidence interval may jeopardise detecting a genuine effect or Type 2 error. Power or *p* of a test is a test that correctly identifies the actual difference between compared groups (Pallant, 2013). Nevertheless, and as Banerjee (2009.p.7) acknowledged, statistical significance "*is not an all or none situation*", and Pallant (2013.p.216) added that when "*the sample is large (e.g. 100 or more participants) power is not an issue*". α is the probability of committing a Type 1 error, and the other name for it is the statistical significance level, and β is the probability of committing Type 2 error (Banerjee et al., 2009). Power of a test, however, is (1-β), which is the possibility of detecting an effect in the sample in terms of sample size, effect size and alpha level (Banerjee et al., 2009) (Pallant, 2013). Yet, many studies set α= 0.05 and β= 0.2 , and Banerjee et al. (2009) proposed that researchers should choose a low α value when their research question gives particular importance to avoiding type I

error and should choose a low β value when their research question gives particular importance to avoiding type 2 error. The details of these tests results are reported in Chapter 7.

5.9.3 Exploratory factor analysis

Factor analysis is usually used to test the dimensionality and stability of the survey construct that is used in a study, and to explore the quality of the survey measures (Sanders, Gugiu and Enciso, 2015). The main purpose of factor analysis is to reduce the number of variables sets and items, and make the sets smaller and more manageable (Field, 2013) (Samuels, 2016). To test the dimensionality and stability of the survey of this research, exploratory factor analysis will be conducted. Samuels (2016) suggested that exploratory factor analysis is a process that is carried out to validate scales of items in a question that has not been validated. Factoring data can be done using either using Exploratory Factor Analysis (EFA) or Confirmatory Factor Analysis (CFA). The first approach is used to explore the data at the early stages of the research (Field, 2013) (Pallant, 2013), and the second is to test a specific hypothesis (Field, 2013), confirm or test the theory (Henson et al., 2001). Since the aim of this statistical analysis to explore whether the factors resulting from the analysis reflects the RAEng's four main principles, which will be done for the first time, and generate a theory, EFA is more adequate to achieve this aim (Henson et al., 2001). Before starting the factor analysis process, data must be inspected to determine whether the data set is suitable for factor analysis, and two main issues must be considered: sample size and the strength of the relationships between the items or variables (Pallant, 2013). **S**tatisticians do not agree on how large a sample should be, but they generally recommend that the larger, the better (Pallant, 2013). Pallant (2013) specified to have at least 300 cases in the sample size, but it is acceptable to have a smaller sample of 150 cases. Based on these considerations, the researcher will try to, at least, achieve the 150-population sample size. However, sample size requirements have been reduced over time, as more research on this topic has been done (Osborne, Costello and Kellow, 2008). Osborne, Costello and Kellow (2008) highlighted that smaller samples with strong data can still be suitable for factor analysis. They explained that strong data in factor analysis means "*high communalities without cross-loadings, plus several variables loading strongly on each other*" (Osborne, Costello and Kellow, 2008.p.7), which, they believed, can be rare in practice. Velicer and Fava (1998) specified that communalities are considered high if they are all > 0.8, while Osborne,

Costello and Kellow (2008) indicated that this is uncommon in social sciences where the magnitudes are low to moderate 0.4 - 0.7. However, Samuels (2016) suggested that communality scores that are < 0.2 should be removed, and to address the intercorrelation strength among items, an inspection of the correlation matrix for coefficients should be inspected and the value should be > 0.3 (Pallant, 2013). Another important test should be considered before conducting factor analysis is testing data factorability. Two statistical measures should be generated: Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, in which Bartlett's test of sphericity should be significant ($p < 0.5$) to consider the factor analysis appropriate (Bartlett, 1954). The KMO index value, on the other hand, should range from 0 – 1, and to be a minimum of 0.6 for good factor analysis (Kaiser, 1970). According to Howard (2016), Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) metrics values indicate the following:

- 0.00 – 0.50 means unacceptable factorability.
- 0.50 – 0.60 means bad factorability.
- 0.60 – 0.70 means mediocre factorability.
- 0.70 – 0.80 means middling factorability.
- 0.80 – 0.90 means good factorability.
- 0.90 – 1.00 means great factorability.

The data sets must then be verified to check if the data are suitable for factor analysis, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity values for the measure of each item should be calculated (Allen, Bennett and Heritage, 2014) (Howard, 2016). If the data sets are found to be suitable, factors can then be extracted. Factor extraction procedure involved determining the smallest number of components or factors that can represent the interrelations among a data set (Brown, 2000). There are a number of techniques that can be used to help to define the number of factors, such as Kaiser's criterion, scree plot tests, and the Principle Component Analysis (PCA), which are the most common techniques used for factors extractions (Osborne, Costello and Kellow, 2008). The Kaiser's criterion technique rule states that factors with eigenvalues over 1.00 should be considered in the analysis (Pallant, 2013) (Brown, 2000), where the eigenvalue of a factor represents the total variance explained by the factor. Cumulative variance percentage is another arguable area in the factor extraction analysis

approach, especially in different disciplines, wherein natural sciences factors should be at least 95 %, and in humanities, it can get as low as 40% (Williams, Onsman and Brown, 2010). In the scree plot technique, each eigenvalue of the factors are plotted, and the plots are then inspected for natural breakpoint or elbow in the data, where the curve's shape changes direction and flattens out (Cattell, 1966) (Pallant, 2013) (Osborne, Costello and Kellow, 2008). The number of factors that can be extracted should be those over the elbow, which can be unclear sometimes, especially if there are data clusters near the bend, and therefore it can be a subjective test that requires the researcher's judgment, which can be debatable on the number of factors that should be extracted (Williams, Onsman and Brown, 2010). Thus, a PCA test is usually conducted to confirm the number of extracted factors and to ensure extracting the number of factors that is common in the three techniques. However, a debatable point arises in this context regarding using PCA or EFA, which are both Exploratory Factor Analysis extraction techniques. Statisticians, such as Field (2013) and Yong and Pearce (2013) suggested that factors loading for both techniques are similar, and that rotation needs to be done regardless of the factor extraction technique that is used, and both techniques can result in similar solutions (Field, 2013). The PCA will be chosen as the literature indicates that a PCA technique is recommended if no prior model exists (Williams, Onsman and Brown, 2010). After factors are extracted using the PCA, another test should be carried out to inspect the component correlation matrix tables and check how each variable is related to one another (Williams, Onsman and Brown, 2010). Field (2013.p.694) suggested that correlation matrix tables should be inspected for coefficients > 0.3. Hair Jr et al. (2010) indicated that coefficients that are equal to +/- 0.3 are considered minimal, coefficients that are equal to +/- 0.4 are considered important, and coefficients that are equal to +/- 0.5 are considered significant. Hair Jr et al. (2010) added that if no correlation coefficient goes beyond +/- 0.3, then factor analysis should be considered whether it is an appropriate method. After this test is conducted, and coefficients are inspected, if most factors have high loadings on the most important factors and small loadings on the other factors, it will be challenging to identify the factors loadings. Therefore, a technique known as the rotation should be used to differentiate between factors (Field, 2013.p.678), and to maximize high loading and minimize low loadings (Allen, Bennett and Heritage, 2014.p.219) to facilitate factor extractions. There are two main types of rotation, orthogonal (uncorrelated) and oblique (correlated). Orthogonal rotation techniques produce solutions that are easier to interpret and report, but in social sciences, it is expected to find some correlations among

factors. Accordingly, using orthogonal rotation could cause losing valuable information if factors are related, and oblique rotation provides a more accurate solution (Osborne, Costello and Kellow, 2008) (Allen, Bennett and Heritage, 2014.p.219). The most common oblique approach that is used is the direct oblique (Pallant, 2013), and Field (2013) believed that if the oblique rotation outcome indicates a correlated factor structure, then consideration to use orthogonal rotation is no longer a useful idea. Thus, Oblimin rotation will be used to improve the factors (Field, 2013), after the previous steps are carried out. When Oblique rotation is applied, the factor matrix is then split into the pattern matrix and structure matrix, which both should be considered to double check and report them both (Field, 2013). After following these steps to extract and identify the number of factors for the measures, a retaining process is then applied. This process involves removing cross-loading items if their primary factor had a value < 0.4 and > 0.3 in the alternative factor. Also, items with cross leadings that have differences between their primary and alternative factors < 0.2 should be removed (Howard, 2016). Samuels (2016.p.4) added that removing cross-loading items should be starting with the "*item with the highest ration of loadings on the most variables with the lowest heights loadings*". Each time an item is removed, the analysis should be re-run to inspect the new pattern matrix (Pallant, 2013) (Brown, 2000). In addition, items that have an item cut-off loading value that is < 0.3 should also be removed (Brown, 2000), and factors that have less than three item loadings should not be considered as appropriate factors (Samuels, 2016). Finally, after retaining the factors and their loading items, these factors should be labelled and named. Labelling factors is an inductive, theoretical and subjective process. Thus, each factor's theme and meaning depended on the researcher's definition, which should reflect the conceptual and theoretical intent (Williams, Onsman and Brown, 2010).

Testing the internal consistency of a scale is one of the main issues, and internal consistency is the degree at which the items that make a scale "*hang together*" (Pallant, 2013). Streiner (2003.p.217) added that "*one of the central tenets of classical test theory is that scales should have a high degree of internal consistency as evidenced by Cronbach's alpha*". Since the RAEng's SEPs survey instrument is a newly developed instrument, its scales must be assessed for fitness, and whether the scale variables rated by students reflect the RAEng's four main ethical principles. Ideally, Cronbach's alpha coefficient of a scale should be > 0.7 (Pallant, 2013). However, scales with items less than ten are expected to have Cronbach's alpha that is < 0.7, because, and according to

Neuendorf (2011), Cronbach's alpha may be too sensitive to the number of items and or measures, and therefore, a 0.2 - 0.4 range is acceptable. On the other hand, Pallant (2013) stated that if it is difficult to get a good Cronbach's value > 0.7, it is worth considering reporting the mean inter-item correlation for items ranging from 0.48 – 0.76, However, Briggs and Cheek (1986) believed that values ranging between 0.2- 0.4 are acceptable. The details of these tests results are reported in Chapter 7.

5.10 Potential challenges expected in this research

The literature identified several factors that can affect research on ethics. Some of these factors are inherited from the data collection methods, some are related to the respondents' psychological and biological states, and some are related to the researcher's effect. In the previous sections of this chapter, some of the inherited limitations of data collection methods and possible errors done by researchers were discussed. Several more biases can affect and jeopardise the results and findings of any research and should be considered. For example, Randall and Fernandes (1991) and Randall, Huo and Pawelk (1993) expressed that social desirability biases are expected phenomena emerging in almost all studies that focus on studying ethics (Woodyatt, Finneran and Stephenson, 2016). Callegaro (2011.p.2) defined social desirability as "*the tendency of some respondents to report an answer in a way they deem to be more socially acceptable than would be their true answer*". Respondents tend to use this strategy to present themselves in a favourable image and to avoid negative judgements or evaluations, and as a result, analysis results would over report socially desirable attitudes or perceptions and underreport socially undesirable attitudes or perceptions. Kaminska and Foulsham (2013) explained that some questions might ask respondents to reveal and expose the unpleasant sides of their personalities or viewpoints. These questions might ask respondents about socially unaccepted behaviours, such as using drugs, or other socially not approved behaviours, such as not voting in the elections. The reasons for respondents acting this way is to avoid embarrassment, distress and unease when revealing socially undesirable responses. To solve this issue, the researcher will try to word the questions in friendly ways to reduce the possibility of feeling threatened that students might experience, and to try to reduce socially undesirable responses (Holbrook and Krosnick, 2009). Barton (1958) suggested that using less threating wording can imply to respondents that socially undesirable perceptions or behaviours can exist and are common behaviours and

perceptions. Thus, giving excuses and impressions to respondents to believe that it is normal to reveal such socially undesirable perspectives.

Another factor that can affect participants' responses is memory errors. According to Sudman and Bradburn (1973) two memory errors can affect responses, the first is forgetting an entire event, and the other is related to time compressions. In the first example of memory errors, Kouchaki and Gino (2015) explained that, often, individuals who engaged in unethical behaviours in the past are least likely to remember their action's details. This lack of memory might be attributed to a phenomenon that is known as "ethical amnesia", by which the memory of the unethical actor's becomes less detailed, less clear, and less vivid over time, compared to their actions that are not related to ethics. As for the second memory error, the degree of importance of ethical issues can be reduced by respondents, because the amount, degree, and the level of information required from them can be a lot.

Moreover, some time might have passed since they have learned new information in an educational event. Thus, the greater the degree of information required from the respondents, the more difficult it is to provide the required information (Cubitt, 2007), which is something that cannot be controlled or managed by the researcher. However, these limitations were taken on board when conducting the research. Also, respondents' motivation level, fatigue level, interest, anxiety, physical health, emotional and mental factors (Ruspini, 2002), hunger, or wisdom all can affect responses (Ary, Jacobs, Razavieh and Sorensen, 2010). Another potential factor which can affect responses is testing conditions such as, heat, light, ventilation, time of the day, or presence of distractions. These factors all can affect the scoring process, and eventually, the performance (Ary, Jacobs, Razavieh and Sorensen, 2010), and accordingly, causing biased or incorrect responses (Creswell, 2013). The researcher tried to ensure that the students were completing the surveys in times that are appropriate for them, and not overloaded with the study.

Although the primary purpose of questionnaires is to gather the individuals' opinions regarding a particular issue, respondents opinion may or may not reflect their genuine opinions due to several biases and errors (Van Vaerenbergh and Thomas, 2012). Smith (2011) supported these notions by indicating that in surveys, a response variance consists of true and error variance, and the error variance is created due to response errors, and

these errors can misrepresent research results (Vitell, Nwachukwu and Barnes, 1993). For example, the literature indicated that demographic variables, such as gender and culture, can cause response errors (Hofstede, 2011) (Vitell, Nwachukwu and Barnes, 1993). For example, Moors (2012) found that females tend to use extreme points of the survey scales more than males, and Hamilton (1968) reported similar observations but among males. On the other hand, Wang et al. (2008) and Bennett (1977) indicated that Asians demonstrated tendencies to mid-point options. Other studies conducted in the U.S.A, also found a difference between responses of African Americans (Clarke, 2001), Hispanics (Marin, Gamba and Marin, 1992) and European Americans, where the first two demonstrated higher tendencies to choose extreme positive response options. Another factor found to be affecting responses in surveys is survey design. For example, the language of the questionnaire and questionnaire format (Van Vaerenbergh and Thomas, 2012). Creswell (2013) noticed that poor wording designs can affect capturing accurate views of respondents, because poor writing can affect respondent's comprehension of the questions (Tourangeau, Rips and Rasinski, 2000.p.9). Also, the survey language if administrated in the respondents' native language responses might differ than if conducted in the second language, which might be due to the difference in the level of involvement with the topic (Van Vaerenbergh and Thomas, 2012). Cognitive load was also found to be another possible factor that can impact responses (Van Vaerenbergh and Thomas, 2012), and cognitive load is the cognitive effort that is invested by respondents to answer survey questions (Krosnick, 1991). Bless et al. (1992) stressed that cognitive load can cause response errors. If the survey questions are challenging to comprehend, respondents will, more likely, reach different interpretations, providing incorrect responses, or refusing to continue answering the rest of the survey questions (Lenzner, Kaczmirek and Lenzner, 2010). This will be done by asking the students for feedbacks from time to time about the difficulty of the survey questions and items, and the length of the survey.

5.11 Chapter summary

This chapter provides an overview of the research approach and design that has been employed in this mixed methods thesis research project. The current PhD thesis aims to develop a systematic, multiple assessment design framework to evaluate the effectiveness of ethics education in an engineering programme. This thesis adopted the triangulation approach, in which two qualitative designs are triangulated (Study 1), then two

quantitative designs and one qualitative design are triangulated (Study 2) to form a broader triangulation study. Study 1 employed two qualitative designs (Phase I and Phase II), and in Phase I a focus group discussion was used to collect data, while in Phase II the researcher used narrative and a reflective writing as a mean to collect the qualitative data. Study 2, on the other hand, employed a sequential explanatory mixed method design, which involved a survey questionnaire in Phase I and semi-structured interviews in Phase II. Phase III, however, was based on testing the reliability, validity and factorial structure of the developed survey and survey items and scales. The research design reflected the pragmatic philosophical stand of the researcher. The following chapter of this thesis will present the data analysis and findings for Study 1.

Chapter 5 Study 1 Analysis Results and Findings

6.1 Chapter overview

This chapter discusses the analysis of Study 1. The analysis discusses whether some of the relationships proposed in the first framework, which was discussed in Chapters 2 and 3 and presented in Chapter 4, can be qualitatively validated. This chapter aims to answer the first research sub-question using the moral reasoning framework, which will contribute to answering the main research question and validating the new conceptual model. The moral reasoning framework seeks to explore the differences in moral reasoning abilities among engineering students based on exposure to ethical educational interventions. The study's findings can then provide more insights and validation for the new conceptual model's many facets, such as the effect of educational interventions on students' ethical perceptions and behavioural change. The findings of Study 1 were based on the thematic analysis of focus group discussions and self-reflection writing interviews, which are used to complement and confirm the findings from each phase, and to provide a broader picture of the relationships that emerged from the integration of the first study's two phases. The progression and structure of this chapter are shown in Figure 6.1.

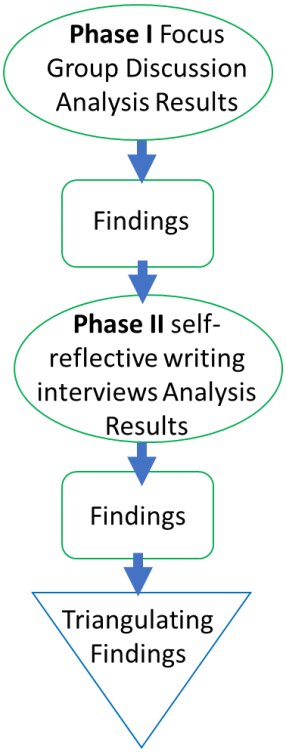


Figure 5.1 *Chapter 6 structure (Study 1 analysis results)*

The chapter starts with a discussion of phase I of study 1 which is the result of the focus group discussion, then the findings, followed by a discussion of the results of phase II which is the self-reflective writing interviews and the findings of this phase. After that, the findings of both phases were triangulated to form one whole picture of the overall findings of study 1. Finally, the chapter is summarised in the chapter summary section.

6.2 Phase I focus group

In this phase of Study1, two focus groups were interviewed. Table 6.1 demonstrates Phase I of Study 1, sample characteristics.

	Group 1 (Exposed to ethics education intervention)	**Group 2 (Not exposed)**
Number of students	13	18
University	York	York
Study level	MSc in Engineering Management class of 2015/16	Second year Electronic Engineering students class of 2015/16
Discipline	Engineering Management.	Electronic Engineering
Cultural background	China, one from India, and one from the Middle East	Mainly from the U.K, few from China and Malaysia, and one from the Middle East

Table 5.1 *Phase I, Study 1 sample characteristics*

Group 1 included engineering students who had attended an educational intervention in Engineering Ethics, while group 2, included engineering students who had not attended ethics intervention. Six groups, in total, participated in this phase of the study, three in each category and 31 students in total. Both groups were introduced to the same six ethical scenarios. These scenarios attempted to prompt discussions on the moral responsibilities of the students reflecting on their decision-making skills, and reflect real ethical issues in real life engineering (Martin, Conlon and Bowe, 2018) (Bairaktarova and Woodcock, 2017).

6.2.1 Level of ethics education exposure in the two group

Both groups were convenient sample groups that already existed in natural settings, as this qualitative research phase does not try to provide results that could be generalised for a wide population (Woźniak, 2014), and its main purpose is exploratory aims. In the natural settings, the MSc students enrolled in the Engineering Management programme undertake a compulsory module called "Law for Engineering Management for MSc". Generally, in this module students are presented with the general foundations of law, and the implications of the law for professional engineers who are working in different international settings (University of York, Law for Engineering Management for MSc, 2019). The topics that are discussed in this module are:

- Law of contract: purchase; sales; subcontract law
- Trading Regulations: Companies Act; Insolvency Act; Company Directors Disqualification Act
- Law in Society
- Dispute Resolution; Arbitration and Mediation
- Engineering Ethics

The engineering ethics session aims to familiarize students with the Royal Academy of Engineering's (RAEng's) Statement of Ethical Principles (SEPs), using a mixture of historic and real-life case scenarios, such as the Challenger Space Shuttle and other real-life cases and fictional case scenarios. In addition to trying to explore the different issues that might be encountered by engineering managers during the development, implementation and operation of an international business, it tries to cover different types of international trades trading and financial risks, cultural and cross-cultural issues and human resource issues (University of York, MSc Engineering Management, 2019).

On the other hand, students who were not exposed to this educational intervention, such as other MSc students, undergraduates and PhD students, must attend and pass academic misconduct and plagiarism tutorials and workshops These interventions are compulsory for all students who are enrolled in the University of York (UoY) (University of York, Academic Integrity, 2019). On top of these interventions that are required by the university, the Department of Electronic Engineering at the UoY embeds professional ethics in their engineering curricula, such as obtaining ethical approvals for engineering research projects and working in project teams (University of York, Ethics Committee,

2017). The participants in both groups were recruited by asking the modules leaders and lecturers for their permissions first, then asking for the students' permissions to be interviewed.

6.2.2 Details of the case scenario used

These cases were dynamic, complex open-ended, and with no clear-cut solutions (Atesh, Baruah and Ward, 2017) (Atesh, Baruah and Ward, 2016). The solution to each given problem scenario depended on the relative importance assigned to them by the students and the various criteria. For instance, these cases provided technical and ethical issues, that involved friends and classmates during a coursework. These cases also tried to address issues that required judgement, analysis, independent thought, perspective taking, and decision making while assessing ethical knowledge, cognition, reasoning, skills, and attitudes of the students (Richards and Gorman, 2004). These fictional scenarios involved situations that students can feel they would better relate to, and incorporate ethics as a consideration of a design assessment (Wilson, 2013). The examples were based on academic dishonesty cases involving classmates and friends (Vesilind, 1996). These scenarios were presented to the students as follow:

1. An assignment is due next week on MATLAB and a significant part of it involves presenting your simulation results. One of your classmates is struggling with the simulation analysis and he comes to you asking for some help. What will you do?

2. You are confident that your simulation data is 100% accurate. This student requests if he can use the simulation data from you in order to get a high score. Will this affect your previous decision?

3. This student happens to be your best friend and you both have spent a lot of time studying together. On one of the previous instances, he even helped you when you were struggling with another assignment. Will this affect your decision?

4. You know that this best friend of yours is recently going through some hard times with relationships/family issues and couldn't dedicate much time to do the simulation. How will this influence your earlier decisions?

5. Sharing assignment data with your friends could be counted as an Academic Misconduct and could even hamper your Degree grade. It can also lead to your expulsion from the University. What will you decide?

6. Your best friend has recently been offered a high-profile job in one of the top organizations in the UK and you have seen how hard he had to work in order to secure this job. However, you have just found out that this job is dependent on your friend getting a Distinction in his final degree. This means that he must get a high score in this MATLAB assignment, or he risks losing this job. What will you do? (Atesh, Baruah and Ward, 2017) (Atesh, Baruah and Ward, 2016)

The developed fictional case scenarios considered Jones's (1991) moral intensity and the characteristics of the ethical issue, their role in recognizing the moral issue, and the essentiality of the six main categories of any moral issue. For example, for each case scenario, the magnitude of consequences, social consensus, probability of effect, temporal immediacy, proximity, and concentration of effect were all considered when developing and analysing the data. The moral intensity of the situation is essential for making decisions about whether or not an ethical problem exists and when considering the courses of action to follow in ethical situations (Singhapakdi, Vitell and Franke, 1999). Kidder's (1995) four paradigms were also reflected upon when creating the case scenarios, as Kidder focused on ethical dilemmas and not singular ethical issues as in the case of Jones. Ethical dilemmas are paradigm conflicts between two or more ethical issues, while Jones focused on a single ethical issue construct, such as fairness, safety, honesty, employees' economic security, or truthfulness. Kidder added that decisions either fall into ethical decisions - right versus right decisions, or moral temptations - right versus wrong decisions, and that the right versus right decisions are the most difficult ones. The case scenarios were designed using cases that students might be familiar with and could easily relate to, thereby, they did not give any added benefit or advantage to students who had prior experiences on an ethics module.

The focus group discussion lasted for approximately 30 minutes for each group. For each scenario, the different responses of the two groups were manually reviewed, coded and compared to derive the emerging themes needed for the analysis. The researcher uploaded each case scenario on powerpoint slides and gave students some time to discuss each question among their group members. The discussions were audio recorded using a digital audio recorder, transcribed, and analysed using a thematic analysis approach (Braun and Clarke, 2006). The researcher conducted the transcribing procedure herself in order to have the opportunity to absorb and be familiar with the data and to identify the themes and insights that emerged (Poland, 2003). The researcher tried, as much as possible, to

observe and record any behaviour or body language the interviewees expressed during the interviews, to help her make better judgements about what the students meant. A few words were excluded from the transcripts, as they were unclear either because of recording errors or because the interviewees were speaking in a different language other than English. The researcher tried to use additional outside help from her Chinese friends to understand the unfamiliar phrases the interviewees said in Chinese. Watts et al. (2017) recommended some practices to improve qualitative data collection, and one of these practices is employing non-leading questions. Mecca et al. (2015) added that structured data collection methods are also considered a good practice that can improve data collection, and that can be achieved by using interview guides and protocols for qualitative approaches. These recommendations were reflected upon and displayed in her interview guide illustrated in Appendixes 6.

6.3 Phase I analysis results

After the transcripts of the focus group sessions had been coded, the different responses of the participants from the two categories were compared for each given scenario. The students' critical thinking, understanding, reflections, connections across different areas, and engagements were analysed then compared (Martin, Conlon and Bowe, 2017). Their decision-making abilities were evaluated in order to observe any distinct pattern or consistent theme in their analysis. The different responses also demonstrated the key factors that influenced their ethical judgment and moral reasoning for each scenario.

6.3.1 Scenario 1

In response to the first scenario, students from both groups demonstrated similar awareness of the ethical issues embedded in the first scenario and similar perceptions. These similarities were demonstrated by them using specific statements to indicate this. For example, some students from group one demonstrated ethical awareness by saying "*we also need to consider the ethical considerations and the potential problems associated with this help*", and some students from group 2 also expressed *"... it's wrongdoing*". The students also expressed similar ethical intentions, where some students from group 1 indicated *"I will offer help by explaining how to use the software and let them do the work by themselves"*. Similarly, some students from group 2 suggested*: "I would never send my own data to anyone"*. These statements suggest that the process of ethical decision making followed Rest's (1989) FCM for both groups' participants, and they demonstrated similar professional skills in accuracy and rigour, and honesty and

integrity, which are key ethical skills that are emphasised by the RAEng's SEPs (The Royal Academy of Engineering, 2011) (The Royal Academy of Engineering, 2012). The students were able to recognise the moral issue that was present in this scenario (Rest et al., 1986), then evaluated, formed and finally developed their ethical judgements which were represented in offering possible ethical solutions to the ethical issue in the scenario (Rest, 1984) (Rest et al., 1986). After the students demonstrated their awareness and evaluated and discussed their judgements, they indicated that they prioritised moral issues over other issues, which suggested that they held moral intentions (Rest et al., 1986) (Rest et al., 1999).

The interviews indicated several factors influencing students' ethical decisions among both groups. For example, some students revealed that the type of help they would offer would depend on the degree of friendship and how close the person is to them "*it will depend on who this person is, and if they are close to me, if they are very close, yes definitely I would help*". The comments were consistence with Moore and Gino (2013) and Treviño, Weaver and Reynolds (2006) indications that friends can stray the individual's moral compass and affect moral judgements. The reason for this possible stray could be related to Treviño, Nieuwenboer and Kish-Gephart (2013) suggestions that peer effect is related to psychological closeness and the feelings of connection to the other individuals, and that these feelings of closeness can distance the individuals from their moral compass (Gino and Galinsky, 2012). In addition, some students from both groups expressed that the priority is finishing their own work first, and then helping their classmates. Other students indicated "*My main priority is to finish my own work first, then I might have more deeper ideas and deeper opinions to help him. But I must finish my work first, then I can immediately help him*". Likewise, some students from group 2 expressed that "*It depends on how much time I can spend with him, because I still have to submit my assignment as well*". As indicated in the literature, prioritizing one's responsibilities, choosing between these priorities, and identifying benefits versus costs is another factor that affects ethical decisions (Shalvi, Gino and Barkan, 2015). Students in these cases have shown how they developed their ethical judgment, by referring to some aspects of their evaluation and developing justifications to their judgements. This also explains some aspects of the decision-making process that require reasoning and going through some potential choices and the potential consequences of these choices, to determine what choices to consider (Rest, 1984) (Rest et al., 1986).

From this scenario, nothing was captured or deduced that was not noted previously from the literature. Both groups' members demonstrated similar patterns of perceptions and similar factors influenced these perceptions, where the overall perceptions were ethical and complied to Rest's FCM (Rest, 1989).

6.3.2 Scenario 2

In the second scenario, students from both groups also showed similar ethical awareness and perceptions. For example, some students from group 1 expressed ethical awareness and judgement by saying "*giving your data is considered collusion or plagiarism*". In a similar way, some students from group 2 indicated *"It's against the university's regulations, and the university stated clearly that students will be expelled in case of collusion"*. Students from both groups also expressed similar intentions, where some were ethical, and some were not. For instance, some students from both groups stated, *"I will not give the data, it's my work, and using my data is considered cheating in the assignment".* These comments demonstrated the four components of Rest et al. (1986), in which the students identified the moral issue in the given scenario (Rest et al., 1986), held ethical judgements about it and developed a moral justification to it (Rest et al., 1986) (Rest, 1984). Also, by stating that it "*is considered cheating*", and that they will not share their data, they prioritised moral issues over other issues and held moral intentions (Rest et al., 1999). At the same time, some students from both groups argued that they can share their data, one of the students stated *"If this person is one of my best friends then I might give them my data, regardless of who might get higher marks, I know it's not a good thing to do, but I will do it".* This suggested that although the students demonstrated their ethical awareness of the ethical issues in the scenario, their intentions did not match this awareness. In other words, being ethically aware does not mean that students will develop ethical judgment and hold ethical intentions, and eventually carry out an ethical behaviour (Martin, Conlon and Bowe, 2017), because when a situation involves a friend, students were willing to bend their ethical beliefs (Atesh, Baruah and Ward, 2016) (Rodzalan and Saat, 2016). Bending rules, in this case, were related to limitations in the students' moral cognitions and being bounded ethicality (Gino, 2015) (Sezer, Gino and Bazerman, 2015).

Students from both groups also demonstrated similar patterns of professionalism. For example, some students from group 1 marked "*I will help the friend by showing how to do it and how to get the data, but not by giving my details and effort*". While some students

from group 2 specified "*I will try to check whether the friend's struggle is in doing the simulation, or simply being lazy to do it, and if I found out that he is just being lazy, then I will definitely not help him*". These implications suggest demonstrating ethical skills in accountability and responsibility for their own personal conduct (Rest et al., 1986), trying to avoid deceptive acts, and preventing misconduct (The Royal Academy of Engineering, 2011) (The Royal Academy of Engineering, 2012). In addition, some students from group 2 highlighted that "*if that person has a reputation for not working nor trying hard, then I will not help, but if the person I see working hard every single day, then I would push him to the right direction, but not giving my data*". The students here have demonstrated one of the RAEng's ethical principles, by trying to ensure that they wisely and faithfully use their engineering knowledge (The Royal Academy of Engineering, 2011) (The Royal Academy of Engineering, 2012).

As for the factors that might influence students' decisions in similar cases, the students expressed several possible factors that affect their ethical decisions. For example, some of them insisted on the closeness of the friendship (Rodzalan and Saat, 2016) (Bommer et al., 1987). While others showed that individual differences in perceiving the implications in the given scenario can also affect ethical perceptions. For example, a couple of students from group 1 argued *"*Student K: *being honest is more important than friends.* Student L: *no! being honest to your best friend is more important than school*". These two diverse views support Kidder's (1995) assertions that ethical issues can be messy and totally confusing, because they can arise quickly and unexpectedly and may have unexpected consequences. The students' arguments are consistent with proposals of an ethical dilemma in the literature that arises when the individual faces two or more ethical conflicts (Maclagan, 2003). The arguments also show that dilemmas are complex issues that make choosing between them challenging, because the choice is between two right values (Dole and Hurych, 2009). These different views also relate to the different personal perceptions of rewards versus sanctions as implied by Susewind and Hoelzl (2014). Susewind and Hoelzl (2014) indicated that holding different simultaneous goals can create biases, for example, goals to provide benefits to others, and provide benefits to themselves at the same time, where loyalty can affect and facilitate unethical behaviours. Furthermore, these diverse views represent that an individual's ethical skills that are related to their moral development level have influenced the students' perceptions

regarding what is perceived as right or wrong or the duties and obligations involved in a particular ethical issue (Torres, 1998).

During the discussion, two themes emerged. These two themes are social desirability and an indication of ethical maturity differences. Some members of group 2, started feeling insecure about the nature of the questions that had been asked which possibly influenced their responses. Thus a potential theme of social desirability occurred among some of group 2 members "*Student A: has there been like an incident of collusion and this is your way of getting it?*; *Student B: he is* [referring to the lecturer who was lecturing before the focus group discussion took place and went outside the room when the discussion started] *trying to find out how I got those values*". The reason for social desirability bias occurring is that during the discussion students were sharing personal information in front of other participants, observers, and in the presence of recording devices which may preclude participants from speaking openly (Woodyatt, Finneran and Stephenson, 2016). Thus, social desirability have taken place during the group discussion with group 2, and that was not present when discussing the same scenario with group 1 (Randall and Fernandes, 1991). The second theme is an indication of ethical maturity levels. When discussing reasons for not helping a friend by sharing data, some participants from group 1 stated that for professional reasons, such as saying "*I will not give the data, because it's my own intelligent patterns, which must be protected, and it shows my progression .. so, I will help the friend only by showing how to do it and how to get the data, but not by giving my work details and effort*". While for group 2 participants, the reasons were related to fearing sanctions "*To give someone my data and risk my own degree to help them? No, I will not help in this way*". According to Rest et al. (2000), obeying rules out of respect for the social system is considered superior ethical skills compared to obeying rules out of fearing punishments, which according to Kohlberg (1969) means two different ethical development levels. Thus, the indication of different ethical maturity levels and sensitivity skill sets between the two groups can be a result of the ethics educational intervention group 1 had undertaken. Therefore, some students from group 1 demonstrated superior ethical sensitivity and skills compared to some students from group 2. Rest's et al. (1986) FCM stages were evident in this case scenario, and the individual factors affecting moral reasoning, such as ethics education, and friends' effect were also present (Rodzalan and Saat, 2016) (Bommer et al., 1987). A new possible impact has also emerged, that is, feelings of social desirability and insecurity could be

related to the absence of ethics education in the case of some members of group 2 (Randall and Fernandes, 1991).

6.3.3 Scenario 3

For the third scenario, students from both groups expressed their feelings on being pressured due to the complexity of the situations "*cases are starting to get worse and worse*". This support Street and Street (2006) proposals that exposing students to escalating ethical case scenarios can affect respondents' responses. Also, it suggests that the severity of consequential information can affect respondents' moral emotions and empathetic feelings towards the harmed party. Both groups shared similar views where some insisted on not helping their friends, and others maintained their previous views on the necessity of helping friends. For example, some students insisted on not helping their friends *"a friend may be lost, but self-privacy and dignity must be kept. This assignment is their job and responsibility, which should be planned for, executed and done earlier".* These comments indicate prioritising moral concerns over other issues and holding moral intentions of choosing the moral decision over other values and committing to the moral choice (Rest et al., 1986) (Rest et al., 1999). In this case, the moral motivation or intention was to choose morality over self-serving goals, by demonstrating ethical courage and determination to follow the moral principles and decisions (Lincoln and Holmes, 2011). Other students demonstrated other ethical options to help their friends. For example, some students mentioned, "*I will help my friend by guiding him step by step to come up with his own data, which might be the best way to help, at least it's better than giving him the data directly*". Whereas, some suggested "*I would encourage this friend to seek help from his/her supervisor*" and "*I would try to urge them to consider delaying the deadline*". The comments demonstrated that the students evaluated and formulated different possible solutions to the same ethical issue to determine and decide what is morally acceptable to do (Rest, 1984) (Rest et al., 1986), and achieve objectives that are consistent with their own value systems by choosing alternatives (Bommer et al., 1987). On the other hand, some other students mentioned "*my best friend? then I will give him my data*". These perceptions could be related to ethical blind spots (Sezer, Gino and Bazerman, 2015), and bounded ethicality (Gino, 2015), which can make some students judge ethical issues in unethical ways, such that they were willing to bend the rules for their friends (Rodzalan and Saat, 2016).

The students mentioned several factors that could affect their ethical decisions in similar scenarios. One factor is the potential risks in conducting such acts "*I would be careful about spending lots of time helping them if I hadn't properly completed my assignment yet, because we might both be spotted for collusion*". Others justified "*It could happen that we followed the same method, and there is no way to prove it is collusion. It's the same values, but if it's your best friend, it would be riskier*". These comments reflect Jones's (1991) assertions that individuals' attention to the ethical implications in an issue affects memory, assumptions, judgements, intentions, and eventually behaviours. After developing a moral judgement, a process that depends on the individual's cognitive moral development level takes place. Based on the individual's ethical development level, the individual will decide what is morally acceptable or correct. Then a process of balancing moral factors against other factors takes place to establish a moral intent, and in this case, multiple factors play a role. They include social rewards, satisfying the social needs of relatedness and affiliation, and maintaining a friendship (Alderfer, 1969). Another factor is the university's sanctioning rules for collusion (Mulder, 2018). These two factors force students to choose one path and sacrifice the other and cause 'benefits versus costs' situation (Shalvi, Gino and Barkan, 2015), and as indicated by the discussion and confirmed by Ajzen (2002), individuals differ in how they perceive rewards and punishments in their lives.

This scenario raised the tendency to use justification among students of both groups. For example, some students from group 1 claimed that time limitation is a drive behind helping a friend in need "*hence the deadline is in a week, and MATLAB simulations take a long time, and the available time is limited, I will help the friend to solve the problem quickly. Otherwise, we can set a plan together, to finish analysing the data before the deadline and not to reach this situation again*". Some other students from group 2 claimed that the help is returning the favour "*If my friend would help me, then I would help them as well".* The two examples align Trevino's (1986) proposals that people at lower ethical cognitive levels tend to use moral justifications to imply that ethical standards do not apply to facilitate wrongdoing but maintain feeling moral about themselves (Shalvi, Gino and Barkan, 2015).

At this point of the case scenarios, the same group of students, who were members of group 2, had growing suspicious about the reasons for asking them these questions "*Student A: I feel it's a bit of a trap from the university, to see if people help each other*

or give each other their results, I will go with (X) there's nobody who can say that I give results; *Student B: A good way around, that's the best way"*. The comments suggest that some students from group 2 were feeling insecure, which suggest that social desirability bias reoccurred in this case. This might be due to insecurities involved in revealing their true and honest perceptions or due to the sensitive nature of the questions. These feelings have caused the students to hold social desirability biases (Randall and Fernandes, 1991) (Randall, Huo and Pawelk, 1993), and that have caused the students to feel threatened, and made them try to portrait themselves in favourable images. This cause participants to feel insecure, and that their anonymity is not protected enough, because they are sharing their personal information in front of other participants and in the presence of the recording devices. All of these influencers have prevented participants from speaking openly (Woodyatt, Finneran and Stephenson, 2016), and influence their true answers regarding their ethical perceptions (Randall and Fernandes, 1991) (Randall, Huo and Pawelk, 1993). In addition, the influence of these group members may have influenced other members to change their perceptions (Atesh, Baruah and Ward, 2017) (Atesh, Baruah and Ward, 2016), and not be fully in control of their answers during the interviews, even if their intentions are to be as honest as possible and to meet the interviewer's expectations (Acocella, 2012). Moreover, the domination of outspoken students during the discussion have influenced the other group members' perceptions and affected what they said during the group discussion, which is expected in focus group discussions (Leung and Savithiri, 2009).

Overall, several emergent findings were deduced from this scenario, where some were previously captured in the literature and some were new. Examples of the findings previously highlighted by the literature were moral judgement and the impact of factors such as friends in straying these moral judgements (Rest, 1989). Another finding highlighted in the literature was the effect of moral intensity (Jones, 1991), wherein this scenario several of the characteristics of the ethical case presented to students seemed to affect their ethical awareness, judgment, and intention differently. For example, the proximity of effect and the feeling of nearness, whether social, cultural, psychological, or physical, affected students' perceptions on whether the predicted act can be harmful or beneficial to close people. Moreover, the temporal immediacy of the issue which was present in some students' cases and the shorter length of time implied greater immediacy, therefore, the necessity of helping the friend in unethical ways. Some of the new emergent

themes in this case scenario are the increased tendency to use justification by students in both groups, which was not captured earlier in the literature. This is in addition to the social desirability theme that emerged in an earlier case scenario and emerged again in this scenario. Moreover, some of Kidder's (1996) ethical dilemma paradigms were also present. For example, short-term goals versus long-term goals and the potential consequences of these predictions. Many students were torn apart between their short-term goals in maintaining good relationships with their friends and wanting to maintain their long-term goals in being ethical and following the guidelines and regulations.

6.3.4 Scenario 4

The fourth scenario also witnessed similar perceptions among the two groups, where some students, stressed that they would help by sharing their data, and some would not. This scenario also encouraged the students to express more feelings than the other three scenarios, but no differences were observed between the two groups. Students from both groups suggested different options to solve this case. For example, some of them suggested "*Telling this friend how to do the assignment is the most efficient way, and also helping him to deal with some of his issues, but I will stick with not giving him my data*". Other students proposed "*I will suggest requesting mitigating circumstances, if he did not get the approval, then I will make sure that he will submit on time and try to teach him how to do it".* These statements demonstrated different ethical choices representing different ethical reasonings to reach morally acceptable decisions (Jones, 1991). These comments also indicate that students held some ethical skills such as identifying ethical implications in the issue, having moral judgement abilities and skills, having critical thinking abilities and considering consequences (Cheruvalath, 2019) (Kulju et al., 2015). Also, students showed a willingness to do good, in line with what is expected of a professional engineer to have desires and motivation to do good deeds (Kulju et al., 2015), demonstrate empathy (Segal, 2000) and be compassionate to other students in distress (Levenson and Ruef, 1992). On the other hand, some students conveyed their willingness to help their friends, where some revealed: "*I would do more if it helps him to do less, and I would say everything, I might do the whole work for him"*. These comments support Hiadt's (2003) proposals that moral emotions trigger moral reasoning and influence some unethical behaviours (Haidt and Joseph, 2004) (Haidt, 2007). This happens due to close friendships being involved, which make the mental process more emotional, and these emotional reactions differ from one person to another (Rest, 1989).

Both groups of students talked about different factors that affect their ethical decisions in relation to this scenario. Some factors were related to the potential risks involved in this act and the role of sanctions "*am afraid it might affect something, like being accused of misconduct or anything. Therefore, I will not share anything*". This confirms that sanctions can play a positive role in reducing unethical intentions (Mulder, 2018) and that students perceptions of risks and potential negative consequences can influence judgements (Jones, 1991) (Bommer et al., 1987). Other students reflected on previous experiences "*I have helped people in the past and they just keep on asking you, because they won't try*", which is consistence with Schwartz's (2016) proposals on the effect of the learning feedback loops that can impact the ethical perceptions of an individual. After a behaviour is conducted, the decision that has been made produces an outcome and consequences. These consequences are observed by the decision maker, and his or her learning experiences involve an internal evaluation that is based on the decision that has been made and then undertaken. This internal evaluation consequently affects the individual's moral perceptions and the decision-making process for next time when an ethical issue arises (Schwartz, 2016) (Ferrell and Gresham, 1985) (Hunt and Vitell, 1986).

From this scenario, nothing was captured or deduced that was not captured previously from the literature. Both groups' members demonstrated similar patterns of perceptions and similar factors influencing these perceptions, where students varied in their emotional reactions according to individual differences, and their moral decisions engaged emotions as well as reason (Greene et al., 2001). In addition, the effect of moral was also present in this scenario, where the characteristics of the ethical case presented to students seemed to affect their ethical awareness, judgment, and intention differently intensity (Jones, 1991). For example, the probability of the effect and the magnitude of consequences of the harms that might be caused to the friend could be perceived as high according to some students, therefore the students perceive helping this friend in an unethical way is justifiable. Meanwhile, other students appeared to perceive the social consensus and the degree of the social agreement embedded in helping the friend in an unethical way that was not in accordance with the university's rules and preferred helping the friend in an ethical way. In line with some of Kidder's (1996) ethical paradigms, such as justice vs. mercy, some students wanted to be fair, while others found this conflicted with their personal desires to show compassion and love.

6.3.5 Scenario 5

Scenario 5 also saw similar perceptions from both groups of students, by which some of them indicated that they would help their friends by sharing their own data while some would not. Students who indicated that they would help their friends said, "*If the friend got caught, I still undertake the responsibility*". Moral awareness is demonstrated by what the students have said, as they recognized that their actions have the potential component or characteristic of harm or benefit other individuals including themselves (Rest et al., 1986). Others highlighted that *"As long as it's not affecting my work, I can do and will do anything for my best friend…I have to take the risk"*. This evinces the notions that being ethically aware of the ethical situation, did not lead to ethical judgment (Martin, Conlon and Bowe, 2018) (Rodzalan and Saat, 2016), as some of the students failed to recognize their negative perceptions of their in-group favouritism. Moreover, they failed to recognise the effect of group loyalty, which can cause them to act and hold unethical judgements regarding the issue (Watts et al., 2017). Thus, supporting Rest's et al. (1986) proposal that an agent who demonstrates ethicality, considerably, at one stage may not necessarily act so in the other stages. On the other hand, other students said that they "*Will help by offering my references and methods I used only, but not the contents*". This suggests that these students recognised the ethical implication in the given issue, and this awareness was possibly triggered by the decision maker's recognition of a potential moral issue (Atesh, Baruah and Ward, 2017) (Rest et al., 1986).

The students discussed and talked about many factors that affect their ethical decisions in response to this scenario. For example, some students talked about the potential sanctions that are associated with such behaviours (Mulder, 2018) "*teachers are very clever even if few things are changed, they will find out, and both of us will fail, so I can only offer help by teaching him how to do it, and maybe give a sketch or give some notes"*. Sanction perceptions, in this case, were more threatening than rewards, because these perceptions are related to the possibility of fearing harm, and here the students have found a balance between benefits versus costs and preferred to avoid external punishments by sticking to the university's rules (Kohlberg, 1984).

An interesting difference that emerged between the two groups was perceiving academic integrity. Students from group 2 showed a better understanding of academic conduct and integrity than group 1 members. For example, some students from group 2 highlighted some choices to avoid academic misconduct "*I would go for highlighting things in*

PowerPoint, what to do and what not to do, because I do not think its collusion, because it's the same as what goes on asking a lecturer. But not go for sharing, because I can't be 100% correct in everything, and it would be obvious if the same mistakes occurred in both assignments". In addition, they considered that working collaboratively can also affect them negatively, and therefore, they should be aware of the possible consequences "*both works would still look similar even if you revised and discussed things together but worked individually, and from previous experience, a couple of people worked together side by side on an assignment and they were caught for collusion*". Others suggested that they would help their friends by doing the work for them "*but I will try my best not to make it look the same as my work, like using a different writing style*". A possible reason for this higher level of academic integrity could be that participants from group 2 spent a long time in the university than group 1 participants. Most of group 1 members were international students who came to the U.K to complete undertake a one-year master's degree programme, while most of group 2 members were students who already spent at least two years in the university on an undergraduate engineering degree. Thus, group 2 had more experience of the academic environment and were more familiar with the university guidelines and academic conduct regulations (Atesh, Baruah and Ward, 2016). However, this can also be related to Kohlberg's (1969) and Kohlberg and Hersh's (1977) proposals that students at the lower levels of ethical development obey the authorities out of the fear of punishment rather than respect for the social system, which is, in this case, the university's rules (Rest et al., 2000). To support these arguments, some students from group 1 expressed that "*I will show some of my data to teach the friend, just for explaining but not for sharing. He must write something about what he found himself, it's his responsibility that he gets his own data and reports it himself".* Thus, two points arise from these comments. The first, is that ethics education could have affected the ethical perceptions and the higher level of skills, helped students in group 1 to demonstrate a better understanding of respecting their responsibilities in leading their own work and performance, therefore, better ethical leadership skills (Zapalska, Jackson and Zelmanowitz, 2016). Ethics education also seems to have affected group1 participants as they showed more strengths and abilities to support the ethical processes (Kulju et al., 2015). There is also evidence of the moral intensity effect, in which the characteristics of the ethical scenario affected students' perceptions differently (Jones, 1991). Furthermore, some of Kidder's (1996) ethical dilemma paradigms were also evident in some of the

discussions, where some students faced conflicts between being truthful to themselves and being loyal to their friends.

6.3.6 Scenario 6

The final scenario brought some contrasting opinions from both groups. Few students insisted on not wanting to help their friends, due to fear of being accused of academic misconduct. Some argued that a student who is good enough to secure a high-profile job should be smart enough to complete their academic assignment on time *"it's none of my business. He got no problem with his work and it's only a matter of getting a high score, and securing a high profile job means a lot of time dedicated on working on academic assignments, therefore I will not help him because he already knows how to do it*". The reason for not wanting to help the friend, in this case, align Jones's (1991) probability of effect, which could be low or have no effect at all. The students who made these comments saw the probability of the harm in this case scenario as low, and decided that the student seeking help were not in great need of the decisionmakers' help, or even the case scenario they faced did not exist in the first place (Singhapakdi, Vitell and Franke, 1999). Other students stressed "*Stop guilt tripping me, I am not going to help you*", indicating the important role of guilty feelings in motivating students to either conduct an unethical or ethical act. Guilt also has an important role as an intrinsic reward/sanction system, in which the student wants to satisfy the social needs of belonging, relatedness and affiliation (Alderfer, 1969). All of these could lead to the perception that no potential harm that could be done to the friend if they do not help, and the perceived degree of social pressure in the situation is low (McMahon and Harvey, 2006). Other students suggested that helping the friend in this case will not be beneficial for his/her future career "*I will not help him, because it means that he got this job by cheating in the assignment, and that would not be a glorious thing for him nor for the company he is planning to work for, and he will regret it in the future*". This indicates that the students are conscious of accuracy and rigour that is listed in the RAEng's SEPs, which is essential skills for professional engineers and provide better engineering solutions as inaccuracies and carelessness in engineering can lead to failures in and of engineering projects. This could potentially lead to accidents, financial failures, injuries or death (The Royal Academy of Engineering, 2011). Moreover, the comments also indicate that students had a degree of professional ethical sense towards honesty and integrity principles that are listed in the RAEng's SEPs. Since engineers will be working for the benefit of different groups of

people, and they will have duties to keep these people informed about relevant facts, not being honest about having the set of skills that are required by these organisations is considered cheating. Furthermore, these comments showed their awareness of some key ethical skills that are important for their careers as engineers, and the importance of having the ability to recognise the ethical aspects of engineering decisions and to fulfil the ethical expectations of the general public (The Royal Academy of Engineering, 2011). On the contrary, some students from both groups expressed that they would help their friends "*I will sacrifice MATLAB for a friend, yes I will do it…. because he is my best friend and we share lots of moments together and we have a strong relationship, that's why I would sacrifice an assignment for one of my best friends, because I know they would do the same*". This showed that the students were ethically aware of the implications of the issue, but they were willing to bend the rules when the situation involved friends (Rodzalan and Saat, 2016). This willingness could be due to their ethical blindness (Moore and Gino, 2013), and being bounded ethically (Chugh, Bazerman and Banaji, 2005) (Tenbrunsel et al., 2010).

One of the main things that had been observed among group 2 members and was not present during the discussion with group 1 members was that many students changed their opinions and expressed their willingness to help their friends if they are offered materialistic rewards such as monetary benefits. One stated "*Maybe if he's a billionaire, then I would help. I would go and set up a business because I wouldn't want to be working at a company designing lifts*". Others added that if they are to be introduced to connections and networks they might help out "*I will find a way to get profit out of all of this and still be clean and not do anything illegal….he might give me money, or give me the opportunity to know the people he is working for and get an insight of the company*". The comments supported Ferrell's and Gresham's (1985) framework, especially their proposals on the effect of rewards and sanctions, and the role circumstances and opportunity plays in motivating unethical behaviours. In this case, the students' perceptions were opposite to the case of students from group 1 and some of group 2 participants were motivated by extrinsic rewards, and maximizing self-gains and benefits (Shalvi, Gino and Barkan, 2015). This is due to differences in ethical sensitivity and judgement skills and qualities (Susewind and Hoelzl, 2014) (Rest et al., 2000). It appears some students from group 2, who aimed for maximising self-benefits, could be positioned in the pre-conventional level. This is because the physical consequences of their actions

are the determinants of their perceptions of good or bad regarding the ethical issue, regardless of the individual's values of these consequences. Also, satisfying their own needs determined what is perceived as right or wrong (Kohlberg and Hersh, 1977). Thus, perceptions of right versus wrong at this level are not based on a society's standards, but rather on achieving their own personal desires, physical needs (Kohlberg, 1969) (Kohlberg, 1984). Although Trevino (1986) believed that justifying the benefits of those who are close as morally right is considered among the attitudes of the pre-conventional moral development level, other researchers seem to make it sound less dramatic. For example, Hiadt (2003) stressed that moral emotions are responsible for ethics-related behaviour, and he argued that moral feelings and intuitions trigger moral reasoning (Haidt and Joseph, 2004) (Haidt, 2007). Lehrer (2009) added that the process of reasoning requires emotions and feelings, because emotions allow humans to comprehend the information that could not be understood directly

6.4 Summary of the findings

To summarise the finding of this phase of the study, Table 6.2 illustrates the main findings.

Skills and Attitudes	Group 1	Group 2
Ethical awareness skills	Similar	similar
Ethical reasoning and maturity	Higher levels	Lower levels
Ethical motivation and intention	- Some students did not want to help due to professional skills - Willingness to bend ethical rules to help a close friend - Maintained consistence opinions and ethical grounding throughout the scenarios.	- Some students did not want to help due to fear of collusion - Willingness to bend ethical rules to help a close friend - Quick to change their opinions and ethical grounding on the given scenarios.
Perceptions of Rewards vs Sanctions	Majority sought internal rewards	Some sought internal rewards, but the majority sought maximising economic benefits
Social desirability	Was not present	Was present and increased with the increased complexity of the questions

Table 5.2 *Summary of the findings of Phase I, Study 1*

As indicated in Table 6.2, the analysis for all case scenarios and for both groups showed similar results. Participants from both groups demonstrated ethical awareness "*giving your data is considered collusion or plagiarism*", ethical judgement "*...it's wrongdoing*", and ethical intentions "*I would say no*" (Rest, 1989) (The Royal Academy of Engineering, 2011) (The Royal Academy of Engineering, 2012). Both group members also demonstrated similar ethical decision-making patterns in the given scenarios. In general, students used phrases like '*danger*', '*problem*', '*risky*', '*affect me'*, '*disqualified*', '*safer*', '*jeopardise*' to express their ethical awareness of the given situations (Martin, Conlon and Bowe, 2018). Moreover, similar ethical judgements patterns were present almost in all scenarios among the two groups. These judgements were affected sometimes by ethical blind spot and implicit biases (Sezer, Gino and Bazerman, 2015) such as the effect of significant others (Moore and Gino, 2013) (Treviño, Weaver and Reynolds, 2006) and peers in particular (Treviño, Nieuwenboer and Kish-Gephart, 2013), where the effect of the psychological closeness distance the students from their own moral compasses (Gino and Galinsky, 2012). These blind spots have caused them not to recognize their negative perceptions of others and their in-group favouritism attitudes, which accordingly can cause discriminatory behaviours and harm other members of out-groups. However, individual differences in terms of perceiving ethical dilemmas among the two group participants were noticed (Kohlberg, 1969) (Rest et al., 2000) (Mazar, Amir and Ariely, 2008). In addition, participants from both groups demonstrated a willingness to bend the rules and their own ethical believes to help their friends "*I can do and will do anything for my best friend*". Thus, being ethically aware does not mean that students will develop ethical judgment and hold ethical intentions, and eventually carry out ethical behaviour (Martin, Conlon and Bowe, 2018). When a situation involves a friend, students were willing to bend their ethical believes and perspectives (Atesh, Baruah and Ward, 2016) (Rodzalan and Saat, 2016). Bending rules for friends might be due to bounded ethicality (Gino, 2015), which is a result of the students' ethical blind spots (Sezer, Gino and Bazerman, 2015).

The analysis also suggested some differences in the maturity levels. Some students from group 1 referred to professional reasons for not helping a friend, while some students from group 2 referred to the fear of punishment and necessity of obeying the university's rules (Kohlberg, 1969). Therefore, this is an indication of differences in ethical maturity levels. Some participants from group 2 kept changing their ethical groundings and

perceptions on the given scenarios more often than group 1 participants, particularly in the final scenario when some participants from group 2 contradicted their previous ethical views about ethical practices to favouring economical profits, job security and corporate networking. This shows a degree of bias and inconsistency in the students' ethical decision-making skills. On the other hand, most of group 1 participants maintained their ethical grounding and consistency throughout the six scenarios, demonstrating superior levels of maturity and more depth in their ethical decision making skills (Atesh, Baruah and Ward, 2017) (Atesh, Baruah and Ward, 2016), which can be related to the ethics education intervention.

The perceptions of the two groups, generally, were similar in terms of the motives and factors affecting their ethical intentions, but the last scenario highlighted some key factors that influenced their responses, which varied between the two groups. The two key motivation themes that emerged were external and internal rewards and sanctions systems. As discussed earlier, although rewards may be perceived as external factors, they can also develop esteem, status and social approval, feelings of worth and goodness which are felt internally when performing activities (Ferrell and Gresham, 1985). These two forces and perceptions of rewards and sanctions affected students from both groups and drove them either to hold ethical or unethical intentions (Mazar, Amir and Ariely, 2008). For group 1 participants and some participants from group 2, they preferred internal rewards, such as feelings of goodness whether it involves helping the friend out of loyalty, or being guilt-free by behaving ethically and not sharing or doing the work for the friend (Ferrell and Gresham, 1985). The internal reward and good feeling involved in helping the friend out of loyalty and psychological closeness (Gino and Galinsky, 2012) (Malek, 2010), which was expressed by many students from group 1 and some of group 2, could also be related to several social and relationship goals, which lead individuals to seek to maintain satisfying relationships with the others (Hicks, 1997). On the other hand, some students from group 2 preferred the economic benefits over the psychological costs (Shalvi, Gino and Barkan, 2015) as many students from group 2 expressed their willingness to help their friends if they were to be offered materialistic rewards. Interestingly, during the data collection and discussion of some scenarios, some students from group 2 expressed their concerns and suspicions in relation to the questions in the scenarios and the reasons for asking them and conducting this research. These inquiries and types of questions were not present during the discussions with group 1. As discussed

earlier in subsection 5.10, researching ethics has a sensitive nature, and social desirability bias can affect the study's findings (Randall and Fernandes, 1991) (Randall, Huo and Pawelk, 1993). However, social desirability biases and insecure feelings are both expected in almost every study that has been done on ethics. Additionally, the degree of sensitivity and or threat of the questions may lead the respondents to over-rate or under-rate their responses or answers (Cohen, Manion and Morrison, 2013), and the researcher expects to observe this phenomenon during data collection from the students. Yet these biases were present only during the interviews with members of group 2 and not with members of group 1 which raises the question of whether social desirability bias decreases with ethics education. The researcher suggests expanding this for future research.

6.5 Limitations and highlights of Phase I Study 1

There are some limitations that are associated with the group discussion interviews in general, and they appeared in some cases during the data collection stage. For example, some participants felt that their anonymity was not protected enough, because they were revealing and sharing their personal information in front of other classmates and in front of the researcher. Moreover, revealing this information in the presence of the recording devices might prevent participants from speaking up openly (Randall, Huo and Pawelk, 1993). Another limitation of the focus group discussions relates to the influence of some dominating members who influenced the perception of the rest of the group (Atesh, Baruah and Ward, 2016) (Atesh, Baruah and Ward, 2017). This effect might have resulted in other students in the focus group responding favourably to their ideas or comments (Stewart, Shamdasani and Rook, 2007). All of this might have led some of the focus group participants to conform to the most popular opinions in the group, at least publicly, as it is considered socially accepted (Acocella, 2012). These limitations, however, are considered acceptable in an exploratory research study, especially since conclusions are not being drawn from the results of this study alone.

Some of the highlights of this phase are that the design supported Street and Street (2006) assertion that exposure to escalating ethical case scenarios can increase the likelihood of unethical behaviour of the respondents. Moreover, each case developed certain themes of discussions. For instance, in the case of scenario 3, the discussions developed increasing justifications, from both groups, on why they should help their friends.

To conclude the analysis of the findings of this phase, some elements of the proposed model were evident in the analysis of this phase, such as:

- The environmental effect, by which students demonstrated how they were influenced by their immediate surroundings, such as their personal environment (Bommer et al., 1987) and the effect of the university's code of ethics.

- The nature of the moral issue, moral intensity and characteristics of the moral issue represented in the given case scenarios affected the students' ethical awareness (Jones, 1991), and that supported Jones's MIM proposals. Kidder's (1996) four dilemmas paradigms, however, was not clear in the analysis. In accordance with MIM effects, students reacted to the ethical case scenario based on their cognitive moral development level (Kohlberg, 1984) (Trevino, 1986) (Rest et al., 2000).

- Rest's et al. (1986) FCM, Kohlberg's (1969) and Rest's et al. (2000) Neo-Kohlbergian and moral development concepts were also evident in the analysis, as individual differences in ethical sensitivity skills and ethical maturity, played important roles in recognising ethical issues.

- Blind spots and biases affected students ethical judgements, and these factors were found to cause some students to intentionally bend their ethical rules, either to serve their group or to serve themselves (Chugh, Bazerman and Banaji, 2005). Students' ethical judgements were affected by their perceptions of rewards and sanctions, and whether an opportunity arises to conduct the intended behaviour or not (Ferrell and Gresham, 1985). Also, some factors, such as moral feelings played roles in these perceived rewards and or sanctions (Hiadt, 2003) (Haidt and Bjorklund, 2008).

Elements, such as the effect of a learning experience or residual impact and consequences on current and future behaviours (Schwartz, 2016), gains in ethical skills and change in ethical perceptions and behaviours were not clear in the analysis. Thus, it is difficult at this stage to confirm a positive impact of ethics education on students' ethical perceptions and behaviour, therefore, and to fill this gap, Phase II was designed and conducted. Hence, the findings necessitate conducting further research to confirm, provide more clarity,

complement, triangulate and validate the findings of Phase I (University of Surrey, 1997). Thus, Phase II was designed and conducted.

6.6 Phase II self-reflective writing interviews

This phase aimed to provide a follow up to the previous phase (Race, Hotch and Packer, 1994), complement, triangulate and validate the findings (University of Surrey, 1997). In this phase of Study1, two groups of students were interviewed. Table 6.3 shows the sample characteristics of Phase II of Study 1.

	Group 1 (Exposed to ethics education intervention)	**Group 2 (Not exposed)**
Total no. participated	66 students	
Removed from analysis	9 interviews	
No. of interviews used	55 interviews	
No. of students	18	37 (7 from York, 30 from Coventry)
University	York	York and Coventry
Study level	MSc in Engineering Management class of 2016/2017 and 2017/2018	PhD, MSc (other than Engineering Management), foundation year and years from 1 to 5 cohorts of 2017/2018 and 2018/2019
Discipline	Engineering Management.	Electronic Engineering and Mechanical Engineering.
Cultural background	Mostly from China, and few from the Middle East, Europe, U.K, East Asia, and North America.	Mostly from the U.K and Europe, few from the middle east, East Asia, China, and South Africa.
No. reported not being engaged in such activities	2 students	4 students

Table 5.3 *Phase II of Study 1 sample characteristics*

Group 1 included engineering students who had attended an educational intervention in Engineering Ethics, while group 2, included engineering students who had not attended ethics intervention. Both groups were introduced to the same nine ethical scenarios, and asked to read each case scenario, which described an ethical issue or dilemma and respond by selecting one or more options from multiple possible choices (Mumford, Steele and

Watts, 2015). Students at two engineering departments at two different Universities have been asked to complete the self-reflective writing interviews. Group 1 participants were MSc Engineering Management students enrolled in the University of York and were 2016/2017 and 2017/2018 cohorts. Group 2 participants included seven students from the University of York who did PhDs, MScs and third year of different electronic engineering programmes, and were all 2017/2018 cohorts. Group 2 also included thirty students from Coventry University who did MScs, foundation years and years 1 to 5 of different Mechanical Engineering programmes and were 2018/2019 cohorts. The reason for covering a wide sample for group 2, which included students from different study levels, is to match the ages of the group 1's participants. The age ranged between 19 to 35 years old for group 1's participants, and 17 to 42 for group 2's participants. The researcher believes that this approach is the best way to balance the two groups and provide some level of homogeneity.

Completing the assessment was voluntary and the students have understood that all responses are confidential. The self-reflective writing interviews were designed using scenarios that students are familiar with and could easily relate to. This did not give any added benefit or advantage to students who had prior experiences on an ethics module. As shown in Table 6.2, the total number of students who participated in the reflective writing interviews was 66, and 9 of these reflective interviews were illuminated since the students completed one or two section parts of the assessment or returned the assessment uncompleted at all. The interviewees were students from the UoY and from Coventry University (CU), 18 of which had undertaken the ethics session of the Law module at the UoY, and 37 who have not. All 18 students who had undertaken the ethics session of the Law module at the UoY were enrolled in the engineering management master programme at the UoY (Group 1), 7 students were from a different level of study at the UoY, and 30 were from two levels of study at CU. All groups were provided with 9 case scenarios for reflection which looked at past ethical decision-making and what they have learned from these experiences. Both students' groups from York and Coventry, who had not undertaken the ethics educational intervention were mixed to form group 2. This approach was used by the researcher to ensure blind assessment and review of the data analysis (Watts et al., 2017). On the other hand, group 1 participants are students from York who have undertaken the engineering ethics workshop. The reflective writing interviews lasted for approximately 10-15 minutes, and participants' responses were collected from the

assessment paper given to each student. For each student, the different responses of the two groups were manually reviewed, coded and compared to derive the emerging themes needed for analysis. As for phase II of the triangulation method, the students were given paper-based assessments to reflect on and return them back to the researcher. The researcher then searched across the range of reflection texts to find repeated patterns of meanings and themes (Braun and Clarke, 2006).

6.6.1 Level of ethics education exposure in the two group

Group 1 was exposed to the same ethics education intervention that was discussed earlier in subsection 6.2.1, and the 7 York students who were part of group 2, also had similar ethical exposure to those in group 2 in Phase I. As for students from CU, students in year 2 did problem-based learning, where one of the on-task marks is ethics and the other is judgement. Students are taught briefly about ethics and they are expected to develop their skills on ethics. In the final year, students are taught about employment law and management decisions on ethics cases in the second semester and are asked to do an ethics assessment for their final year project.

6.6.2 Details of the case scenario used

The scenarios were fictional case scenarios that involved situations which students could relate to better (Wilson, 2013). These scenarios included unethical case examples, such as academic dishonesty cases (Vesilind, 1996), bribery (Pritchard, 1992) (Kansas State University , 2009), copyrights (Schrag, 1998), software protection (Massachusetts Institute of Technology, Department of Electrical Engineering and Computer Science, National Academy of Engineering, OEC, 2002) and whistleblowing on friends. This assessment was based on students' reflections on these cases (Antes et al., 2012) and recalling past information based on the students' personal experiences which are important in forming current and future ethical decisions (Mumford, Steele and Watts, 2015). These scenarios are as follow:

1. Buying a paper from a research service, essay bank or term paper mill (either pre-written or specially written).

2. Copying a whole paper from a source text without proper acknowledgement.

3. Submitting another student's work, with or without that student's knowledge (e.g. by copying a computer disk).

4. Accepting money to do other people's work (e.g. essay).
5. Inventing experimental results to make it look more appropriate.
6. Installing illegal copies of movies, music, or software.
7. Misinforming a friend or a colleague about any academic information or sources.
8. Misleading any academic staff member to submit a piece of work after the deadline.
9. Being aware of a friend's or a colleague's misleading behaviour towards another colleague and not doing anything about it.

Jones's (1991) six main categories of the moral intensity of the ethical issue, and Kidder's (1996) four paradigms that are discussed in the previous phase, were also reflected upon when creating the case scenarios used in the self-reflective writing interviews. Students were asked to write about either themselves or someone they know, and then asked to reflect on one or more of nine given scenarios, or to reflect on a similar deed they have done in the past but does not exist in the list. Some of the given cases of the assessment were adopted from previous studies that focused on plagiarism (Park, 2003), and some were based on the students' and academics' personal experiences. Students were then asked to explain their emotions, feelings, consequences of that deed, and whether they would do the same behaviour again and why in more details.

The rationale for allowing students to self-select cases rather than compelling them to consider all is to increase the response rate of the students. The average time to complete one given scenario question will take about 10-15 minutes to complete but reflecting on two or more scenarios will take longer times to remember the incidents vividly. Therefore, this might discourage students from given more detailed, honest and precise reflections, and as a result, increase non-response rate. Also, in Phase I, some students expressed being pressurised by the case scenarios and how they were getting more and more difficult. Due to the difficulty in answering questions related to ethical and unethical behaviours done in the past, the students are to be given a choice to determine whether they would like to reflect on one or more scenarios. As discussed in Chapter 5, subsection 5.10, there are many challenges in studying ethics and ethical behaviour areas, and one of the challenges is social desirability. Hence, the researcher tried to word and present the

questions in friendly ways to reduce any potential threatening feelings that might be experienced by the students (Holbrook and Krosnick, 2009). In addition, the researcher aims to reduce memory errors that are attributed to remembering past behaviours and can affect students' reflections. As indicated earlier in Chapter 5, Kouchaki and Gino (2015) explained that individuals who engaged in unethical acts in the past are least likely to remember their action's details. Moreover, the amount, level and degree of information that can be required from students can be a lot if they were to reflect upon all case scenarios. Thus, the researcher gave the students the choice to reflect on any scenario they would like to reflect on, rather than compelling and forcing them.

6.7 Phase II analysis results

After the transcripts of the focus group sessions had been coded, the different responses of the participants from the two groups were compared for each given scenario. Their decision-making abilities were evaluated, in terms of their decisions in the past and now, in order to observe any distinct pattern or consistent theme in the analysis. The different responses demonstrated some key factors that influenced their ethical judgment and moral reasoning for each scenario.

Six students, from both groups, indicated that they have never been involved in any of the listed unethical behaviours, nor any similar behaviour to those listed. They expressed that the reasons for not being involved in similar behaviours were that they were aware of the ethical implications in such behaviours "*these are not ethical behaviours*!". This indicates a similar degree of ethical awareness among some members of both groups, and that they demonstrated similar ethical judgements (University of York, Academic Integrity, 2019). Other students revealed that a potential outcome of such behaviours would be the negative feeling associated with committing such unethical behaviours "*I will feel nervous and guilty and will think about the behaviour again and again"*. Moreover, others added that guilt feeling and being blamed discouraged them from conducting similar behaviours "*feel guilty or maybe blamed*", which underpins Buch's and Tolentino's (2006) speculations about intrinsic rewards and sanctions. In these two examples, students were driven by their internal perceptions of rewards and sanctions systems to get involved or not, in activities that may enhance their feelings of satisfaction, self-competence, and responsibility. These internal reward systems were moral obligation feelings and fear of being blamed which could result in monitoring and constraining one's own behaviour, such as guilt feeling, which are discussed by Hiadt (2003), Eisenberg

(2000) and Stegge (1998). Some of these students conveyed that work experience enhanced their ethical judgements "*I have learned from my work that these practices are not ethical, and I should be true to myself".* This statement represents Stevens's (1984) suggestions that professionals may show higher ethical tendencies than students, because work experience can play an important role in influencing ethical decision-making skills and perceptions. These indications also are consistent with Kidwell's, Stevens's and Bethke's (1978) findings that stricter ethical judgments were related to one's work experiences. This is related to workplace norms, which can affect ethical judgments as a result of socialization, and the more time spent in a job the stronger the socialization outcomes are (Hunt and Vitell, 1986) (Hunt and Vitell, 2006).

The rest of the participants from both groups reported being involved in one or more of the ethical case scenarios.

6.7.1 Scenario 1

	Group 1	**Group 2**
No. of reported involvements	1	1
Culture	China	Europe

Table 5.4 *Sample characteristics for students reported involvements in scenario 1*

As illustrated in Table 6.4, one Chinese student from group 1 and one European student from group 2 reported being involved in scenario 1 in the past. Both group members expressed that they were ethically aware of the situation. For example, some students from group 1 stated: "*I know it's unethical*", and similarly did some students from gruoup2 "*we know it's not a good behaviour*" (Rest et al., 1986). Group participants gave different reasons and motivations behind committing this act. Some students from group 1 indicated that this behaviour is culturally acceptable in their countries "*Its normal in my country and so many students do the same thing, even though we know it's not good behaviour, but we are used to it"*. This comment indicated that there are two main influencing factors, that is culture and peers. This matches O'Fallon's and Butterfield's (2005) speculations that different cultural backgrounds can influence ethical perceptions, in which practices, traditions and norms among societies, can create different

understandings of ethics and principles across societies. This shows there are differences between people's epistemologies (Honan et al., 2013). Although all cultures base and build their virtues on the same foundations of morality, the degree of emphasis varies (Haidt and Graham, 2007). The second factor is peers, which causes some individuals to stray from their own moral compass (Gino and Galinsky, 2012), and in some cases, increase their desires to mimic unethical behaviours regardless of this behaviour's immorality (Moore and Gino, 2013) (Gino, Ayal and Ariely, 2009). On the other hand, participants from group 2 indicated that they were pressurised by competitiveness "*I was overwhelmed with work and I had to do it and this person tried to cut the easy way out, and this was very unfair. I needed good research to get good grades*". These comments relate to Gaberson's (1997) propositions that students usually turn to unethical conduct due to pressures to be the best, emphasis on perfectionism, and misconceptions about making mistakes. Also, complexities of time pressure, fatigue, stalled or impaired moral development, and absence of role model all may lead to dishonest behaviours.

When the students were asked about any emotions they have experienced when conducting the behaviour, students from group 1 mentioned that they felt little to no negative feeling after conducting the behaviour. They also expressed their future intentions for not getting involved in similar acts in the future "*I didn't feel much guilt at that time, although I may have done the wrong decision when I was in high school, if I had to do it again I would not do that".* These comments point to two things, the first is that the students held ethical intention and are willing to do good in the future (Kulju et al., 2015) (Trevino, 1986), and second, students have learned from their mistakes and intend to self-regulate their behaviours (Grinsven and Tillema, 2006). Group 2 participants, on the other hand, expressed that they "*felt very bad*", and expressed that they will consider better options in the future, but did not indicate their future intentions and whether they are considering stopping such actions "*next time I will face the problem and seek a better solution*".

The discussion of this scenario showed that Rest's et al. (1986) FCM was evident in both groups' members' reflections, and that they showed ethical judgments and awareness when faced with this scenario. However, factors such as culture (O'Fallon and Butterfield, 2005) (Honan et al., 2013), stress and competitiveness (Gaberson, 1997) contributed to acting inconsistently with their ethical perceptions. The students who had undertaken ethics interventions expressed clear future ethical intentions, but the other students only

expressed that they will consider better choices in the future. This supports Harré's (1985) notions that an indication of high ethical development level is a clear sense of moral certainty, which supports and boosts the individual's ethical awareness. Thus, change in ethical behaviour and improved ethical perceptions were evident in this case scenario among the students who had undertaken ethics interventions.

6.7.2 Scenario 2

	Group 1	**Group 2**
No. of reported involvements	2	-
Culture	China and the Middle East	-

Table 5.5 *Sample characteristics for students reported involvements in scenario 2*

As illustrated in Table 6.5, two students from group 1 identified with this scenario, and they were from China and the Middle East. Some students demonstrated ethical awareness (Singhapakdi, Vitell and Franke, 1999) "*I once copied part of a paper which is about the steps of a lab, but I think copying a whole paper is totally not allowed*". Others expressed that they were not ethically aware at the time they copied the paper "*at that stage, I haven't recognised the importance and the ethical values behind such behaviours, I wasn't aware, and that wasn't discussed with or to me"*. This supports Trevino's (1986) and Rest's et al. (2000) statements that identifying the moral issue, or moral awareness, is a very essential initial stage in the ethical decision-making process, because it can build the foundations of the ethical behaviour. The second comments may be consistent with the notions that unethical behaviours are not always committed intentionally. Unintentional unethical acts are committed by people who have their attention shifted from the violations they are committing, and therefore, failed to supervise their own behaviours (Shalvi, Gino and Barkan, 2015) (Gino, 2015).

As for any moral feelings that have been experienced after the act was committed, some students revealed that they did not experience any negative emotions "*I felt nothing because all classmates did the same work and described the steps almost the same*". The

students believed that because the copied text was only part of a lab experiment procedure, and not coping results, it was permissible to do so. On the other hand, the other students who were unaware of their unethical acts revealed experiencing negative feelings "*I feel ugly now and I have done something against the rights of authors*". These moral feelings could be related to the feelings of moral obligation (Beck and Ajzen, 1991) (Cronan and Al-Rafee, 2008) and guilt (Eisenberg, 2000), which are feelings of responsibility to perform or decline to perform behaviours. The students expressed their good and ethical intentions to act ethically in the future "*I will not choose to behave in this way in the future*". Some of them also added that they already stopped the behaviour "*nowadays, I am following all procedures to avoid falling into unethical behaviour*". These implications are consistence with Rest's moral intent (Singhapakdi, Vitell and Franke, 1999), that individuals should figure out a sequence and course of concrete actions to act on their moral intentions (Jones, 1991) (Rest et al., 1986). These forms of self-regulatory techniques, supports Baumeister's et al. (1994) notions that when an individual fails to reach a goal, they are then motivated to apply more effort to compensate for this failure by feeling guilt and regret, and learning from mistakes and being open to new challenges in mastering and learning tasks, and continuing to self-reflect to improve and attain levels of these competencies (Grinsven and Tillema, 2006), which can boost leadership skills, and increase both, self-leading and leading performance and change skills (Barkhordari-Sharifabad, Ashktorab and Atashzadeh-Shoorideh, 2017).

One important aspect of ethical perceptions that emerged from the data analysis of this case is professional image and reputation. Some students suggested that they represent the engineering profession "*as a person and engineer, I have to follow the ethical values and act as a role model, at the same time to show the professionalism in following instructions and the right process of doing things".* These perceptions represent the RAEng third set of SEPs: Respect for life, law and the public good, where students felt responsible to act honourably, responsibly and lawfully to uphold the reputation and dignity of the engineering profession (The Royal Academy of Engineering, 2011). Moreover, there could be some aspects of the RAEng fourth set of SEPs: Responsible leadership, in which the students realised and understood that their conduct have impacts on others, and they must be objective and truthful in any statement they make (The Royal Academy of Engineering, 2011.p.55-61).

This scenario brought up several highlights of the impact of ethics education, some of them were highlighted in the literature and some were not. For example, Rest's et al. (1986) proposals that ethics education can improve ethical awareness and sensitivity. The new behavioural pattern that emerged is self-regulation, where the students indicated how they felt and acted previously, and their intentions and behaviours now. The dynamic of this behaviour was explained in the psychology literature, but was not evidenced in the way that is explained by students (Zhong, Liljenquist and Cain, 2009). This is due to the sensitivity of the questions being explored in relation to ethical behaviour and the difficulties involved in opening and revealing such private information. Another pattern that emerged is that those students who were exposed to ethics education expressed the importance of their professional images among others, which also was highlighted by the RAEng's SEPs (The Royal Academy of Engineering, 2011), but the literature lacked empirical evidence on that.

6.7.3 Scenario 3

	Group 1	**Group 2**
No. of reported involvements	1	-
Culture	North America	-

Table 5.6 *Sample characteristics for students reported involvements in scenario 3*

As illustrated in Table 6.6, one student from group 1, identified with this case scenario and the student was from North America. They started their reflections by stating that they were aware of the ethical implications of their act at that time, and that they held ethical judgements about it "*I knew I was doing something wrong"*. The comments, of course, supported Rest's et al. (1986) ethical awareness and ethical judgements definitions. The student added that negative feelings were experienced after committing this act "*I was feeling tense and nervous because I knew I was doing something wrong, and that was not the way my parents raised me. Because I am not used to doing that, and when you try something different, you are always nervous the first time".* The comments are consistence with the ideas of sanction and punishments for undesired behaviours.

Sanctions here, are the psychological threatening effects or internal sanctions, and the threat here is the possibility and fear of causing harm, which in this case is psychologically harming the parents (Mulder, 2018). This is also consistent with the notions that certain feelings can be associated with unethical acts, such as anxiety and fear of being blamed (Willigenburg, 2003). These feelings, in turn, can trigger concerns about the self or one's closest kin (Hiadt, 2003), in this case, the parents. The comments also demonstrated how familial values, goals and other types of ethical conduct may influence the individual's ethical choices, perceptions and behaviours (Creyer, 1997) (Koiranen, 2002). In addition to these anxious feelings, the students added other feelings experienced, such as guilt "*there was no consequences rather than a guilty conscious"*, and regret "*I feel bad when I analysed what I did, and I regret doing it*", which all reflects moral obligation feelings (Rajeev, 2011) (Zeelenberg et al., 1989) (Zeelenberg, Dijk and Manstead, 1998). In addition to feelings of being young and was not ethically matured to act in that manner, "*I was young when I did what I did"*. The comments may point to the students' realisations and awareness of their own ethical progression 'meta-ethical-cognition' (Cheruvalath, 2019), and that they did in fact developed and matured ethically (Kohlberg, 1969) (Auger and Gee, 2016). As for the reason for behaving in such way, the students had given one main reason and that is the weak possibility of being caught "*I know nothing was going to happen to me, and I was 100% sure that I won't be discovered"*. This proves Ferrell's and Gresham's (1985) suggestions on the role of opportunity in behaving unethically. Yet, the student added that their moral conscious was warning "*I was listening to this little voice in my head telling me I was being a bad guy*", which reflect moral obligations and responsibilities.

The students, however, made some interesting points about their current level of ethical maturity "*Now I am more matured, I would like to think that because I will not do this act again!"*. These reflections indicate several points. First, the students' realisations of their own ethical cognition development or 'meta-ethical-cognition' (Cheruvalath, 2019), and their realisation that some sort of change and effect impacted their ethical perspectives (Cheruvalath, 2019) (Batha and Carroll, 2007). Second, intentions of more self-regulated behaviour in the future (Schraw, Crippen and Hartley, 2006), and showing a desire to regulate one's ethical behaviour (Bollom, 1988). These indications support (Zapalska, Jackson and Zelmanowitz, 2016) leadership skills, in which the individual demonstrates abilities in leading own performance and abilities and willingness to change, such as

being able to manage conflict, having skills in decision making and problem-solving, being able to improve and implement this improvement, vision development and implementation, being creative and innovative. The students also expressed that this experience taught them to be a better individual "*I think it didn't have any impact on who I am today, there is always a chance to be better and now that I understand what I did wrong, I will not repeat my behaviour in the future".* These indications are consistent with Kulju et al. (2015) proposals that having ethical strengths and demonstrating ethical leadership is an important ethical skill for ethical sensitivity. The students have demonstrated that by using their past experience of unethical behaviour to self-regulate their current and future behaviours (Moore and Gino, 2013). Moreover, the student indicated that they hold clear ethical intentions (Singhapakdi, Vitell and Franke, 1999) for their future behaviours (Ajzen, 1991) (Ajzen, 2006).

The emerging patterns from discussing this scenario indicates that Rest's et al. (1986) FCM were evident and aligned with the literature discussed in Chapter 2. The new emerging patterns are the empirical evidence for the effects of rewards and sanctions on ethical decisions (Mulder, 2018), and how past unethical behaviours' residual impacts can influence current and future ethical intentions and behaviours. These factors and impacts were discussed earlier in the literature in Chapter 2, yet no empirical evidence was found to support these notions in the literature on ethical behaviour. Again, the reason for this could be related to the participants' feelings of threat and that their privacies are being violated, therefore, refusing to express and reveal such information to the researcher thereby providing new values in these findings.

6.7.4 Scenario 4

	Group 1	**Group 2**
No. of reported involvements	-	1
Culture	-	Europe

Table 5.7 *Sample characteristics for students reported involvements in scenario 4*

As illustrated in Table 6.7, one student from group 2, reported involvement in this scenario and they were from Europe. The students did not indicate whether they were aware of the implication of their behaviour and what is and was their judgement since the only motivation and benefit is money "*I did not care since I was paid. After the submission, he will be punished*". The comments show that the students sought to maximise self-benefits and financial gains, which indicate that the student falls in the pre-conventional ethical level. The reason for this assumption is that the student aimed for satisfying their individual needs which determined what they perceived as right or wrong (Kohlberg and Hersh, 1977). In addition, the students showed little care towards the other people who might be affected by this action, because they were appetite driven (Curran, 2008) (Lewis, Amini and Lannon, 2001), and had little moral code (Curran, 2008). In addition, they demonstrated lack of emotions and justified their personal interests as morally right by appealing to personal benefits (Trevino, 1986) (Lewis, Amini and Lannon, 2001). This lack was further evident in their reflections that they had not experienced any negative emotions "*I didn't experience any bad feelings, life goes on*". Generally speaking, the comments indicate a lack of ethical sensitivity (Weaver and Mitcham, 2016), and emotional skills and concerns in particular, such as sympathy (Hiadt, 2003), moral obligation (Bairaktarova and Woodcock, 2017) (Cronan and Al-Rafee, 2008), and responding with compassion (Levenson and Ruef, 1992). The students further confirmed that the right decision was taken at that time "*yes because I worked for that money and I earned it fairly*". The reflections suggest two aspects involved in this reflection. One is the potential failure in recognizing and identifying the ethical implications in the ethical issue. This could be related to failing to identify the moral intensity of the ethical issue (Jones, 1991) and failing to see the potential harm (McMahon and Harvey, 2006), which eventually affected their judgment, because the moral intensity of the situation can help to identify whether or not an ethical problem exists (Singhapakdi, Vitell and Franke, 1999). Two is the potential low ethical development and maturity level of the student, in which the fulfilment of personal interest, personal desires and physical needs is sought (Kohlberg, 1969) (Kohlberg, 1984).

Discussing this scenario revealed several points that were discussed earlier in the literature, such as Rest's et al. (1986) four components, and that lack of ethics education can cause individuals to seek maximising self-interests (Kohlberg and Hersh, 1977).

6.7.5 Scenario 5

	Group 1	Group 2
No. of reported involvements	2	2
Culture	China	China and Europe

Table 5.8 *Sample characteristics for students reported involvements in scenario 5*

As illustrated in Table 6.8, two students each from both groups identified with this scenario, group 1 respondents were from China and group 2 respondents were from China and Europe. Ethical awareness and judgements varied between the members of the two groups. Students from group 1 indicated clearly that they were aware of the ethical implications in this behaviour "*We all know that this behaviour is wrong*" (Rest et al., 1986). Students from group 2, on the other hand, had varied views. Some of them were aware of the ethical implication "*I felt like I was dishonest*", others were not sure "*the results were not far from accurate, and I believe that the alterations I made were very small, so I think it's not changing and fabricating results*". Others, yet, expressed that they do not think it is a wrong decision "*I do not consider it to be wrong*". These variations in ethical judgements could be related to several factors, such as failure to recognise the ethical components in the issue (Hunt and Vitell, 1986), and the different impacts of the moral intensity of that issue on each student (Jones, 1991). Another factor that could have been affecting the students' ethical awareness is the effect of individual differences, such as different levels of ethical sensitivity among the students (Rest et al., 2000), and the different ethical cognitive development levels (Trevino, 1986). Thus, failing to recognise the ethical components in the issue (Hunt and Vitell, 1986) and the moral intensity of that issue may have also affected the remaining stages of the ethical decision-making process (Jones, 1991), in which one stage can influence or interact with the other stages (Rest et al., 1986). Additionally, some students have misconceptions about certain types of academic dishonesty, such as manipulating laboratory results, which may not be perceived as cheating by some students (Arhin and Jones, 2009).

As for the motivations for committing such behaviours, both groups' participants indicated similar motives. For example, fatigue "*I tried tonnes of times to do the physical test, but I failed"*, stress "*the experiments are difficult, after trying many times, I couldn't get the right data*", and competitiveness "*in order to quickly finish the experiment and get a high mark".* This is consistent with McCabe's, Trevino's and Butterfield's (2001) implications that increasing competition in the job market forces students to experience pressures to do well. These pressures can lead to engaging in various forms of unethical behaviours (McCabe et al., 1996). Few students from group 2, summarised the motives that led them to conduct such acts "*the risk involved in the reward was favourable*", and "*it's human nature vs. decency"*. The comments are reflecting Shalvi's, Gino's and Barkan's (2015) proposals that self-serving justifications are used by individuals to stretch the truth and facilitate their wrongdoing by feeling moral. This attitude is also related to the lower levels of the ethical development theory, in which satisfying the individual's needs determines what is perceived as right or wrong (Kohlberg and Hersh, 1977), based on personal desires and physical needs (Kohlberg, 1969) (Kohlberg, 1984).

As for the feelings experienced after conducting the behaviour, students from group 1 indicated that they did experience negative feelings. Examples of these negative feelings are anxiety (Willigenburg, 2003) "*I was nervous and scared because I am afraid that the teacher will be aware of it*", shame (Hiadt, 2003) " *although my experiments got a good mark, I felt ashamed of what I've done*", and regret (Rajeev, 2011) (Zeelenberg et al., 1989) "*No one knows about what I have done, but I regret doing it*". These emotions indicate self-conscious emotions, which Hiadt (2003), Stegge (1998) and Rajeev (2011) expected to emerge as a product of conducting unethical behaviours. Whereas students of group 2 did not express any experience of moral feelings, particularly, since some of them felt that what they have done was not considered wrong "*I did not really feel that adjusting my results was wrong*". Some of them also indicated their beliefs that these actions were minor "*I am unsure that my behaviour was unethical. The events I explained are minor*". These statements support a point the researcher made earlier, in relation to failing to recognise the ethical components in the issue (Hunt and Vitell, 1986), and the possible effect of the moral intensity of that issue (Jones, 1991). These factors may have been affecting the ethical decision-making process as a whole, in which one stage may influence or interact with the other stages (Rest et al., 1986). These assumptions are based on Jones's (1991) suggestions that failing to recognize the moral issue, leads to failing

to employ an ethical decision choice, which is essential for the ethical cognitive process (Rest et al., 1986). Thus, the individual will attempt to anticipate the easier option psychologically and rationally (Butterfield, Trevin and Weaver, 2000) (Reynolds, 2006).

As for the future intentions and willingness to do good, students varied in their perceptions. Students from group 1 indicated that they will not repeat the act "*certainly not! I will not invent experiment data again as it is a fraudulent behaviour whether it is observed or not*". Some of them added that they will ask for help in the future "*I will ask the instructors for help to understand why I always keep getting the wrong results data, I believe this is a better option*". These statements reflect some of the learning feedback loops, where after a behaviour is conducted and a decision has been made, certain outcomes and consequences may have resulted and been observed by the decision makers. These experiences have involved some internal evaluation and retrospection on the decision that has been made, which may then have affected the students' moral perceptions, thereby the decision-making process for next time when an ethical dilemma arises (Schwartz, 2016) (Hunt and Vitell, 1986). As a result of these learning feedback loop outcomes, perceptions of rewards and sanctions are formed as part of the internal reward, self-concept and self-image system (Mazar, Amir and Ariely, 2008). Based on the students' failure to behave ethically, their self-image is threatened and unbalanced, therefore, the students are motivated to exert more effort to compensate for this failure by feeling guilty and regretting what they have done (Baumeister et al., 1994). Thus, self-regulatory will take place, and it was present and indicated by students from group 1. However, the students expressed their ethical future intention (Rest et al., 1986) (Rodzalan and Saat, 2016) and willingness to do good which is one aspect of ethical sensitivity and ethical leadership (Kulju et al., 2015), and the students expressed their desires and willingness to change, such as being able to improve and implement this improvement (Zapalska, Jackson and Zelmanowitz, 2016). Furthermore, some students from the same group expressed that they held misconceptions about experiments results in the past "*Now I know not every test will succeed and it's not a dumb thing to get wrong experimental results*". This underlines what Ajzen (1991) thinks about intentions, that it can change over time due to the change in conditions and circumstances and that new information could affect behaviour (Cronan and Al-Rafee, 2008). This also indicates that the students are aware of this change of their own cognition or 'meta-ethical-cognition' (Cheruvalath, 2019). Whereas for group 2 participants, they held contrasting perceptions.

Few of them indicated that they will not repeat their past behaviours "*I would not do that again. I would ask the tutor to repeat the experiment again. If not, I will report and listen to the module leader*". Others insisted that their act is acceptable *"I still think I made the right decision",* especially that they believe that these acts had no risks "*they were not great risks, else I wouldn't have done them".* The contrasting views suggest a conflicting understanding of ethics, which are related to lack of ethical awareness, which in turn impacted ethical judgement and intentions (Rest et al., 1986). Moreover, the moral intensity of the issue involved in the scenario could have been another reason for not recognising the ethical issue (Jones, 1991) (McMahon and Harvey, 2006), and mainly affecting the ethical awareness (Jones, 1991). For example, the magnitude of consequences or *the sum of the harms (or benefits) done to victims (or beneficiaries) of the moral act in question* might not have been clear for this group of students. Thus, students could not see the potential harm in fabricating their data, but on the other hand, they have seen the beneficiary of this act, and that is the decision maker self-serving goals. Also, the concentration of effect and the number of people affected by this act is given magnitude, which according to the students, could be low or null, thus, not moving the decision maker's sensitivity towards the welfare of others (Rest et al., 1986). Furthermore, some respondents of group 2 have reacted to the ethical dilemma with cognitions determined by their cognitive moral development level (Trevino, 1986). Since some students did not recognise the moral issue, their judgements will be affected and will be based on the previous stage, which was not complete, therefore the judgement will be biased. In addition, some students expressed that their perceptions of the potential risks or negative consequences of that behaviour and their personal judgements (Jones, 1991) (Bommer et al., 1987) motivated them to conduct this activity.

Students from group 1 indicated that they have already improved their skills in ethical decision making, as they felt they are more ethically matured "*I grew up now and became more matured, and I shall never do these acts again*". They also said that they did what they have done because they were younger "*I felt the behaviour was childish*", which support what Kohlberg (1969) and Rest et al. (1986) proposed that different developmental cognitive structures of moral judgement are related to moral cognitive. This also is consistent with Carroll's and Shaw's (2012) ethical maturity suggestions, that ethical sensitivity is like an "ethical antenna" that can alert us in the presence of an ethical issue, which is related to individual differences. Additionally, students from the same

group stressed that they are currently trying to behave in an ethical manner. This is because of their belief that being ethical is part of the responsibilities of an Engineering master's degree student "*now I always refer to my true and real results, and I think it's what a master student should do*". Others added that ethical conduct is part of the responsibilities of being scientists "*I don't behave like in the past anymore. Now when I carry out an experiment or analysis, I always base my results on the truth, which is the basic rule for an experimenter and an engineer*". These reflections evince Kulju's et al. (2015) implications on ethical character strength and leadership as part of ethical leadership, which is, in turn, one aspect of developing ethical sensitivity. In addition, the reflections also demonstrate the RAEng's vision of Respect for life, law and the public good (The Royal Academy of Engineering, 2011) as well as acting in an honourable, responsible and lawful way and upholding the engineering profession's reputation and dignity. Furthermore, Zapalska's, Jackson's and Zelmanowitz's (2016) views about leadership also be present in these comments.

Overall, these reflections suggest that students from group 1 demonstrated higher levels of cognitive ethical development in which they stressed a sense of responsibility, logical reasoning, and an internal source of justice and morality (Kohlberg, 1969) (Kohlberg, 1984). In other words, indicating that group one students fit in the higher ethical developmental level than group 2 members in terms of responding to this ethical scenario (Rest et al., 2000). This is believed to be so due to the main characteristics of individuals at this cognitive level, such as wanting to follow regulations, and moral obligations as their shared ideals and community accepted practices (Kohlberg, 1969) (Kohlberg, 1984). In addition, there are many indications to change in ethical perceptions and behaviours among members of group 1, and that supports the previous findings of the scenarios, that ethical education has impacts on ethical behaviour.

6.7.6 Scenario 6

	Group 1	Group 2
No. of reported involvements	2	28
Culture	China and Europe	The U.K and Europe

Table 5.9 *Sample characteristics for students reported involvements in scenario 6*

As illustrated in Table 6.9, students from both groups have been involved in this case scenario. Group 1 participants were from China and Europe, and group 2 participants were from the U.K and Europe. The reflections from group 1 participants varied between being unaware of the ethical implications in this act (Gino, 2015) "*now I understand I was doing something wrong, even it was a small thing but I'm sure it was not the right behaviour*", and being ethically aware (Rest et al., 1986) "*There is a law of piracy*". On the other hand, participants of group 2 indicated that they were aware of their unethical actions, held ethical judgements, but they have their own reasons to act in that ways "*the actions are clearly illegal, immoral and wrong, however, if seemingly justified can be deemed right*". Some students added that there are many financial injustices in the world "*the behaviour is immoral, however, there is enough injustice in this world with finances and unjustifiable greed*". The students tended to use self-serving justifications to stretch the truth, and help them justify making the wrong decision and feel moral at the same time (Shalvi, Gino and Barkan, 2015). The students also seemed to maintain incorrect views about themselves as being objective (Moore et al. , 2005) "illusion of objectivity", and that their judgements were justified by their perspectives of self-interests and self-serving biases. However, these tendencies to justify these unethical acts were attempts to minimize their ethical dissonance by engaging in justifying violations (Barkan, Ayal and Ariely, 2015) (Shalvi, Gino and Barkan, 2015). This again confirms Rest's et al. (1986) and Rodzalan's and Saat's (2016) suggestions that being ethically aware of an ethical situation does not indicate that the outcome of the decision process and the behaviour would be ethical. When the students were asked if they made the right decision, participants from group 1 stressed that it was not the right decision "*no it was not!*", and

"*no, because I have done something against the law*". On the contrary, many students from group 2 indicated that they did the right decision "*yes, I made the right decision. I enjoyed the film and saved money*". A distinctive variation seemed to be between the two groups, in which group 1 showed higher levels of ethical development while some members of group 2 justified their personal interests as morally right by appealing to personal benefits (Trevino, 1986), which is related to the first ethical cognitive development level (Rest, 1994), where group 1 participants acknowledged their wrongdoing and sense of moral certainty (Rest et al., 2000).

Both groups participants, however, specified similar motives behind acting in such a way. For example, some indicated that "*most people do that*", and the availability of multiple piracy websites "*there are lots of piracy websites*". Others also added that it is hard to get access through legal ways "*I downloaded only items I could not access through legal means or I could not afford*", and lack of money "*the legal copy software or music are expensive"*. These motives are consistent with Kocanjer's and Kadoić's (2017) implications that the advanced high technology and availability of various applications and devices all can facilitate and allow unethical behaviours and decisions. Starting from smart watches, glasses and appliances to applications that can solve physics and mathematical problems. Simpson, Banerjee and Simpson Jr. (1994), Triandis (1979) and Cronan and Al-Rafee (2008) also believed that factors, such as socio-legal and socio-cultural attitudes and computer and digital attitudes, all can impact ethical perceptions. They also indicated that situational factors, habits, fast internet connections, peer-to-peer internet networks which are difficult to control, and inexpensive high storage capacities, all can facilitate unethical perceptions and behaviours. Nonetheless, group 2 participants tended to express more self-serving justifications than group 1, and these justifications lacked emotional consideration of the other potential parties that could be harmed as an impact of this behaviour. For example, some students expressed motivations of installing illegal software as being bored "*I installed movies due to boredom*". Others believed that movies stars earn large amounts of money "*global actors/actresses already have more wealth than required, and I, therefore, make no life-changing difference to the individuals it effects".* Others added that the movie industry earn lots of money and that justifies illegal movie downloads or installations *"a multibillion-pound company has marginally less profits".* These reflections lacked emotional engagements, which are important aspects of ethical sensitivity (Kulju et al., 2015). The reflections also demonstrated lack

of understandings of the social and economic inequalities that led them to think, believe and act in ways that can hinder positive change, and increase social and economic injustice (Segal, 2000). As engineers, they are required to develop these ethical sensitivity skills in order to practice their profession effectively in contemporary socio-technical systems. This also can be a result of Jones's (1991) moral intensity and concentration of effects proposals. In this aspect of moral intensity, the perceived number of people that could be affected by the act of a given magnitude, a few rich individuals in this case, which have less perceived concentrated effect than if the affected people were a few poor or working-class people. This justification supports Jones's example *"Cheating an individual or small group of individuals out of a given sum has a more concentrated effect than cheating an institutional entity, such as a corporation or government agency, out of the same sum."*. Moreover, the potential and probability of effect of the act in question actually causing the harm or benefit to others (Jones, 1991), in this case, the perceived potential harm or otherwise, was maybe perceived low or even absent, and maybe the social pressures were high (McMahon and Harvey, 2006).

Overall, most group 1 participants and a few participants from group 2 expressed little to no moral obligation feelings. Some had not experienced negative emotions "*I didn't feel bad because that's what everybody did and it felt normal doing it*" and some were happy to save money "*I was happy! as I mentioned before, many illegal copies can offer the good experience with a cheaper or free price*". Some, on the other hand, felt a little guilt "*relief to have access to software bad for obtaining illegally*". The majority of the students expressed the absence of moral obligation or negative emotions (Bairaktarova and Woodcock, 2017) (Cronan and Al-Rafee, 2008). According to them, this is due to the perceived social acceptance of conducting such behaviours, socio-cultural and computer and digital attitudes (Cronan and Al-Rafee, 2008) (Triandis, 1979), and maximising economic benefits, and prioritizing financial goals (Shalvi, Gino and Barkan, 2015). On the other hand, many students from group 2 revealed their excitement for installing illegal copies of software "*it was the best feeling ever!"*, *"I was proud of getting it for free while my friend cashed out!"*, and "*hell yea! I was very happy*", which are expressions that were not present among group 1 participants. These reflections illustrate that the students emphasised on maximising their self-benefits, which is expected among pre-conventional ethical development level (Kohlberg, 1969). Additionally, the reflections indicate a lack

of ethical sensitivity, particularly showing emotional engagements (Levenson and Ruef, 1992).

Many students in group 1 expressed their ethical future intentions of acting ethically (Jones, 1991) (Rest et al., 1986), and willingness to do good in the future (Kulju et al., 2015) "*of course am not going to do this again. Downloading Illegal copies is illegal behaviour, it is not the right way to get software*". Others, on the other hand, cleared out that they do not install illegal copies anymore "*I don't use or download illegal copies anymore, because I want to respect and follow the copyright laws and support the legal copies*". The comments confirm self-regulatory attitudes (Zhong, Liljenquist and Cain, 2009), which might take place as a result of feeling guilty (Baumeister et al., 1994), and trying to compensate this behaviour by learning from their mistakes and self-reflect to improve and attain levels of these learned competencies (Grinsven and Tillema, 2006). Some students from group 1 suggested a potential reason for behaving unethically was lacking ethical maturity "*maybe because I was young and didn't understand that I was doing something wrong"*. This demonstrates that students became aware of their own ethical development 'meta-ethical-cognition', which is another important aspect of ethical sensitivity (Cheruvalath, 2019). On the other hand, some students from group 2 indicated that they will continue conducting similar behaviours "*I will stop if I feel that it's kind of piracy, but it's not so bad for me, so I'll do it again"*. These indications could imply that the students were fully aware of the ethical implications of the act (Rest et al., 1986) and a blind spot judgement may have resulted from this lack of awareness (Sezer, Gino and Bazerman, 2015), eventually making the whole process of ethical decision-making and perceptions biased. In addition, some students from group 2 showed some hesitancy about behaving in a similar way in the future. For example, some of them related their future ethical act to circumstances "*when possible I would try to purchase a legal copy*". Others stated clearly that they will continue this act "*because there weren't any repercussions probably, I will do it again*", while some expressed their hopes to stop conducting these behaviours "*I still carry out the same thing. But I do hope to stop*". This hesitancy is due to the lack of ethical awareness (Jones, 1991) (Hunt and Vitell, 1986). This lack could be related to the students' low ethical development level (Rest et al., 1999) (Kohlberg, 1984), and lack of ethical sensitivity and consideration for the welfare of others. The reflections also highlighted factors, such as opportunity, and perceptions of rewards and sanctions (Ferrell and Gresham, 1985). In addition to perceptions of risk,

personal weights of consequences based on the students' personal and unique values possibly may have played a part in these perceptions (Jones, 1991) (Bommer et al., 1987).

Discussing this scenario indicated that most of group 2 perceived a simple issue of moral temptation as a right versus right ethical issue (Kidder, 1996), and that is evidence of a lack of ethics education. Group 2 also showed no clear intentions to stop the behaviour and that this behaviour is widely accepted among students of group 2. This suggests that such issues should be focused on in the ethics interventions.

6.7.7 Scenario 7

	Group 1	**Group 2**
No. of reported involvements	-	1
Culture	-	Middle East

Table 5.10 *Sample characteristics for students reported involvements in scenario 7*

As illustrated in Table 6.10, one student from group 2 reported involvement in similar behaviour as scenario 7, and the student was from the Middle East. The student indicated awareness of the behaviour and held ethical judgements of the act (Rest et al., 1986) "*it is ethically incorrect"*. The student included some factors that motivated this act. For instance, this included being driven by competition to behave unethically "*I worked hard so I deserved a better grade*". These reflections reflect McCabe's et al. (1996) suggestions that with increasing competition in the job market students may experience pressures to do well, and these pressures can lead to engaging in various forms of unethical behaviours. The students also expressed that they did, in fact, experience negative feelings when committing these acts "*I felt bad, but I had to do it*". Regardless of their moral obligation feelings (Hiadt, 2003) (Eisenberg, 2000), accomplishing their self-interests and personal desires goals were more desirable and stronger, and the degree of their moral obligation was not strong enough to stop them from conducting their behaviour. As for their future intentions, students specified that they hold ethical intentions for the future (Rest et al., 1986) (Ajzen, 2006) "*I will never do it again! It doesn't worth the feeling*".

The students did indicate the effect of moral obligation on their future intentions (Beck and Ajzen, 1991) (Cronan and Al-Rafee, 2008), and were planning to regulate this behaviour in the future based on what they had learned from their mistakes (Grinsven and Tillema, 2006).

The discussion revealed the presence of some elements of Rest's et al. (1986) FCM, such as ethical awareness, judgements, intentions and behaviour. There is also an indication of future ethical intentions to regulate past unethical behaviours, but there are no indications on how this can be or will be done.

6.7.8 Scenario 8

None of the respondents reported being engaged in similar behaviours in the past.

6.7.9 Scenario 9

	Group 1	**Group 2**
No. of reported involvements	9	-
Culture	China, Europe and North America	-

Table 5.11 *Sample characteristics for students reported involvements in scenario 9*

As illustrated in Table 6.11, only participants from group 1 reported being engaged in similar acts, and they were from China, Europe and North America. The students generally showed their ethical awareness and some expressed their ethical judgements towards the act (Rest et al., 1986) "*I think the behaviour is not ethical and not good*". They added that better options could have been considered to deal with this issue "*the right decision was to have made more effort in terms of convincing the colleagues to do what is the right thing rather than continuing with the wrong choices*. *I think it is wrong taking credit for something you have not done*". The comments reflect how the students developed their moral judgements, and the process of evaluating and formulating possible solutions to this ethical dilemma and developing a moral justification to it. In this case scenario, the students went through some potential choices and the potential

consequences of these choices, to determine which are the ethically sound choices (Rest et al., 1986). Students, in this case, demonstrated ethical awareness and judgement.

Some reflections indicated that some students could have experienced being ethically bounded, in which they decided to keep silent and not report or whistleblow their friends behaviours (Gino, 2015). The reason for assuming this is because bounded ethicality is developed upon further awareness or reflection, and realising their involuntary discrimination against others (Sezer, Gino and Bazerman, 2015), such as "*People getting away with other people's work and not being caught*". Many students expressed different and conflicting judgments about this act. Some of them indicated that they had tried to advise their friends, but they did not consider telling on them "*I tried to advise him, but in the end, it was his decision, I would not tell the department on him, as telling on people is also wrong*". These conflicts are consistence with Kidder's (1995) suggestions, in which tough conflicts in the individual's perceptions and paradigms of right versus right ethics might take place when facing an ethical dilemma. Whistleblowing is one example of right versus right dilemma paradigm (Malek, 2010), in which the individual faces a dilemma between truth versus loyalty ethical paradigms. In addition, other students implied that they should only focus on their own behaviours *"I think I just need to mind my own business and make sure I don't do any of these behaviours myself"*. This perception also conflicts the second SEP of the RAEng's SEPs, the set of principles on honesty and integrity. In this set, as discussed earlier in Chapter 3, integrity mean trying to impact and influence an improvement of other people's practices, as such a professional engineer should not only avoid falling in unethical practices individually, but also attempt to prevent misconduct practices done by others (The Royal Academy of Engineering, 2011).

Regarding experiencing any feelings, the students indicated various feelings. Some expressed feeling disappointment "*it is quite disappointing when you face this kind of situation. You can't stop the friend and you can't tell on him either".* Disappointment is a negative feeling that occurs when a negative outcome results from a process rather than a choice and expresses feelings of powerlessness (Rajeev, 2011), and when things go beyond the individual's control. In addition, other students expressed powerlessness "*I felt so bad about the other guy's behaviour, but I couldn't stop them from doing that. As they knew those behaviours were unethical*". This again, underpin the previous notion of feelings of not being able to control the circumstance, and that the students possibly feel

they lack control (Rajeev, 2011) (Zeelenberg et al., 1989). The reflections also support Ajzen's (2002) hypothesis in which self-efficacy and controllability may affect intentions and eventually behaviours. For example, the students' perceptions of the difficulty or ability to perform the behaviour is affected by their own self-efficacy, in addition to whether they believe they do have control over this act (Ajzen, 2002), due to their perceptions of the external uncontrollable factors. Further, some students revealed that they felt sad *"I felt very upset as they got a better mark than me and they didn't spend any time learning. I felt sad and upset because of work and time invested in learning"*. Others, however, indicated that they experienced anger "*anger, sadness, and frustration as being misled with the information required on a piece of work*", which reflect many of the feelings associated with moral behaviours that have been discussed by Hiadt (2003). On the contrary, some students indicated that they felt happy, as they felt this bonded them with the group members more together "*I feel good as it helps us do the co-operative work better*". This reflections, however, may not support Kidder's (1996) propositions in terms of having ethical conflicts between truth versus loyalty or individual versus community paradigms (Mathes, 2004), because if it was some sort of ethical conflict or dilemma the feeling might be different. In other words, the students would express negative feelings. This reaction is an indication of an ethical blind spot and implicit biases, where the students did not recognize their positive perceptions of this person and their in-group favouritism, which can cause discriminations and harm towards the out-group members (Sezer, Gino and Bazerman, 2015). The students explained that due to certain factors they could not whistleblow on their friends. These factors involved maintaining satisfying relationships with the others which hindered ethical acts in this case (Hicks, 1997) "*I didn't want to mess other students up and cause troubles, and certainly I didn't want the teachers to catch them"*. The students emphasised that they were and are aware of their friends' unethical acts, and they were and are aware of the fact that they needed to do something, yet they will only make sure that they will provide them with advice. This was evident in some reflections such as "*Even though I know what he did was wrong, and I am at fault of doing nothing, I would continue in doing the same and just advise him, although it doesn't sound fair*". In addition, other students included more details "*if the friend is a child, I would be a better role model to him and might tell him and educate him*". The reflection introduces two perceptions, ethical growth and being a role model. The first perception suggested seeing their friend who acted unethically as a child, and not ethically matured enough, which support Rest's et al.

(1986) that a morally mature individual is a moral agent who is aware that he or she is a moral agent, and that their increased ethical abilities is what can help them consider their own cognitive processes while they develop. Moreover, the reflections suggest that the reflector perceived the friend at a lower level of ethical maturity (Mazar, Amir and Ariely, 2008). In addition, some aspects of ethical leadership that have been present in the comments, such as having ethical responsibility, effective communications, taking care of people in the team, being able to manage conflict, having skills in decision making, problem solving, and being able to improve and implement this improvement (Zapalska, Jackson and Zelmanowitz, 2016). Other students have also indicated that having ethical knowledge and behaving ethically is a kind of intelligence "*now I am wiser, I have been through many experiences and should and must acquire more knowledge and be wiser before taking any decision*". This buttress Carroll's and Shaw's (2012) notions of ethical maturity, and how it "*suggests quality of engagement in how we respond to the challenges of professional life"*.

In general, most of the members of group 1 reflected on their scenario, which suggests that the students who undertook the ethics intervention see whistleblowing as a challenging ethical issue, and more emphasis on this in the educational interventions could be beneficial. The discussion of this scenario revealed many points that were raised previously in the literature and in Chapter 2. For example, the four ethical dilemma paradigms (Kidder, 1996), and the conflicts between those paradigms that can make whistleblowing a difficult dilemma to solve. The new and interesting patterns that emerged in this scenario was the students' realisations about their own ethical maturity, which also can be indicated as a change in ethical behaviour.

6.7.10 Social desirability observations

When the researcher distributed the reflective interview forms among group 2, many students started asking questions about whether the researcher is from an investigating agency trying to catch students red-handed. The researcher, module leader, and the researcher's supervisor kept assuring students that this assessment is for research purposes and that confidentiality and privacy of the data are assured. Few students, however, decided not to participate, some were still unsure and replied in very short statements and words to the assessment questions, such as being involved in "*illegal streaming",* they had experienced *"no feeling"* when committing the unethical acts, and that *"no one was affected"* by their behaviours. Other students managed to provide rich

reflections and data for the researcher, while several provided reflections, such as "*I HAVE ETHICS I DID NONE OF THESE SHAMEFUL ACTS* [written in capital letters]". Others added that "*piracy is bad*", and when asked about their feelings, some of them replied *"indifferent", "I feel nothing",* and *"I don't care"*, which could be an indication that these students were trying to present themselves in a favourable image. This is done in an attempt to conform to the general societal norms, regardless of their actual or true behaviours, feelings or opinion, by under-reporting their opinions that are undesirable (Randall and Fernandes, 1991) (Randall, Huo and Pawelk, 1993), and social desirability has taken place at that time.

6.8 Summary of the findings

After the written reflections have been coded, different responses of the participants from the two categories were compared for each given case. Their decision-making abilities were evaluated in order to observe any distinct or consistent patterns in their analysis. The different responses also demonstrated the key factors that influenced their ethical judgment and moral reasoning for each scenario. Table 6.12 summarises the findings of Phase II of Study 1.

Categories	Scenarios	Group 1	Group 2
Ethical awareness and judgement	**1**	• Recognised the ethical issues and held ethical judgement	• Recognised the ethical issues and held ethical judgement
Drives		• Cultural acceptance • Peers	• Competitiveness pressures
Ethical sensitivity		• Little moral obligation • Self-regulation	• Moral obligation • Self-regulation
Future intentions		• Ethical future intentions	• Ethical future intentions
Ethical awareness and judgement	**2**	• Some were aware and some were not	-
Drives		• Peers • Lack of awareness	-
Ethical sensitivity		• Some experienced moral obligation • Self-regulation	-
Future intentions		• Demonstrated ethical future intentions	-
Professional skills		• Respecting the engineering professional reputation and image. • Abilities and willing to change	-

Ethical awareness and judgement	**3**	• Recognised the ethical issues and held ethical judgement	-
Drives		• Weak possibilities of being caught	-
Ethical sensitivity		• Moral obligation • Self-regulation and willing to change • Meta-ethical cognition • Ethically more matured	-
Future intentions		• Demonstrated ethical future intentions	-
Ethical awareness and judgement	**4**	-	• Biased judgement towards maximising financial benefits.
Ethical sensitivity		-	• Lacking emotional compassion toward others. • Justified their unethical acts as acceptable
Ethical awareness and judgement	**5**	• Recognised the ethical issues and held ethical judgement	• Some students recognised the ethical issues, some had biased ethical perceptions, and some lacked ethical awareness
Drives		• Fatigue • Stress • Competitiveness	• Fatigue • Stress • Competitiveness • Self-serving biases
Ethical sensitivity		• Moral obligation • Shame • Self-regulation	• A tendency to use justifications

		• Meta-ethical-cognition and feeling of being ethically more matured	
Future intentions		• Ethical intentions	• Contrasting
Professional skills		• Role models actors	• Was not evident
Ethical awareness and judgement	**6**	• Recognised the ethical issues and held ethical judgement	• Recognised the ethical issues but held biased judgement
Drives		• Most people do it • Financial savings	• Availability of piracy websites • Difficulties in accessing these programs through legal ways
Ethical sensitivity		• Little to no moral obligations • Self-regulation • Willing to change • Meta-ethical-cognition and feeling of being ethically more matured	• Emphasis on self-serving justifications that lacked considerations to other parties • Lacking ethical sensitivity
Future intentions		• Ethical future intentions	• No indications for stopping the behaviour
Ethical awareness and judgement	**7**	-	• Recognised ethical issues and showed ethical judgements.
Drives		-	• Stress • Competition
Ethical sensitivity		-	• Moral obligation • Self-regulation

Future intentions		-	• Demonstrated ethical intentions towards the future
Ethical awareness and judgement	**9**	• Recognised the ethical issues and held ethical judgement	-
Reasoning		• Students discussed better options than their actual decisions at that time • Kidder's dilemma conflict was evident • Misconnects about whistleblowing • Biased perceptions and in-group favouritism	-
Emotions experienced		• Disappointment • Powerless • Sadness • Anger	-
Professional skills		• Ethical maturity and intelligence • Being a role model to others	-
Social desirability attitudes		Not evident	Evident

Table 5.12 *Summary of the findings of Phase II of Study 1. The (-) sign indicates blank entities as no participants from the group reflected on the case scenario. Case scenario number 8 was excluded from the table, as no respondents for either groups reported being involved in such activities.*

In the first scenario, both groups' members showed similar degrees of ethical awareness and judgements (Rest et al., 1986). Both groups' members gave different motivations behind committing this act, such as perceptions of cultural norms (Honan et al., 2013) (O'Fallon and Butterfield, 2005) (Haidt and Graham, 2007), peers effect (Gino, 2015) (Moore and Gino, 2013), stress, competitiveness, pressures to be the best, and fatigue (Gaberson, 1997) all leading them to act dishonestly. Both groups' members acknowledged experiencing moral obligation feelings, but these feelings varied in their degrees. However, these varied levels of moral obligation feelings had similar impacts on the students future intentions as they were willing to do good in the future (Kulju et al., 2015) (Trevino, 1986), and demonstrated that they have learned from their mistakes and intend to self-regulate their behaviours (Grinsven and Tillema, 2006).

In the second scenario, only students from group 1 had chosen and reflected on this case. Some of the students indicated that they were aware of the ethical issue and their unethical acts, and some indicated that they were not aware that the behaviour was unethical (Singhapakdi, Vitell and Franke, 1999). The students who were aware of their unethical actions indicated that peers had some influence, and that they were mimicking what is perceived as normal among the peers (Moore and Gino, 2013) (Gino and Galinsky, 2012), therefore, they did not experience any negative emotions. On the other hand, the students who had indicated that they were unaware of their unethical acts indicated experiencing negative feelings due to their moral obligation feelings (Eisenberg, 2000) (Beck and Ajzen, 1991). In both cases, however, students expressed their good and ethical intentions to act ethically in the future by self-regulating their past unethical acts and showed their ethical leadership skills by expressing their willingness to change their behaviour in the future (Rest et al., 1986) (Jones, 1991) (Singhapakdi, Vitell and Franke, 1999). One important theme emerged from the data analysis of this case, that is professional image and reputation (The Royal Academy of Engineering, 2011). These perceptions comply with the RAEng's third set of SEP: Respect for life, law and the public good, where students felt responsible to act honourably, responsibly, lawfully and uphold the reputation and dignity of the engineering profession (The Royal Academy of Engineering, 2011). Moreover, there could be some indications that the students developed some of RAEng's fourth sets of SEP: Responsible leadership, as the students realised and understood that their conduct and designs have impacts on others, and they must be

objective and truthful in any statement they make (The Royal Academy of Engineering, 2011).

In scenario case number 3, few students from group 1 had indicated their engagement in such activities, and they expressed their awareness when conducting this act, and also indicated ethical judgments (Rest et al., 1986). They said that the weak possibilities of being caught encouraged them to conduct this behaviour. They indicated that they experienced moral obligation feelings when committing this act (Rajeev, 2011) (Zeelenberg et al., 1989), and they were young and not ethically matured enough (Pintrich, 2002). The students also added that they are more ethically matured now reflecting their 'meta-ethical-cognition' (Pintrich, 2002), and realising the changes and effects that have impacted their ethical perspectives (Cheruvalath, 2019) (Batha and Carroll, 2007). There is an indication of the intentions and desires of more self-regulated behaviour in the future (Cheruvalath, 2019) (Batha and Carroll, 2007).

Few students from group 2 reflected on scenario case number 4. The students demonstrated biased judgements toward maximising self-serving financial benefits (Kohlberg and Hersh, 1977), and lack of compassion to other potentially affected people (Curran, 2008) (Lewis, Amini and Lannon, 2001). They also justified their behaviours as acceptable (Kohlberg, 1969) (Kohlberg, 1984).

In scenario 5, participants from both groups indicated being involved in this act before, and ethical awareness and judgements varied among the two groups' participants. Students from group 1 indicated their clear ethical awareness and judgement of involvement in this behaviour (Rest et al., 1986) (Kohlberg, 1969). On the other hand, some students from group 2 indicated that they were aware of the ethical implication (Rest et al., 1986) (Kohlberg, 1969). Others showed biased ethical perceptions (Sezer, Gino and Bazerman, 2015), and others lacked ethical awareness (Hunt and Vitell, 1986). Both groups' participants revealed that different factors motivated them to behave in that way, such as fatigue, stress and competitiveness (McCabe et al., 1996). However, one factor emerged among some members of group 2, that is self-serving (Shalvi, Gino and Barkan, 2015), which suggested a lower level of ethical maturity (Kohlberg, 1969) (Kohlberg, 1984). Students from group 1 indicated that they did experience negative feelings, such as shame (Hiadt, 2003) and regret (Rajeev, 2011) (Zeelenberg et al., 1989). Whereas students in group 2 did not experience moral feelings, since some of them felt

that what they have done was not considered wrong, and some indicated that their actions were minor. Lacking moral emotions among group 2 could be related to failing to recognise the ethical components in the issue (Hunt and Vitell, 1986), and the possible effect of the moral intensity of that issue (Jones, 1991). As for the future intentions and willingness to do good, students varied in their perceptions. Students from group 1 indicated that they would not repeat the act (Schwartz, 2016) (Ferrell and Gresham, 1985), they would self-regulate these past unethical acts, and showed self-awareness and were conscious of the change in their own ethical cognition 'meta-ethical-cognition' (Pintrich, 2002). Whereas for group 2 participants, few of them indicated that they will not repeat their past behaviours, others insisted that their act is acceptable because they believed that these acts were minor, which is related to their ethical awareness and recognition of the moral issues (Singhapakdi, Vitell and Franke, 1999) (Treviño, Weaver and Reynolds, 2006). Students from group 1 revealed that they felt they developed their ethical knowledge (Kohlberg, 1969) (Rest et al., 2000), which was not evident among group 2 members. Additionally, some of group 1 members described their current ethical manners as ethically stronger, more sensitive and role model to other engineering students, as they act in more honourable, responsible and lawful ways to uphold the reputations of the engineering profession (The Royal Academy of Engineering, 2011) (Kulju et al., 2015). These implications suggest a difference in ethical maturity levels (Rest et al., 2000), because the students in group two demonstrated more tendencies and desires of wanting to follow regulations, and that their moral obligations are their shared ideals with community accepted practices (Kohlberg, 1969) (Kohlberg, 1984).

In scenario case number 6, few reflections were from group 1, and almost two-thirds of group 2 indicated being involved in this act. Both groups members demonstrated ethical awareness (Rest et al., 1986) , but group 2 participants showed more biased judgements which mainly were based on self-serving justifications (Schwartz, 2016). Both groups' participants concluded that factors, such as socio-cultural attitudes, habits, peer-to-peer internet networks, saving money all can impact ethical perceptions (Cronan and Al-Rafee, 2008). However, group 2 participants expressed more self-serving justifications compared to group 1, which showed they lacked ethical sensitivity (Kulju et al., 2015), and understandings of the social and economic inequalities they can cause (Segal, 2000). Although participants of group 1 expressed little to no moral obligation feelings, they revealed their ethical future intentions of acting ethically (Rest et al., 1986) (Jones, 1991),

while others confirmed that they do not install illegal copies anymore, which suggest self-regulation attitudes (Zhong, Liljenquist and Cain, 2009). Some students form group 1 also highlighted that one reason for behaving unethically was lacking ethical maturity but they are now aware of their new ethical perceptions (Pintrich, 2002). In contrast, students from group 2 expressed various perceptions, but none of them indicated stopping these acts in the future, due to the biased perceptions they held about this act (Sezer, Gino and Bazerman, 2015).

In relation to scenario 7, only a few students from group 2 reported involvement in this act. These students indicated that they were aware of their behaviour and they held ethical judgements towards the act (Rest et al., 1986). The students included some factors that motivated them to commit this act, such as stress and competition (McCabe et al., 1996). The students also mentioned that they did experience moral obligation feelings (Hiadt, 2003) (Eisenberg, 2000), but these feelings did not stop them from accomplishing their self-interests and personal goals, because they were more desirable (Kohlberg, 1969) (Kohlberg, 1984). As for their future intentions, the students specified that they hold ethical intentions for the future (Rest et al., 1986) (Ajzen, 2006), because of the remembrance of how they felt in the past when they acted that way (Beck and Ajzen, 1991). They also implied that they were planning to regulate this behaviour in the future based on what they have learned from their mistakes (Grinsven and Tillema, 2006).

Most group 1 participants reflected on scenario case number 9, while no reflections were seen from group 2. The students generally demonstrated ethical awareness, and some expressed their ethical judgements towards the act (Rest et al., 1986). In this case scenario, the students went through some potential choices and the potential consequences of these choices, to determine which are the ethically sound choices (Rest et al., 1986). However, this case scenario involved several conflicting perspectives from students, where some of them believed that being silent about their friends' behaviours is not ethical (Gino, 2015), others suggested that they cannot do more than advising the friend. Some other students highlighted that they should only focus on their own behaviours, and not try to intervene in other people's business (The Royal Academy of Engineering, 2011). As a result of holding these various perceptions, experiences of various feelings were also expected. Some students indicated experiencing disappointment and powerlessness (Rajeev, 2011), and lacking control (Rajeev, 2011) (Zeelenberg et al., 1989). Further, some students revealed that they felt sad and angry

(Hiadt, 2003), and surprisingly, some students indicated that they felt happy, as they felt this bonded them together with the group members more. Although the students held different and contrasting ethical views, most of them implied that they felt they have matured and developed ethically (Pintrich, 2002), and that having ethical knowledge and behaving ethically is kind of intelligent (Cheruvalath, 2019).

6.9 Limitations and highlights of Phase II Study 1

There are some limitations that are associated with the self-reflective writing interviews, and they appeared in some cases during the data collection stage. For example, some participants might have felt threatened and vulnerable for exposing their own thoughts, reflecting and sharing these reflections. However, the literature noted that it is expected and that not a lot of students will feel comfortable exposing their feelings and behaviours truly and honestly (Srivastava, 2012). Another limitation related to the way many students were seated, especially in the case of many group 2 members, which made the situation similar to the focus group discussions situations, where some dominating members had some influence on changing the perceptions of some other group members (Atesh, Baruah and Ward, 2016) (Atesh, Baruah and Ward, 2017). This effect could have encouraged other students in the group to respond favourably to this dominant group members' ideas or comments (Krueger and Casey, 2015). All of this might have led some of the group participants to conform, at least publicly, to the most popular opinion in the group, as it is considered socially accepted (Acocella, 2012).

Some of the highlights from the case scenarios that have been used in this phase of the study are that it enabled the researcher to find some distinctive ethical development levels and ethical skills. For example, most of group 2 participants selected scenario 6 to reflect on, which is a clear right versus wrong ethical dilemma. On the other hand, most of group 1 participants selected a more complex ethical dilemma to reflect on, in which two right issues were conflicting each other (Dole and Hurych, 2009) (Kidder, 1996). In addition, in the majority of the case scenarios, students from group 1 demonstrated superior and better ethical skills, such as ethical sensitivity, empathy, moral obligation and other professional skills (Batha and Carroll, 2007) (Srivastava, 2012).

To conclude the findings of this phase analysis, all elements of the proposed model were evident in the analysis of this phase, such as:

- The nature of the moral issue, moral intensity and characteristics of the moral issue affects an individual's ethical awareness as presented in Jones's (1991) MIM and Kidder's (1996) four dilemma's paradigms.

- Effects of environmental factors, such as **s**ocial environment (Rest et al., 1986) (Beck and Ajzen, 1991), cultural values (Rest et al., 2000) (Haidt, 2007) (Ferrell and Gresham, 1985), and personal environment (Bommer et al., 1987).

- Individual differences, such as ethical sensitivity skills and ethical maturity that were proposed by (Rest et al., 1986), moral development (Kohlberg, 1969) and the Neo-Kohlbergian (Rest et al., 2000) concepts.

- Blind spots and biases that can affect ethical judgements, such as group favouritism or tendencies to maximise self-serving goals (Chugh, Bazerman and Banaji, 2005), which illustrates Ferrell's and Gresham's (1985) framework's main components of opportunity and rewards/ sanctions. Moral and immoral intentions were also clear in the analysis, where students' judgements were affected by their perceptions of rewards and sanctions, and whether an opportunity arises or not to conduct their intended behaviour (Ferrell and Gresham, 1985). Other factors, such as perceptions of self-efficacy controllability (Ajzen, 2002), moral feelings and obligations also played roles in the students' perceptions of rewards and or sanctions.

- The learning feedback loop and past experience had residual impacts on students' perceptions of rewards and sanctions (Schwartz, 2016).

6.10 Discussion of Study 1

As indicated earlier, this study consists of two phases that were designed to overcome the limitations that emerge from one study design and complement each other. Phase I identified some differences between the two groups of students, one that has been exposed to ethics education intervention and another who did not. These differences were suggestions of the way they perceived rewards and sanctions, in which some members from group 2 (the group who was not exposed to ethics education), demonstrated more tendencies to favour external and materialistic rewards (Kohlberg, 1969) (Kohlberg, 1984). This suggested differences in ethical development and maturity levels (Kohlberg, 1984). Yet, this phase lacked observation and identification of changes in ethical

cognition or behaviour (Mazar, Amir and Ariely, 2008), and whether ethics education developed any change in students' ethical skills, reasoning and the overall way of thinking (Malek, 2010), therefore, Phase II was designed and conducted. The study indicated that Rest's et al. (1986) four stages of ethical decision making was evident during the focus group discussion and the reflective writings in both groups, but this did not necessarily mean that students held ethical judgements and intentions, and/or behaved in ethical manners. The focus group discussion interviews and reflective writings revealed that students bend their ethical judgments and beliefs when their self-serving goals and social motives are strong, which supported Rest's proposals that each of the four processes performs a unique function where an individual who demonstrates considerably at one stage may not necessarily act so in the other stages. This is clear when students illustrated ethical awareness in almost all scenarios but were ready to bend their ethical judgements and intentions when it involved their close friends and or external or internal rewards/motivations (Atesh, Baruah and Ward, 2017). This also confirms Salas's, Milham's and Bowers's (20003) concerns about the weakness of assessing ethical cognition using the learning criteria tools, that is students do not behave in accordance with their knowledge. However, Phase II added more breadth and depth to the findings, by employing and using many ethical concepts from the literature besides Rest's model. Some of these ethical concepts included Kohlberg's (1969) and Rest's et al. (1986) moral development and reasoning concepts, Hiadt's (2003) concepts of moral emotions, Jones's (1991) moral intensity model concepts and the effects of the characteristics of the ethical issues, in addition to Kidder's (1996) concepts of right versus right, right versus wrong and his four ethical paradigms. Izzo (2000) recommended that Kohlberg's (1969) and Rest's et al. (1986) concepts are considered effective and interdisciplinary measures for assessing moral reasoning and development. In addition to following Clarkeburn (2002) highlights that moral awareness, recognising ethical problems and ethical sensitivity can also be assessed using these two ethical concepts. Phase II confirmed some of Phase I's indications on exposing students to ethics education intervention and the differences in ethical development and maturity levels (Kohlberg, 1969). The group who was not exposed to ethics education demonstrated more tendencies towards satisfying their self-serving benefits and needs (Kohlberg and Hersh, 1977), and justified these personal interests as morally right as evidenced in Phase I data, and they lacked emotions as evidenced in Phase II data. In contrast, participants from the group who was exposed to ethics intervention demonstrated tendencies to maintain social rules. Also, doing their

duties, and obeying the rules (Kohlberg, 1969) (Kohlberg, 1984) out of respect for the social system rather than fearing punishment (Rest et al., 2000), which confirms some indication from Phase I findings. The students also demonstrated abilities to analyse their own weaknesses and strengths in reaching their ethical judgments and had awareness of the factors that affected their own ethical judgments. In addition to holding a clearer sense of moral certainty, this has supported and boosted their ethical awareness (Rest et al., 2000), and their ethical leadership and characters, which was present in Phase II. Phase I highlights Brock;s et al. (2008) proposals, that the untrained students approached the given case scenarios from maximizing self-serving goals framework, while those who had undertaken the educational intervention approached the cases from working toward solutions framework. This analysis was based on some responses to one case scenario that was used in Phase I, which is scenario 6. Phase II expanded this suggestion and showed different and better ethical decision-making abilities, better evaluation and judgement skills when responding to the given scenarios among group 1 members. For example, Phase II showed that students who participated in the ethics educational interventions demonstrated higher skills in reasoning and analysing the ambiguity and complexity that were present in the given ethical case problems, particularly in case scenario 9, which involved an ethical dilemma. In addition, Phase I did not indicate the differences in leadership ethical skills and attitudes, among group 1 members. However, Phase II supported Borman's and Motowidlo's (1992) and Podsakoff's et al. (1999) proposals in which skills and attitudes gains were observed after ethics education interventions. These skills included ethical leadership skills, self-regulation skills and willingness to change, which can be related to the scandals and in-depth researches that have been introduced to the students, which might have overridden their doubts (Awasthi, 2008) (Cagle and Baucus, 2006). The self-reflective writing method that was employed in this study also supported Thiel's et al. (2013), Antes's et al. (2012) and Stenmark's, Antes's and Thiel's (2011) notions that employing appropriate emotional and self-regulation are good strategies that can contribute to ethical decision making, and that asking students to reflect on certain ethical issues in depth is one way to test the skills that can help in ethical decision making (Mumford, Steele and Watts, 2015). Furthermore, assessing students' emotional reactions, emotional repair and self-regulation after exposure to unethical case scenarios (Stenmark, Antes and Thiel, 2011) helped to identify the change in the students' ethical perceptions as impacts of emotional reactions and moral obligations. In addition, the method helped in identifying the students'

metacognitive strategies and awareness of ethical violations. It also helped to show the degree of tendencies of using justifications for self-serving purposes, which supported Mayhew's and Murphy's (2009) findings that students who had undertaken ethics educational intervention were less likely, compared to the control group, to lie for more money.

Although Mumford, Steele and Watts (2015) suggested that ethics education programmes may not reduce decision-making biases, social desirability bias emerged among some of group 2 members in the two phases of this study (Randall and Fernandes, 1991). The researcher, however, cannot confirm whether this phenomenon is related to ethics education or a cultural impact. This is mainly believed so because this phenomenon occurred among students from a British culture, which is based on utilitarianism and deontology in modern Western ethics philosophies, whereas for Chinese ethics (Driver, 2014), it is Confucian ethics (Gong, 2010). The Confucian ethics orientation has several distinct values such as a sense of shame, protecting the face, and respect for tradition (Hofstede and Bond, 1988), which make expressing such feelings or beliefs more difficult to reveal. Since the focus of this research is exploring students' ethical perceptions, social desirability was one emerging theme that could affect students' ethical responses, but it is not the focus of this research. However, it is an interesting observation worth exploring in the future.

6.11 Connecting findings to the new integrative model proposed

The findings of this study support and highlight the elements of the "The New Integrative Model for Evaluating Ethics Education", that was discussed and illustrated in Chapter 3 subsection 3.6 Figure 3.2. The model started by stating that the environment has effects on individuals' ethical perceptions, and in both phases of this study there were several examples of this effect. For example, in Phase I, there was evidence that factors, such as the existence of codes of ethics, rewards and sanctions can positively affect ethical behaviour (Ford and Richardson, 1994), besides other factors such as peers effects (Hicks, 1997). In addition to individual differences in moral development (Kohlberg, 1969), the more ethically developed students sought to fulfil internal rewards and followed laws out of respect, while students with lower ethical maturity levels sough fulfilling self-serving goals. In addition, the effect of Jones's (1991) MIM was also evident in Phase I, where each ethical scenario affected students differently. Rest's et al. (1986) FCM was also evident in the analysis, in which the students indicated their awareness, judgement and

intentions in all the given scenarios. Phase II expanded the previous findings and confirmed them, and there was much evidence from the students' comments that supported the effect of culture in perceiving ethical issues and how to deal with them (Haidt and Graham, 2007). Other individual differences, such as work experience (You, 2014), education and cognitive moral development levels (Kohlberg, 1969) (Trevino, 1986) (Rest et al., 2000), blind spots and intentionally bending ethical rules, either to serve own group or to serve themselves are also among the key factors affecting ethical decisions (Chugh, Bazerman and Banaji, 2005). Moreover, factors such as the influence of Jones's (1991) MIM and Kidder's (1996) four ethical dilemma paradigms and conflicts between truth versus loyalty or individual versus community paradigms were also evident in the analysis (Mathes, 2004). In accordance to these factors, the students reacted to the given ethical issues showing different skills, where students with lower ethical skills showed more tendencies to satisfy their own needs and personal desires (Kohlberg and Hersh, 1977), and obey laws out of fear of punishment (Kohlberg, 1969). In addition, they lacked emotional skills and justified their personal interests as morally right by appealing to personal benefits and the benefits of those who are close to them (Trevino, 1986). Meanwhile, in the higher ethical development levels, students demonstrated tendencies to maintain social rules, doing their duties, and obeying authority out of respect for the social system rather than fearing punishment (Kohlberg, 1969) (Rest et al., 2000). Students at higher levels also demonstrated superior skills in reflecting on their past unethical behaviours, reflecting on their own ethical judgment and regulate them as needed (Gauthier, 2013). Moreover, Rest's FCM stages were evident in the cases where some students failed to interpret some ethical situations which resulted in students' judging the same scenarios differently and demonstrating different levels of ethical sensitivity to the welfare and needs of others (Rest et al., 1986).

6.12 Chapter summary

This chapter has presented the findings of two phases of Study 1. Phase I aimed at exploring differences among two groups of engineering students in terms of their ethical perceptions, and the factor that may affect their ethical decisions. In this phase, the two groups were from the Electronic Engineering Department of the UoY. Group 1 included engineering students studying Engineering Management Masters programme, who were exposed to ethics education intervention, while group 2 included second-year undergraduate students. Phase II aimed at identifying the ethical skills that can affect

students' ethical decisions and differences between the two groups of students from two different universities. The first group was a group exposed to engineering ethics educational intervention, and the second group was a group not exposed to ethics intervention. Group 1 included engineering students studying Engineering Management Masters programme at the Electronic Engineering Department of the UoY. Group 2 included engineering students at different study levels from the Electronic Engineering Department of the UoY and the Mechanical Engineering Department of CU.

The objectives of this study were achieved through data collection and analysis using qualitative data gathered from focus group discussion interviews that were held with a diverse sample of engineering students studying at the UoY, Department of Electronic Engineering. In addition, qualitative data were gathered from self-reflective writing assessments that were distributed to engineering students studying at the UoY, Electronic Engineering Department, and at CU, Mechanical Engineering Department. The findings from these two qualitative analyses identified no difference among students in terms of ethical awareness and judgment, however, the two groups differed in their ethical maturity levels and the ethical skills that are attributed to these different developmental levels. After discussing some of the key findings from both phases, these results were triangulated and merged to form the overall results of Study 1.

In the next chapter, Study 2 analysis results and findings will be discussed, which is set out to explore the students' ratings of the level of importance and their ratings of the level of development of the RAEng's SEPs.

Chapter 6 Study 2 Analysis Results and Findings

7.1 Chapter overview

This chapter discusses the analysis of Study 2. The analysis discusses whether some of the relationships proposed in the second framework, which was discussed in Chapter 3 and presented in Chapter 4, can be quantitatively and qualitatively validated. This chapter aims at answering the second research sub-question using the RAEng's SEPs framework, which will then contribute to answering the main research question and the validation of the new conceptual model. The RAEng's SEPs model seeks to explore engineering students' perceptions of the level of importance and the level of their development in these sets of ethical skills. The study findings can then provide more insights and validation to the proposed new conceptual model's many facets, such as the effect of demographics, individual differences and educational institutions' micro-ethics on the students' ethical perceptions. The findings of Study 2 were initially based on the statistical analysis of a survey instrument, then semi-structured interviews were used to complement the findings and to provide a broader picture of the emerged relationships from these two phases. The progression and structure of this chapter are shown in Figure 7.1.

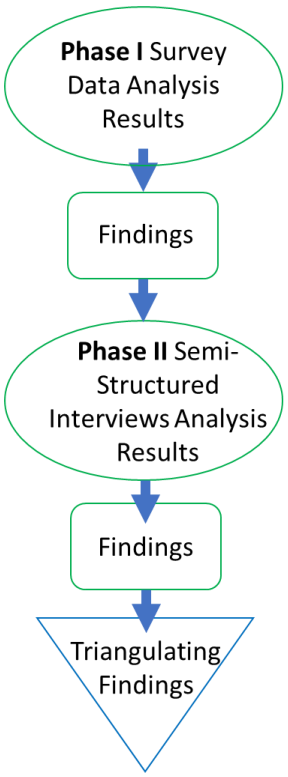


Figure 6.1 *Chapter 7 structure (Study 2 analysis results)*

The chapter starts with a discussion of phase I of study 2, which is the results and findings of the survey instrument and factor analysis. This is followed by a discussion of the phase II results, that is the semi-structured interviews, and the findings of this phase. After that, the findings of both phases were triangulated to form a complete picture of the overall findings of study 2.

7.2 Phase I survey instrument

In this phase of Study 2, the researcher used the survey she constructed to explore the student's ethical perceptions. Table 7.1 demonstrates Phase I of Study 2's sample characteristics.

Groups	Valid	Frequency	Missing	Response Rate
Gender	**Male**	189	3 1.1 %	70.0 %
	Female	74		27.4 %
	Other	4		1.5 %
	Total	267		98.9 %
Nationality	**UK**	96	1 .4 %	35.6 %
	China	103		38.1 %
	South Asia	10		3.7 %
	Europe	14		5.2 %
	East Asia	9		3.3 %
	Africa	2		.7 %
	Middle East	16		5.9 %
	North America & Canada	1		.4 %
	South America	1		.4 %
	Other	17		6.3 %
	Total	269		99.6 %
Working Experience	**Yes**	146	65 24.1 %	54.1 %
	No	59		21.9 %
	Total	205		75.9 %
If ethics workshop taken	**Yes**	111	24 8.9 %	41.1 %
	No	115		42.6 %
	I don't remember	20		7.4 %

	Total	246		91.1 %
Educational Institute	**University of York (UoY)**	200		74.1 %
	Coventry University (CU)	70	-	25.9 %
	Total	270		100 %

Table 6.1 *Phase I of Study 2 sample characteristics and response rate*

The questionnaires were administered both electronically using the internet and given by hand to each participant and collected afterwards (Saunders, Lewis and Thornhill, 2009.p.360). The web-based surveys were distributed using user-friendly software (Greenlaw and Brown-Welty, 2009) (Qualtrics), and paper-based surveys were used to collect the rest of the data by hand. During the 2016/17 and 2017/18 academic years, the researcher administered a survey questionnaire to students enrolled in the Electronic Engineering Department at the UoY. The same questionnaire was administered to students enrolled in the Mechanical Engineering Department of CU in spring term 2018. Table 7.1 illustrates the sample characteristics of Phase I of the study and the response rate for each comparison study.

The survey was conducted at the UoY by inviting participants to complete either an online or a paper survey while the survey was conducted at CU using an online survey uploaded on the department's internal website. The survey design aims to collect data and information from a representative sample of engineering students in the U.K. Based on this notion, the researcher's initial aim was to collect data from multiple engineering schools in different institutions around the U.K to establish a large-scale dataset. The reason for wanting to collect data from multiple educational institutions is the fact that many studies focus on the ethical perceptions of students in a single educational institution, which researchers from educational backgrounds find acceptable (Cohen, Manion and Morrison, 2013). On the other hand, collecting data from multiple educational institutions is considered better (Rodzalan and Saat, 2016), in terms of presenting the targeted population as well as generalising and validating findings (Coolican and Coolican, 2014) (Noble and Smith, 2015). However, this aim could not be

achieved due to time limitations of the PhD project, and the difficulty of one researcher undertaking the task alone.

Data were collected in a three-part survey consisting of 78 items. It was developed and distributed through the Electronic Engineering Department as a paper-based survey and online through Qualtrics at the UoY, and through the internal website of CU for CU students. Completing the survey took approximately 10-15 minutes, and Appendix 7 shows the survey that was given to students.

7.3 Analysis results

A total of 321 participants participated in the survey. The responses of 51 participants were excluded because they only completed the demographic section and left the other parts of the survey incomplete. The remaining sample of 270 students consisted of 200 from the UoY and 70 participants from CU. Before conducting any test analysis, missing data were checked to know if the missing data type is MCAR (Missing Completely At Random) type or not. An analysis for Little's MCAR test was executed, and the results suggested that the data were not missing completely at random, since the Sig. value= .000 (> .005). According to the literature that was discussed earlier in subsection 5.9.2.1, it is not safe to exclude cases listwise, because a large part of the original sample will be excluded (Soley-Bori, 2013), and this can severely limit the sample size (Pallant, 2013). Moreover, imputation is not a good option as well, because it will provide complete data sets that have not been genuinely provided by participants but provided by SPSS (Bannon, 2014). Thus, *Available-case analysis (Pairwise deletion)* choice is undertaken. This is mainly based on the researcher's belief that imputing missing data while testing ethical perceptions is not appropriate because testing procedures seek patterns in the actual responses, and if there are missing values which need to be imputed with a degree of error, then the item variables and the scale properties will be based on inaccurate data.

7.3.1 Independent t-test

The data were analysed using SPSS 25 software package, and since two groups are compared in the first five studies. The test used for the first five studies is independent t-test. The data for almost all items were negatively skewed, but since the sample size in all the study cases are > 50, then normality is assumed for all studies and no normality test will be needed (Allen, Bennett and Heritage, 2014).

7.3.1.1 Effect of gender

In the first comparison test, the relationship between gender and perceived importance and development are tested, the mean scores are compared in this test for two groups, male respondents (N)=189 and females (N)=74. The results of each hypothesis are demonstrated below:

H1.1: There is a significant difference between female and male students in the perceived level of importance of accuracy and rigour at the UoY and CU.

No significant difference was found.

H1.2: There is a significant difference between female and male students in the perceived level of importance of honesty and integrity at the UoY and CU.

No significant difference was found.

H1.3: There is a significant difference between female and male students in the perceived level of importance of respect for life, law and the public good at the UoY and CU.

No significant difference was found.

H1.4: There is a significant difference between female and male students in the perceived level of importance of responsible leadership: listening and informing at the UoY and CU.

No significant difference was found.

HO1.1: There is no significant difference between female and male students in the perceived level of development of accuracy and rigour at the UoY and CU.

No significant difference was found.

HO1.2: There is no significant difference between female and male students in the perceived level of development of honesty and integrity at the UoY and CU.

No significant difference was found.

HO1.3: There is no significant difference between female and male students in the perceived level of development of respect for life, law and the public good at the UoY and CU.

No significant difference was found.

HO1.4: There is no significant difference between female and male students in the perceived level of development of responsible leadership: listening and informing at the UoY and CU.

No significant difference was found.

The findings of this study that sought to compare two gender groups indicated that there was no significant difference in any of the four sets of ethical principles, and for the two measures of importance and development with their 36 statement items. Little differences in response patterns have been noticed between the two groups. Male students rated Honesty and Integrity set as most important, while female students rated Respect for life, law and the public good set as most important to the engineering profession. Both groups rated Responsible Leadership: listening and informing set as the least important compared to the other statement sets. This indicates that both groups shared similar perceptions about the importance of Responsible Leadership: listening and informing as the least important set of skills to the engineering profession. As for rating the development part, there was no statistically significant difference observed among the perceived ethical skills that have been developed among female and male students. Little differences in response patterns have been noticed between the two groups in terms of the perceived development of ethical skills. Male students differed in rating Accuracy and Rigour as being the least developed set compared to the other ethics sets, and rated their development in Respect for life, law and the public good as their most developed. The female group, on the other hand, perceived their development in Responsible leadership: listening and informing as least, but their development in Honesty and Integrity as the most developed during their study time on the programme.

7.3.1.2 Effect of culture

In the second comparison test, the relationship between different cultures and perceived importance and development are tested. The mean scores are compared in this test for two groups, British students and Chinese students. British students (N) =96, and Chinese Students (N) =103. The results of each hypothesis are demonstrated below:

H2.1: There is a significant difference between British and Chinese engineering students in the perceived level of importance of accuracy and rigour at the UoY and CU.

No significant difference was found.

H2.2: There is a significant difference between British and Chinese engineering students in the perceived level of importance of honesty and integrity at the UoY and CU.

An independent sample t-test was conducted to compare the perceptions of the Importance of Honesty and Integrity scores for British students and Chinese students. There is a significant difference in the scores for the British students (M=4.4344, SD=0.60015) and for the Chinese students (M=4.2559, SD=0.49337; t (197) =2.298, p=0.023, two-tailed). The magnitude of the differences in the means (mean difference=0.17844, 95% CI: 0.02528 to 0.33160) indicate a small effect size (d= 0.325).

H2.3: There is a significant difference between British and Chinese engineering students in the perceived level of importance of respect for life, law and the public good at the UoY and CU.

No significant difference was found.

H2.4: There is a significant difference between British and Chinese engineering students in the perceived level of importance of responsible leadership: listening and informing at the UoY and CU.

No significant difference was found.

HO2.1: There is no significant difference between British and Chinese engineering students in the perceived level of development of accuracy and rigour at the UoY and CU.

No significant difference was found.

HO2.2: There is no significant difference between British and Chinese engineering students in the perceived level of development of honesty and integrity at the UoY and CU.

No significant difference was found.

HO2.3: There is no significant difference between British and Chinese engineering students in the perceived level of development of respect for life, law and the public good at the UoY and CU.

No significant difference was found.

HO2.4: There is no significant difference between British and Chinese engineering students in the perceived level of development of responsible leadership: listening and informing at the UoY and CU.

No significant difference was found.

The findings of this study that sought to compare two culturally different groups indicated that there was one significant difference in perceiving the Importance of Honesty and Integrity where the British students rated this set of ethical principles higher than Chinese students. Little differences in response patterns have been noticed between the two groups. British students rated Honesty and Integrity as the most important set of ethical principles to the engineering profession, while the Chinese students rated Respect for life, law and public good set as the most important set of ethical principles to the engineering profession. However, both groups rated Responsible Leadership: listening and informing as the least important set to the engineering profession compared to the other sets of ethical principles. For the development part, British students rated their development in Accuracy and Rigour as their most, while the Chinese students rated their development in Respect for life, law and the public good as their most. Both groups rated Responsible leadership: listening and informing set as their least developed skills during their study time on the programme.

7.3.1.3 Effect of work experience

In the third comparison test, the relationship between work experience and perceived importance and development are tested, the mean scores are compared in this test for two groups, students who have work experience and students who do not. Students with work experience (N)=146 and those who do not (N)=59. The results of each hypothesis are demonstrated below:

H3.1: There is a significant difference between students with work experience and students with no work experience in the perceived level of importance of accuracy and rigour at the UoY and CU.

No significant difference was found.

H3.2: There is a significant difference between students with work experience and students with no work experience in the perceived level of importance of honesty and integrity at the UoY and CU.

No significant difference was found.

H3.3: There is a significant difference between students with work experience and students with no work experience in the perceived level of importance of respect for life, law and the public good at the UoY and CU.

No significant difference was found.

H3.4: There is a significant difference between students with work experience and students with no work experience in the perceived level of importance of responsible leadership: listening and informing at the UoY and CU.

No significant difference was found.

HO3.1: There is no significant difference between students with work experience and students with no work experience in the perceived level of development of accuracy and rigour at the UoY and CU.

An independent sample t-test was conducted to compare perceptions of Development of Accuracy and Rigour scores for students who have work experience and students who do not. There is a significant difference in scores for students with work experience (M=4.1217, SD=0. .63493) and for the students who do not (M=4.4031, SD=0.48402; t (109.910) = -3.146, p=0.002, two-tailed). The magnitude of the differences in the means (mean difference= -0.28145, 95% CI: -0.45877 to -0.10413) indicate a medium effect size (d= 0.4984).

HO3.2: There is no significant difference between students with work experience and students with no work experience in the perceived level of development of honesty and integrity at the UoY and CU.

An independent sample t-test was conducted to compare perceptions of Development of Honesty and Integrity scores for students who have working experience and students who do not. There is a significant difference in scores for students with work experience (M=4.2111, SD=0.70212) and for the students who do not (M=4.4089, SD=0.47445; t (118.765) = -2.104, p=.037, two-tailed). The magnitude of the differences in the means (mean difference= -0.19783, 95% CI: -0.38397 to -0.01168) indicate a small effect size (d= 0.3301).

HO3.3: There is no significant difference between students with work experience and students with no work experience in the perceived level of development of respect for life, law and the public good at the UoY and CU.

An independent sample t-test was conducted to compare perceptions of Development of Respect for life, law and the public good scores for students who have work experience and students who do not. There is a significant difference in scores for students with work experience (M=4.2002, SD=0.67815) and for the students who do not (M=4.4400, SD=0.56381; t (169) = -2.140, p=0.034, two-tailed). The magnitude of the differences in the means (mean difference= -0.23973, 95% CI: -0.46090 to -0.01856) indicate a small effect size (d= 0.3845).

HO3.4: There is no significant difference between students with work experience and students with no work experience in the perceived level of development of responsible leadership: listening and informing at the UoY and CU.

No significant difference was found.

The findings of this study that sought to compare two groups of students, one with work experience and the other with no work experience, indicated that there were three significant differences. The group that had no work experiences rated their development in Accuracy and Rigour, Honesty and Integrity and Respect for life, law and the public good higher compared to the group with work experience. Little differences were observed in the response patterns between the two groups. Students who had work experience rated Honesty and Integrity as the most important set of ethical principles to the engineering profession, while the group of no work experience rated Respect for life, law and public good as the most important set to the engineering profession. Both groups rated Responsible Leadership: listening and informing as the least important set to the engineering profession compared to the other sets of ethical principles. For the development set, beside the significantly different ratings, the group who had work experience rated their development in Honesty and Integrity as their most developed, and their development in Accuracy and Rigour as their least developed. The group with no work experience rated their development in Respect for life, law and the public good skills as their most developed, and Responsible leadership: listening and informing as their least developed, during their study time on the programme.

7.3.1.4 Effect of ethics education

In the fourth comparison test, the relationship between ethics education and perceived importance and development were tested. The mean scores are compared in this test for two groups, students who had ethics education and students who did not have prior ethics education. Students who had previous ethics education (N)=111 and those who had not (N)=115. The results of each hypothesis are demonstrated below:

H4.1: There is a significant difference between students who had ethics education previously and students who had not have previous ethics education in the perceived level of importance of accuracy and rigour at the UoY and CU.

No significant difference was found.

H4.2: There is a significant difference between students who had ethics education previously and students who had not have previous ethics education in the perceived level of importance of honesty and integrity at the UoY and CU.

No significant difference was found.

H4.3: There is a significant difference between students who had ethics education previously and students who had not have previous ethics education in the perceived level of importance of respect for life, law and the public good at the UoY and CU.

No significant difference was found.

H4.4: There is a significant difference between students who had ethics education previously and students who had not have previous ethics education in the perceived level of importance of responsible leadership at the UoY and CU.

No significant difference was found.

HO4.1: There is no significant difference between students who had ethics education previously and students who had not have previous ethics education in the perceived level of development of accuracy and rigour at the UoY and CU.

No significant difference was found.

HO4.2: There is no significant difference between students who had ethics education previously and students who had not have previous ethics education in the perceived level of development of honesty and integrity at the UoY and CU.

No significant difference was found.

HO4.3: There is no significant difference between students who had ethics education previously and students who had not have previous ethics education in the perceived level of development of respect for life, law and the public good at the UoY and CU.

No significant difference was found.

HO4.4: There is no significant difference between students who had ethics education previously and students who had not have previous ethics education in the perceived level of development of responsible leadership at the UoY and CU.

No significant difference was found.

The findings of this study that sought to compare two groups, one who had ethics education and another who did not, indicated that there was no significant difference in any of the four sets of ethical principles, and for the two measures of importance and development with their 36 statement items. Little differences in response patterns have been noticed between the two groups. Students who had previously had ethics education rated Respect for life, law and public good as the most important set, while the other group rated Honesty and Integrity as the most important set to the engineering profession. Yet, both groups, rated Responsible leadership: listening and informing as the least important set of ethical principles to the profession compared to the other sets of ethical principles. For the development part, both groups agreed that their most developed skills were in Respect for life, law and the public good set of skills. The group who had previously had ethics education rated their development in Responsible leadership: listening and informing skills as their least, and the other group rated their development in Accuracy and Rigour as their least during their study time on the programme.

7.3.1.5 Effects of micro-ethics

In the fifth comparison test, the relationship between cross-institutions and perceived importance and development are tested, the mean scores are compared in this test for two groups, group one from the UoY and group two from CU. Both groups were made up of undergraduates at different levels of study. The total number of students from the UoY (N)=49, and the total number of students from CU (N)=70. The results of each hypothesis are demonstrated below:

H5.1: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of importance of accuracy and rigour at the UoY and CU.

An independent sample t-test was conducted to compare perceptions of the importance of accuracy and rigour for students from the University of York and students from Coventry University. There is significant difference in the scores of the students from York (M=4.2143, SD=0.49012) and the students from Coventry (M=4.4325, SD=0.46996; t (117) = -2.449, p=0.016, two-tailed). The magnitude of the differences in the means (mean difference= -0.21820, 95% CI: -0.39465 to -0.04175) indicate a small effect size (d= 0.4544).

H5.2: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of importance of honesty and integrity at the UoY and CU.

An independent sample t-test was conducted to compare perceptions of the Importance of Honesty and Integrity for students from the University of York and students from Coventry University. There was significant difference in scores for students from York (M=4.3122, SD=0.61327) and students from Coventry (M=4.5771, SD=0.50739; t (117) = -2.570, p=0.011, two-tailed). The magnitude of the difference in the means (mean difference= -0.26490, 95% CI: -0.46899 to -0.06080) indicate a small effect size (d= 0.4706).

H5.3: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of importance of respect for life, law and the public good at the UoY and CU.

No significant difference was found.

H5.4: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of importance of responsible leadership: listening and informing at the UoY and CU.

An independent sample t-test was conducted to compare perceptions of the importance of Responsible Leadership: listening and informing for students from the University of York and students from Coventry University. There was significant difference in scores for students from York (M=3.9918, SD=0.64286) and for students from Coventry

(M=4.4647, SD=0.58380; t (115) = - 4.143, p=0.000, two-tailed). The magnitude of the mean differences in the means (mean difference= -0.47287, 95% CI: -0.69897 to -0.24677) indicate a medium effect size (d= 0.7701).

H6.1: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of development of accuracy and rigour at the UoY and CU.

An independent sample t-test was conducted to compare perceptions of the development of accuracy and rigour for students from the University of York and students from Coventry University. There was significant difference in scores for students from York (M=4.1673, SD=0.61639) and students from Coventry (M=4.4339, SD=0.59542; t (96) = -2.097, p=0.039, two-tailed). The magnitude of the differences in the means (mean difference= -0.26660, 95% CI: -0.51891 to -0.01429) indicate a small effect size (d= 0.4399).

H6.2: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of development of honesty and integrity at the UoY and CU.

An independent sample t-test was conducted to compare perceptions of Development of Honesty and Integrity for students from the University of York and Coventry University. There was significant difference in scores for students from York (M=4.0635, SD=0.78223) and for students from Coventry (M=4.4743, SD=0.58614; t (91) = -2.881, p=0.005, two-tailed). The magnitude of the differences in the means (mean difference= -0.41084, 95% CI: -0.69408 to -0.12760) indicate a medium effect size (d= 0.5946).

H6.3: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of development of respect for life, law and the public good at the UoY and CU.

An independent sample t-test was conducted to compare perceptions of the Development of Respect for life, law and the public good for students from the University of York and students from Coventry University. There was significant difference in scores for students from York (M=4.0367, SD=0.85317) and students from Coventry (M=4.5131, SD=0.58274; t (53.318) = -2.918, p=0.005, two-tailed). The magnitude of the differences

in the means (mean difference= -.47640, 95% CI: -0.80380 to -0.14900) indicate a medium effect size (d= 0.6521).

H6.4: There is a significant difference between Engineering students from the UoY and Engineering students from CU in the perceived level of development of responsible leadership: listening and informing at the UoY and CU.

An independent sample t-test was conducted to compare perceptions of Development of Responsible Leadership: listening and informing for students from the University of York and students from Coventry University. There was significant difference in scores for students from York (M=4.0171, SD=0.75673) and students from Coventry (M=4.4898, SD=0.60705; t (92) = -3.325, p=0.0010, two-tailed). The magnitude of the differences in the means (mean difference= -0.47269, 95% CI: -0.75503 to -0.19035) indicate a large effect size (d= 0.9891).

The findings of this study that sought to compare two groups of students, one from the UoY and the other from CU, indicated that there were multiple significant differences. The group from Coventry rated the importance of Accuracy and Rigour, Honesty and Integrity, Responsible Leadership: listening and informing, and all the development sets of ethical principles higher than the group from York. In addition, there were some little differences in response patterns that have been noticed between the two groups. For example, students from York rated Respect for life, law and public good as the most important set of principles, and the Responsible Leadership as the lowest in importance to the engineering profession. The group from Coventry rated Honesty and Integrity as the most important, and Accuracy and Rigour as the least important set of ethical principles to the engineering profession. For the development part, York's group rated Accuracy and Rigour as their most developed set of skills, and their development in Responsible Leadership as their least. On the other hand, Coventry's group rated Respect for life, law and the public good set as their most developed, and Accuracy and Rigour as their least developed ethical skills during their study time on the programme.

7.3.2 Discussion of the results

As shown in Table 7.2, most of the ratings of the four scales in both measures of importance and developments were in the range of '4' as 'Important' for the first measure, and 'Agree' for the second.

Ethical Principle	Male vs Female	British vs Chinese	Work vs no work experience	Had Ethics education vs Had not	York students vs Coventry students
Importance of Accuracy and Rigour	4.2807 4.2610	4.2961 4.2212	4.2772 4.3054	4.2591 4.3283	4.2143 4.4325
Importance of Honesty and Integrity	4.3859 4.3324	4.4344 4.2559	4.4012 4.4153	4.3487 4.4463	4.3122 4.5771
Importance of Respect for life, law and the public good	4.3587 4.4147	4.4167 4.3426	4.3815 4.4165	4.3700 4.4220	4.3309 4.5224
Importance of Responsible Leadership: listening and informing	4.2257 4.1616	4.1937 4.1510	4.2224 4.2136	4.1872 4.2807	3.9918 4.4647
Development of Accuracy and Rigour	4.2321 4.2084	4.2229 4.2022	4.1217 4.4031	4.2430 4.2299	4.1673 4.4339
Development of Honesty and Integrity	4.2522 4.3284	4.1949 4.3287	4.2111 4.4089	4.3394 4.2596	4.0635 4.4743
Development of Respect for life, law and the public good	4.2749 4.2904	4.2169 4.3474	4.2002 4.4400	4.3629 4.2750	4.0367 4.5131
Development of Responsible leadership: listening and informing	4.2445 4.1592	4.1877 4.1864	4.1458 4.3391	4.2089 4.2674	4.0171 4.4898

Table 6.2 *Comparisons of group means and statistical significance. The highlighted values indicate statistically significant differences, and in the case of this thesis, significant differences were found among: British and Chinese students in perceiving the level of importance of Honesty & Integrity, students with and without work experiences in perceiving the level of development of Accuracy & Rigour, Honesty & Integrity and Respect for life, law and the public good, and students from UoY and CU in perceiving the level of importance and level of development in almost all RAEng's SEPs.*

In terms of gender differences, the researcher predicted in Chapter 4 that there would be statistically significant differences between female and male students' perceptions of the level of importance and the level of development of the four sets of ethical skills, but no significant differences were observed.

Differences were expected as Gilligan (1977) proposed that females tend to frame issues as being related to care, for instance, the set of Respect for life, law and the public good in this case. Meanwhile, males tend to frame issues as problems that involve justice, fairness, and rights, for example, the sets of Accuracy and Rigour and Honesty and Integrity in this case. Thus, the results are consistent with Posner (2012) and Grosch and Rau (2017), who indicated that no significant differences were found between genders' integrity levels. Furthermore, the results of perceiving the importance of Responsible Leadership: listening and informing conflicts (Jensen, 2017) indications that differences in perceiving leadership were expected among gender groups. This is because of the assumption that males possess stronger motivations for power than females, where power is inherently bonded to leadership (Yukl, 2013) (Schuh et al., 2014). Nonetheless, the results support Posner's (2012) conclusions, where no significant differences were found between genders on leadership.

In terms of the level of development, as hypothesised in chapter 4, no statistically significant differences were found among the two groups. Thus, both groups perceive the importance of the sets of ethical principles and their development in similar ways.

In the second exploration study, only one statically significant difference was observed in terms of perceiving the importance of Honesty and Integrity. A possible reason for this is that most of the British students' population in this study were undergraduates, which means that they have spent longer times at the university and were more familiar with the universities' academic misconduct and integrity regulations. On the other hand, the Chinese students were mainly MSc students, who came from China to study one-year MSc programmes, meaning shorter periods of time had been spent at the university, and consequently they had limited exposure to the academic misconduct and integrity rules. Thus, British students showed higher rating levels. This result partially supports O'Fallon's and Butterfield's (2005) propositions that nationality can influence ethical perceptions, but it is not clear to what extent. There are notions that practices, traditions and norms among societies, and the different understandings of ethics across societies are

different among people's epistemologies (Honan et al., 2013), therefore such differences suffice. Interestingly, no other significant differences were found, especially in relation to how different cultural effects were expected to influence students (Hofstede and Bond, 1988), such as the Confucius effect. Another observation was made in relation to a point that was discussed earlier in subsection 5.10, that is Wang's et al. (2008) and Bennett's (1977) indications about Asian participants' tendencies to choose neutral and middle point options, which was not observed in this study, as demonstrated in Table 7.2.

Differences were expected, especially in the sets for perceiving the importance of Respect for life, law and the public good and the importance of Responsible Leadership: listening and informing. Hofstede's four cultural dimensions of power distance, individualism, masculinity, and uncertainty avoidance were expected to have impacts on the students' ratings, where they have rated the items lower than the British students, yet no significant differences were found (McSweeney, 2002). However, both groups perceive the level of importance similarly. As for rating the level of development, and as hypothesised in chapter 4, no statistically significant differences were found among the two groups. Thus, both groups perceive the importance of the sets of ethical principles and their development in similar ways

The third study indicated that there were three significant differences. The group that had no work experience rated their development in Accuracy and Rigour, Honesty and Integrity and Respect for life, law and the public good higher compared to the group with work experience. Although the researcher hypothesised that she might find significant differences in the perceived level of importance among the two groups, there were no significant differences. Therefore, a reason for not seeing any differences is that both groups perceived the four sets of ethical principles in similar ways. Thus, these study results support Barnett's and Valentine's (2004) and Schepers's (2003) conclusions that no statistically significant effect was found as a result of the impact of work experience on ethical perceptions. This indicates that both groups perceive these ethical principles as being important to the engineering profession. However, some interesting results were observed in relation to the students' perceptions of their level of development. The students who had no work experience rated most of the development sets higher than the other group, which indicate that the group with no prior work experience increased their ethical knowledge due to the educational programme they were enrolled in. This suggests that the students felt that they had developed their ethical skills during their study time in

the university, and also indicate that they might be satisfied with the educational services provided to them (Avci, 2017). Moreover, work experiences could have influenced the group with work experience and their ethical perceptions (Stevens, 1984), by developing their ethical skills in the workplace which could be the reason for them not noticing much development from their university experience. In other words, this support You's (2014) implications that ethical sensitivity was positively increased when students were exposed to some internship work experiences.

Although the researcher has hypothesised that students who had previously had ethics education would rate the importance of the ethical principles higher than students who did not, the findings of this study indicated that there was no significant difference in any of the four main principles and their 36 statement items. One reason for these results became apparent during conversations with participants after completing the survey. They highlighted that the ethics education they had received was in the form of brief discussions on the importance of and procedures of obtaining ethical approvals from the ethics committees to continue doing their projects. Moreover, some students expressed that they could not remember whether they had taken courses on ethics before (Ruspini, 2002), so they preferred to state that they did rather than stating clearly that they do not remember or leaving the answer box blank, which indicates to social desirability biases (Randall, Huo and Pawelk, 1993). The insignificant findings of this study support Craft's (2013), Borkowski's and Ugras's (1992) and Davis's and Welton's (1991) findings, that ethics education have neutral results. In addition, the results of the students' ratings of the level of development were not significant as well, which is consistent with the stated hypothesis in chapter 4. This could be related to the individual differences of the students.

The last exploration study indicated several statistical differences between the two groups, and this might be due to several reasons. For instance, York's participants' population included 15 females, while Coventry's population included only 2 females. A mixed gender population may have resulted in different overall perspectives results compared to single-gender perceptions (Gilligan, 1977). Another possible reason for such a significant difference is differences in academic sub-disciplines (Rodzalan and Saat, 2016) (Herkert, 2005). As these differences are expected between different sub-disciplines due to the different work, nature and motivation, they might make different impacts on the student's ethical perceptions. Additionally, the nature of the engineering departments' professional codes of ethics, and the extent and ways ethics is taught can

also impact the students' ethical perceptions differently on an organisational and individual levels (Mumford, Steele and Watts, 2015) (Carter et al., 2016). In addition, there is the possibility of the social desirability effect as many of the students were asked to complete an online version of the survey, which their lecturers uploaded on the internal website of the university. This might have caused the students to worry about the level of anonymity of their responses, and made them think that their answers could be traced down and detected, so, students might have been motivated to overrate the survey items (Kaminska and Foulsham, 2013). Furthermore, the mode of data collection might be another factor that impacted the results. At the UoY, 17 students completed the survey online, and the rest completed a paper-based version of the survey (Manfreda et al., 2008). In the case of CU, all respondents completed an online version of the survey, which may have influenced the findings of the study, since each survey mode may require different skills in terms of reading, following directions, and recognizing keys and numbers (Tourangeau, Rips and Rasinski, 2000.p.308). As for the ratings of perceived development levels, such differences are expected as the two engineering programmes, in York and Coventry, have several differences in their intended learning objectives, and differences in their micro-ethics. Thus, different levels of ethical development.

Gap among students' groups perceptions	Accuracy	Honesty	Respect	Leadership
Males	0.0486 (3)	0.1337 (1)	0.0838 (2)	-0.0188 (4)
Females	0.0526 (2)	0.004 (3)	0.1243 (1)	0.0024 (4)
British	0.0732 (3)	0.2395 (1)	0.1998 (2)	0.006 (4)
Chinese	0.019 (1)	-0.0728 (2)	-0.0048 (4)	-0.0354 (3)
Work Experience	0.1555 (3)	0.1901 (1)	0.1813 (2)	0.0766 (4)
No work Experience	-0.0977 (2)	0.0064 (4)	-0.0235 (3)	-0.1255 (1)
Ethics Education	0.0161 (2)	0.0093 (3)	0.0071 (4)	-0.0217 (1)
No Ethics Education	0.0984 (3)	0.1867 (1)	0.147 (2)	0.0133 (4)
York	0.047 (3)	0.2487 (2)	0.2942 (1)	-0.0253 (4)
Coventry	-0.0014 (4)	0.1028 (1)	0.0093 (3)	-0.0251 (2)

Table 6.3 *Gaps between each scale in the two measures of importance and development. Numbers in brackets indicate to the students ranking*

As discussed in subsection 5.10.3, the alignment of the perceived level of importance and the perceived level of development of each set of the ethical skills are to be tested to identify any 'gaps' in the ethical perceptions. The algorithm used was:

Difference = Rated level of importance – Rated level of development

Table 7.3 illustrates the calculated gaps between each scale of the two measures. Given that both the rated level of importance and the rated level of development are in the range 1 to 5, the valid range of the difference is - 4 to + 4. The positive sign indicates that the rated level of importance is greater than the rated level of development, while the negative

sign indicates that the students' perceived level of development is greater than what they perceived as important (Ward, Jasenek and Thiriet, 2008). Overall, and as demonstrated in Table 7.3 the differences between the groups were small and not statistically significant, except for those indicated earlier. However, some small differences were noticed among the response means of the different groups showing that the groups rated perceived level of importance and level of development of Honesty and integrity highest most frequently, while the ratings of Responsible Leadership: listening and informing was rated the lowest in both measures most frequently in comparison to the other scales. In general, there were high ratings of importance compared to the ratings of development criteria which might suggest that there are some issues that require attention (Duke, 2002) (Ward, Jasenek and Thiriet, 2008). To address these issues, and provide an understanding of the reasons behind them, Phase II has been conducted aiming to seek more clarity.

7.4 Factor analysis procedure

After discussing the theoretical reasons that underpin this survey structure and given that there was no empirical justification for the RAEng's four sets of SEPs, the test in this thesis is designed to explore the survey items that were based on RAEng's SEPs. This test is also aimed at comparing the survey items rated by students with the RAEng's theoretical assumptions. To explore and gather information about interrelationships between sets of variables, exploratory factor analysis (EFA) was used in order to refine the item pool and assess the essential factor structure when reporting the scales development.

7.4.1 Data inspection

Before conducting factor analysis, the suitability of the data for factor analysis should first be determined, and this is done by testing and considering the relationships between the items' communalities and the strength of intercorrelation among items (Pallant, 2013.p.189) (Pallant, 2013). Table 7.4 illustrates the communalities of the importance measure (Imp), and Table 7.5 the communalities of the development measure (Dev).

Communalities		
	Initial	Extraction
To act always with care	1.000	.633
To act always with competence	1.000	.689
Perform Services in areas of current competence	1.000	.561
Keep your knowledge up to date	1.000	.743
Keep your skills up to date	1.000	.712
Assist the development of engineering knowledge in others	1.000	.766
Assist the development of engineering skills in others	1.000	.774
Not knowingly mislead others about engineering matters	1.000	.814
Not knowingly allow others to be misled about engineering matters	1.000	.853
Present engineering evidence, theory and interpretation honestly accurately and without bias	1.000	.611
Review engineering evidence, theory and interpretation honestly, accurately and without bias	1.000	.568
Identify risks	1.000	.781
Evaluate risks	1.000	.822
Quantify risks	1.000	.736
Be alert to the ways in which your work might affect others	1.000	.542
Dully respect the rights and reputations of other parties	1.000	.499
Avoid deceptive acts	1.000	.674
Take steps to prevent corrupt practices	1.000	.554
Take steps to prevent professional misconduct	1.000	.623
Take steps to prevent or declare conflicts of interest	1.000	.617
Reject bribery	1.000	.795
Reject improper influence	1.000	.791

Act for each employer in a reliable and trustworthy manner	1.000	.694
Act for each client in a reliable and trustworthy manner	1.000	.587
Ensure that all work is lawful and justified	1.000	.630
Minimise any adverse effect on society or on the natural environment for your own and succeeding generations	1.000	.632
Justify any adverse effect on society or on the natural environment for your own and succeeding generations	1.000	.609
Take due account of the limited availability of natural and human resources	1.000	.644
Hold paramount the health and safety of others	1.000	.562
Act honourably, responsibly and lawfully	1.000	.464
Uphold the reputation, standing and dignity of the profession	1.000	.516
Be aware of the issues that engineering, and technology raise for society	1.000	.604
Listen to the aspirations and concerns of others	1.000	.638
Actively promote public awareness	1.000	.734
Understanding of the impact and benefits of engineering achievements	1.000	.626
Be objective and truthful in any statement made in your professional capacity	1.000	.541

Table 6.4 *Communalities of the importance measure (Imp)*

Communalities		
	Initial	Extraction
To act always with care	1.000	.576
To act always with competence	1.000	.544
Perform services only in areas of current competence	1.000	.712
Keep your knowledge up to date	1.000	.685
Keep your skills up to date	1.000	.672
Assist the development of engineering knowledge in others	1.000	.786
Assist the development of engineering skills in others	1.000	.804
Not knowingly mislead others about engineering matters	1.000	.811
Not knowingly allow others to be misled about engineering matters	1.000	.792
Present engineering evidence, theory and interpretation honestly accurately and without bias	1.000	.643
Review engineering evidence, theory and interpretation honestly, accurately and without bias	1.000	.644
Identify risks where possible	1.000	.838
Evaluate risks where possible	1.000	.848
Quantify risks where possible	1.000	.828
Be alert to the ways in which you work might affect others	1.000	.610
Duly respect the rights and reputations of other parties	1.000	.655
Avoid deceptive acts	1.000	.548
Take steps to prevent corrupt practices	1.000	.603
Take steps to prevent professional misconduct	1.000	.653

Take steps to prevent or declare conflicts of interest	1.000	.705
Reject bribery	1.000	.749
Reject improper influence	1.000	.741
Act for each employer in a reliable and trustworthy manner	1.000	.646
Act for each client in a reliable and trustworthy manner	1.000	.622
Ensure that all work is lawful and justified	1.000	.577
Minimise any adverse effect on society or on the natural environment for your own and succeeding generations	1.000	.709
Justify any adverse effect on society or on the natural environment for your own and succeeding generations	1.000	.697
Take due account of the limited availability of natural and human resources	1.000	.700
Hold paramount the health and safety of others	1.000	.656
Act honourably, responsibly and lawfully	1.000	.681
Uphold the reputation, standing and dignity of the profession	1.000	.588
Be aware of the issues that engineering, and technology raise for society	1.000	.589
Listen to the aspirations and concerns of others	1.000	.660
Actively promote public awareness	1.000	.691
Understand the impact and benefits of engineering achievements	1.000	.710
Be objective and truthful in any statement made in your professional capacity	1.000	.680

Table 6.5 *Communalities of the development measure (Dev)*

Communalities of the importance measure and the development measure showed that all communalities were between 0.505 and 0.825 for the importance measurement (Imp), and between 0.544 and 0.848 for the development measurement (Dev). This suggested that both scale communalities of items are moderate to high in correlation, and there were no values that were < 0.2 (Samuels, 2016), therefore, no items were removed.

The data sets are then verified to check if the data are suitable for factor analysis, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity values for each measure were calculated (Allen, Bennett and Heritage, 2014) (Howard, 2016), and illustrated in Table 7.6 and Table 7.7.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.909
Bartlett's Test of Sphericity	Approx. Chi-Square	5424.414
	df	630
	Sig.	.000

Table 6.6 *KMO and Bartlett's Test of Sphericity for (Imp) measure*

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.941
Bartlett's Test of Sphericity	Approx. Chi-Square	6376.023
	df	630
	Sig.	.000

Table 6.7 *KMO and Bartlett's Test of Sphericity for (Dev) measure*

As illustrated in Table 7.6 and Table 7.7, the obtained values which indicate KMO of .909 for the importance measure (Imp) and KMO .941 for the development measure (Dev), and both have significant value for Bartlett's test of sphericity of 0.000 (Bartlett, 1954), and therefore the factor analysis is appropriate.

7.4.2 Factor extraction

As discussed in chapter 5, three extraction methods are used, the Kaiser's criterion, the scree plot (Osborne, Costello and Kellow, 2008), and the Principal Component Analysis (PCA) (Pallant, 2013). Kaiser's criterion technique rule states that factors with eigenvalues over 1.00 should be considered in the analysis (Pallant, 2013) (Brown, 2000). Table 7.8 and Table 7.9 illustrates the factors with total Initial Eigenvalues > 1.00 for both, (Imp) and (Dev) measures.

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
1	13.146	36.517	36.517	13.146	36.517	36.517	2.583
2	2.017	5.602	42.119	2.017	5.602	42.119	7.160
3	1.941	5.392	47.511	1.941	5.392	47.511	4.007
4	1.542	4.284	51.796	1.542	4.284	51.796	8.243
5	1.453	4.035	55.831	1.453	4.035	55.831	5.677
6	1.262	3.505	59.337	1.262	3.505	59.337	5.359
7	1.169	3.248	62.585	1.169	3.248	62.585	7.486
8	1.108	3.078	65.662	1.108	3.078	65.662	2.706
9	.951	2.642	68.304				
10	.899	2.498	70.802				
11	.812	2.256	73.058				

12	.789	2.192	75.251				
13	.717	1.992	77.243				
14	.709	1.969	79.212				
15	.667	1.852	81.064				
16	.600	1.666	82.730				
17	.549	1.526	84.256				
18	.499	1.387	85.643				
19	.479	1.332	86.975				
20	.435	1.209	88.184				
21	.430	1.195	89.379				
22	.406	1.127	90.506				
23	.368	1.023	91.529				
24	.348	.967	92.495				
25	.325	.902	93.397				
26	.322	.895	94.293				

27	.300	.833	95.125				
28	.287	.798	95.923				
29	.246	.683	96.606				
30	.218	.607	97.212				
31	.206	.573	97.785				
32	.198	.551	98.337				
33	.189	.526	98.862				
34	.160	.445	99.307				
35	.142	.395	99.702				
36	.107	.298	100.000				

Table 6.8 *Factors with total Initial Eigenvalues > 1.00 for the (Imp) measure*

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
1	17.507	48.632	48.632	17.507	48.632	48.632	11.960
2	1.827	5.074	53.706	1.827	5.074	53.706	10.926
3	1.518	4.217	57.923	1.518	4.217	57.923	6.357
4	1.315	3.654	61.577	1.315	3.654	61.577	11.372
5	1.153	3.204	64.781	1.153	3.204	64.781	6.994
6	1.105	3.070	67.851	1.105	3.070	67.851	6.150
7	.954	2.649	70.499				
8	.848	2.355	72.854				
9	.802	2.227	75.081				
10	.734	2.039	77.120				
11	.653	1.815	78.935				

12	.626	1.739	80.673				
13	.574	1.593	82.267				
14	.554	1.539	83.805				
15	.491	1.365	85.170				
16	.472	1.312	86.483				
17	.401	1.114	87.597				
18	.393	1.093	88.690				
19	.376	1.044	89.734				
20	.361	1.002	90.736				
21	.343	.953	91.690				
22	.337	.935	92.625				
23	.317	.880	93.504				
24	.271	.753	94.257				
25	.246	.684	94.942				
26	.241	.670	95.611				

27	.213	.591	96.202				
28	.201	.558	96.761				
29	.197	.546	97.307				
30	.181	.502	97.809				
31	.167	.465	98.274				
32	.152	.423	98.697				
33	.144	.401	99.098				
34	.121	.336	99.434				
35	.112	.312	99.747				
36	.091	.253	100.000				

Table 6.9 *Factors with total Initial Eigenvalues > 1.00 for the (Dev) measure*

For the (Imp) measure, Kaiser's criterion analysis showed that there were 8 factors with total Initial Eigenvalues > 1.00. Principal Factor Analysis shows a variance of 65.662 %. As for the (Dev) measure, Kaiser's criterion analysis shows that there are 6 factors with total Initial Eigenvalues > 1.00. Principal Factor Analysis shows a variance of 67.851 %, which are both high according to the humanities reference percentage that was discussed in chapter 5 (Williams, Onsman and Brown, 2010). The scree test plots for the retained factors are illustrated in Figure 7.2 for the (Imp) measurement and Figure 7.3 for the (Dev) measurement.

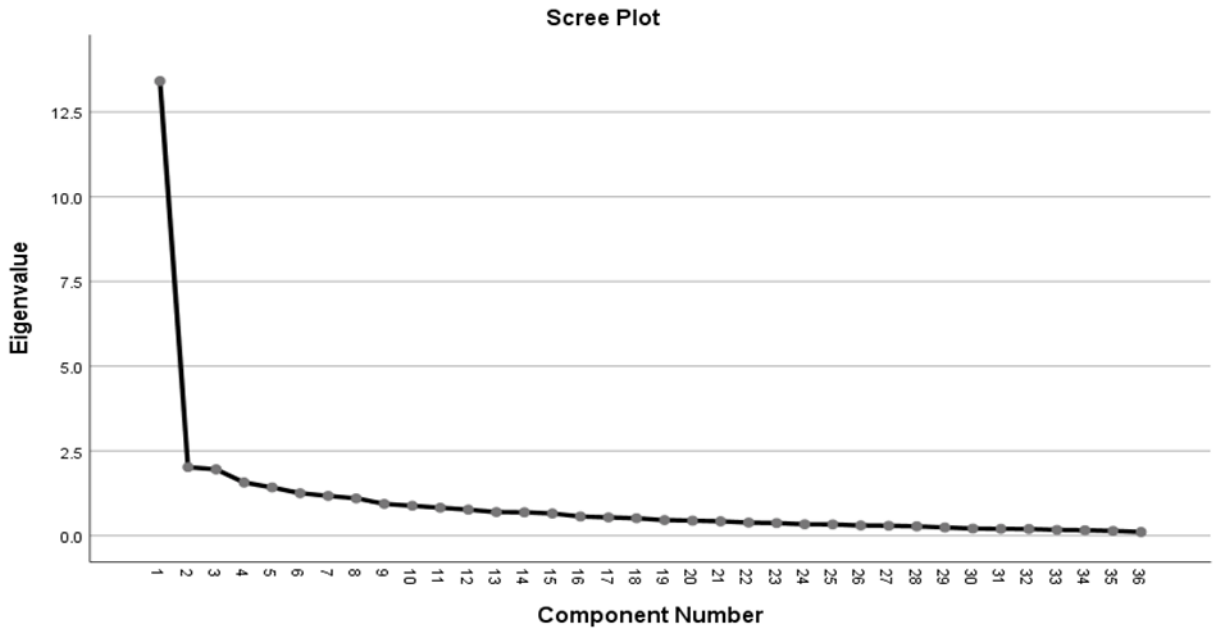


Figure 6.2 *Scree test plot for the (Imp) measure retained factors*

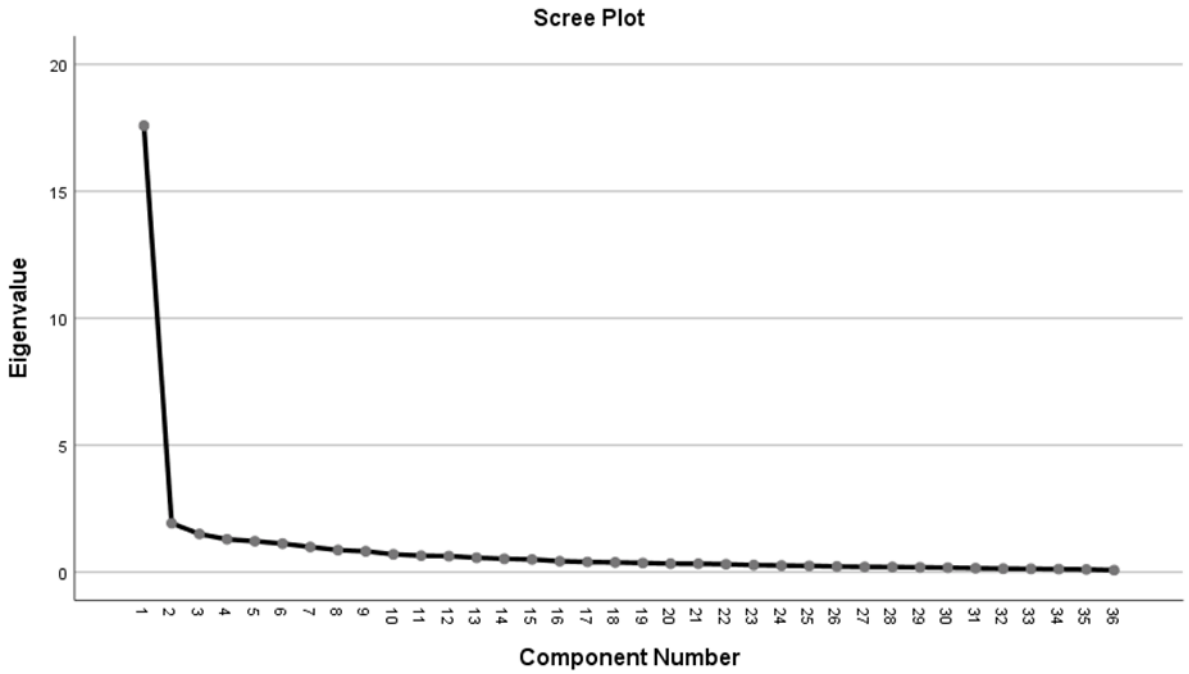


Figure 6.3 *Scree test plot for the (Dev) measure retained factors*

As shown in the scree plots, the number of factors retained over the elbow was unclear, especially the data clusters near the bend (Cattell, 1966). Thus, the test is a subjective test that required the researcher's judgment, which could be debatable on the number of factors that should be retained (Williams, Onsman and Brown, 2010).

7.4.3 Correlation matrix factorability

Based on Hair Jr's et al. (2010) indications that were discussed in chapter 5, the correlation matrixes factorability, which are illustrated in Table 7.10 for the (Imp) measure and Table 7.11 for the (Dev) measure, were inspected.

Component Correlation Matrix								
Component	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	1.000	.139	.052	-.143	.151	.109	-.230	.069
2	.139	1.000	.216	-.387	.294	.313	-.379	.229
3	.052	.216	1.000	-.269	.227	.188	-.189	.111
4	-.143	-.387	-.269	1.000	-.360	-.320	.415	-.151
5	.151	.294	.227	-.360	1.000	.284	-.341	.098
6	.109	.313	.188	-.320	.284	1.000	-.333	.137
7	-.230	-.379	-.189	.415	-.341	-.333	1.000	-.150
8	.069	.229	.111	-.151	.098	.137	-.150	1.000

Table 6.10 *Component Correlation Matrix for the (Imp) measure*

Component Correlation Matrix						
Component	1	2	3	4	5	6
1	1.000	-.483	.339	-.548	.382	-.366
2	-.483	1.000	-.380	.485	-.296	.287
3	.339	-.380	1.000	-.334	.249	-.289
4	-.548	.485	-.334	1.000	-.398	.363
5	.382	-.296	.249	-.398	1.000	-.232
6	-.366	.287	-.289	.363	-.232	1.000

Table 6.11 *Component Correlation Matrix for the (Imp) measure*

For the (Imp) measure, and as indicated in Table 7.10:

- Factor 2 had three minimal factorability coefficients
- Factor 4 had three minimal and one important factorability coefficients
- Factor 5 had two minimal factorability coefficients
- Factor 6 had three minimal factorability coefficients
- Factor 7 has three minimal and one important factorability coefficients.

Other than that, factor 1, 3, and 8 have no intercorrelations with other factors. For the (Dev) measure, and as indicated in Table 7.11:

- Factor 1 has three minimal, one important, and one significant factorability coefficient
- Factor 2 has one minimal and two important factorability coefficients
- Factor 3 has three minimal factorability coefficients
- Factor 4 has three minimal, one important and one significant factorability coefficients
- Factor 5 has two minimal factorability coefficients
- Factor 6 has two minimal factorability coefficients

As assumed and discussed earlier in Chapter 5, after extracting the factors, it appeared that most factors had higher loadings on the most important factors and smaller loadings on the other factors. This makes it challenging for interpretation, and therefore a rotation technique should be used to differentiate between factors (Field, 2013.p.678), and to maximize high loading and minimize low loadings (Allen, Bennett and Heritage, 2014.p.219). Since this research is based on some aspects of social science, it is expected to find some correlations among the factors, therefore, using orthogonal rotation can cause losing valuable information if the factors are related. Thus, independence between factors cannot be assumed, therefore, an Oblique rotation method was a better representation of reality for both measures and can provide more accurate solutions and improving items' factorability (Field, 2013.p. 680 and 689). In the analysis used for rotation in factor analysis of this study, oblimin rotation is used, based on the literature indications, that in social science it is expected to see findings that indicate to correlations and relationships among factors.

7.4.4 Factor retaining

After following the earlier steps to extract and identify the number of factors for a measure, a retaining process is then applied. This process followed the same procedure for both measures and included removing the items that cross-loaded if their primary factor had a value < 0.4 and > 0.3 in the alternative factor. Also, items with cross leadings that have differences between their primary and alternative factors < 0.2 (Howard, 2016). In addition to removing items that had an item cut-off loading value that is < 0.3 (Brown, 2001), not considering factors that have less than three items (Samuels, 2016), and removing the cross-loading items starting with the "*item with the highest ration of loadings on the most variables with the lowest heights loadings*" (P.4), as demonstrated in Figure 7.4.

Act honourably, responsibly and lawfully							-.550
Uphold the reputation, standing and dignity of the profession	.352						-.399
Be aware of the issues that engineering and technology raise for society	.345						-.426
Listen to the aspirations and concerns of others	.482						

Figure 6.4 *Items removals with lowest-highest cross-loadings*

Each time an item is removed, the analysis should be re-run to inspect the new pattern matrix (Pallant, 2013). 9 items were removed from the (Imp) measure, and 22 items formed 4 factors. These factors, their items and loadings are shown in Table 7.12.

Item number in the survey	Item statement	Factor 1	Factor 2	Factor 3	Factor 4
11-	Review engineering evidence, theory and interpretation honestly, accurately and without bias	.474			
16-	Dully respect the rights and reputations of other parties	.421			
21-	Reject bribery	.937			
22-	Reject improper influence	.844			
23-	Act for each employer in a reliable and trustworthy manner	.761			
25-	Ensure that all work is lawful and justified	.438			
30	Act honourably, responsibly and lawfully	.523			
5-	Keep your skills up to date		-.476		
12-	Identify risks		-.839		
13-	Evaluate risks		-.890		
14-	Quantify risks		-.842		
29-	Hold paramount the health and safety of others		-.495		
15-	Be alert to the ways in which your work might affect others			-.391	
26-	Minimise any adverse effect on society or on the natural environment for your own and succeeding generations			-.656	
27-	Justify any adverse effect on society or on the natural environment for your own and succeeding generations			-.772	

28-	Take due account of the limited availability of natural and human resources			-.734	
33-	Listen to the aspirations and concerns of others			-.553	
34-	Actively promote public awareness			-.626	
35-	Understanding of the impact and benefits of engineering achievements			-.652	
1-	To act always with care				.671
2-	To act always with competence				.766
19-	Take steps to prevent professional misconduct				.406

Table 6.12 *Factors of (Imp) measure*

15 items were removed from the (Dev) measure, and 19 items formed 3 factors. These factors, their items and loadings are shown in Table 7.13.

Item number in the survey	**Item statement**	**Factor 1**	**Factor 2**	**Factor 3**
28-	Take due account of the limited availability of natural and human resources	.866		
27-	Justify any adverse effect on society or on the natural environment for your own and succeeding generations	.839		
26-	Minimise any adverse effect on society or on the natural environment for your own and succeeding generations	.832		
33-	Listen to the aspirations and concerns of others	.802		

34-	Actively promote public awareness	.780		
35-	Understanding of the impact and benefits of engineering achievements	.544		
15-	Be alert to the ways in which you work might affect others	.497		
7-	Assist the development of engineering skills in others	.473		
19-	Take steps to prevent professional misconduct	.384		
33-	Listen to the aspirations and concerns of others	.802		
34-	Actively promote public awareness	.780		
35-	Understanding of the impact and benefits of engineering achievements	.544		
15-	Be alert to the ways in which you work might affect others	.497		
7-	Assist the development of engineering skills in others	.473		
19-	Take steps to prevent professional misconduct	.384		
21-	Reject bribery		.872	
22-	Reject improper influence		.817	
30-	Act honourably, responsibly and lawfully		.763	
18-	Take steps to prevent corrupt practices		.752	
24-	Act for each client in a reliable and trustworthy manner		.581	
17-	Avoid deceptive acts		.561	
5-	Keep your skills up to date		.561	
13-	Evaluate risks where possible			-.879
14-	Quantify risks where possible			-.855
15-	Identify risks where possible			-.816

Table 6.13 *Factors of (Imp) measure*

The researcher had labelled the resulting factors in the (Imp) measure as follow:

Factor 1: Ethical Integrity

Factor 2: Health and Safety

Factor 3: Societal and Environmental Impact

Factor 4: Engineering Professionalism & Responsibility

And labelled the resulting factors in the (Dev) measure as follow:

Factor 1: Concern for Others, Society and the Environment

Factor 2: Work Responsibly for Now and the Future

Factor 3: Risk Evaluation & Management

As shown in Table 7.12, the importance measure factor analysis resulted in four factors, and each item number indicates the number of the actual item in the survey:

1. **Ethical Integrity,** which includes the following principles:

11-Review engineering evidence, theory and interpretation honestly, accurately and without bias

16-Dully respect the rights and reputations of other parties

21-Reject bribery

22-Reject improper influence

23-Act for each employer in a reliable and trustworthy manner

25-Ensure that all work is lawful and justified

30-Act honourably, responsibly and lawfully

2. **Health and Safety,** which includes the following principles:

5-Keep your skills up to date

12-Identify risks

13-Evaluate risks

14-Quantify risks

29-Hold paramount the health and safety of others

3. **Societal and Environmental Impact,** which includes the following principles:

15-Be alert to the ways in which your work might affect others

26-Minimise any adverse effect on society or on the natural environment for your own and succeeding generations

27-Justify any adverse effect on society or on the natural environment for your own and succeeding generations

28-Take due account of the limited availability of natural and human resources

33-Listen to the aspirations and concerns of others

34-Actively promote public awareness

35-Understanding of the impact and benefits of engineering achievements

4. **Engineering Professionalism & Responsibility,** which includes the following principles:

1-To act always with care

2-To act always with competence

19-Take steps to prevent professional misconduct

And as Table 7.13 illustrates the development measure factor analysis resulted in three factors, and each item number indicates the number of the actual item in the survey:

1. **Concern for Others, Society and the Environment,** which includes the following principles:

28-Take due account of the limited availability of natural and human resources

27-Justify any adverse effect on society or on the natural environment for your own and succeeding generations

26-Minimise any adverse effect on society or on the natural environment for your own and succeeding generations

33-Listen to the aspirations and concerns of others

34-Actively promote public awareness

35-Understanding of the impact and benefits of engineering achievements

15-Be alert to the ways in which you work might affect others

7-Assist the development of engineering skills in others

19-Take steps to prevent professional misconduct

2. Work Responsibly for now and the future, which includes the following principles:

21-Reject bribery

22-Reject improper influence

30-Act honourably, responsibly and lawfully

18-Take steps to prevent corrupt practices

24-Act for each client in a reliable and trustworthy manner

17-Avoid deceptive acts

5-Keep your skills up to date

3. Risk Evaluation & Management, which includes the following principles:

13-Evaluate risks where possible

14-Quantify risks where possible

12-Identify risks where possible

7.5 Scale fitness results

As discussed earlier in Chapter 5 and according to Streiner (2003), the internal consistency of a scale is "*one of the central tenets of classical test theory is that scales should have a high degree of internal consistency as evidenced by Cronbach's alpha*" (P. 217). Table 7.14 illustrates the values of internal consistencies of the (Imp) and the (Dev) measure scales for the factors that have resulted from the factor analysis test.

Scale	Cronbach's Alpha Coefficient	Mean Inter-item	Number of Items
(Imp)			
1. Ethical Integrity	0.853	0.452	7
2. Health and Safety	0.837	0.500	5
3. Societal and Environmental Impact	0.864	0.477	7
4. Engineering Professionalism & Responsibility	0.744	0.426	4
(Dev)			
1. Concern for Others, Society and the Environment	0.918	0.556	9
2. Work Responsibly for now and the future	0.890	0.538	7
3. Risk Evaluation & Management	0.925	0.804	3

Table 6.14 *Values of Cronbach's Alphas of the (Imp) and the (Dev) measure scales of the resulted factors*

The results illustrated in Table 7.14 highlights the importance and development measures are considered as good scales and fit to measure what the assessment is designed to assess. On the other hand, the scale fitness for the original RAEng's SEPs and their four sets were also tested, and the results of the reliability test are demonstrated in Table 7.15.

Scale	Cronbach's Alpha Coefficient	Mean Inter-item	Number of Items
RAEng's measure of the importance			
1. Accuracy and Rigour	0.852	0.303	14
2. Honesty and Integrity	0.895	0.462	10
3. Respect for life, law and the public good	0.838	0.425	7
4. Responsible Leadership: listening and informing	0.842	0.519	5
RAEng's measure of development			
1. Accuracy and Rigour	0.924	0.471	14
2. Honesty and Integrity	0.925	0.553	10
3. Respect for life, law and the public good	0.884	0.523	7
4. Responsible Leadership: listening and informing	0.873	0.582	5

Table 6.15 *Values of Cronbach's Alphas of the (Imp) and the (Dev) measure scales for the RAEng's SEPs sets*

As demonstrated in Table 7.15, the Cronbach's alpha for:

- The 14-item importance of Accuracy and Rigour scale was 0.852
- The 10-item importance of Honesty and Integrity scale was 0.895
- The 7-item importance of Respect for life, law and the public good scale was 0.838
- The 5-item importance of Responsible Leadership: listening and informing scale was 0.842
- The 14-item development of Accuracy and Rigour scale was 0.924
- The 10-item development of Honesty and Integrity scale was 0.925
- The 7-item development of Respect for life, law and the public good scale was 0.884
- The 5-item development of Responsible Leadership: listening and informing scale was 0.873

The results illustrated in Table 7.15 suggested that the importance and development measures are considered as good scales and fit to measure what the assessment is designed to assess.

7.4.5 Analysis results

The 32 items of the importance measure scale were subjected to Principle Component Analysis (PCA) using SPSS version 25. Prior to performing PCA, the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Mayer-Olkin value was .909, exceeding the recommended value of .6 (Kaiser, 1970), and Bartlett's Test of Sphericity reached statistical significance (Bartlett, 1954), supporting the factorability of the correlation matrix. Principle components analysis revealed the presence of eight components with eigenvalues exceeding 1, explaining 36.517 %, 5.602%, 5.392%, 4.284%, 4.035%, 3.505%, 3.248% and 3.078% of the variance respectively. An inspection of the scree plot (Cattell, 1966), was ambiguous and showed inflexions that would justify retaining either 5 or 7 factors. To aid the interpretations of retaining the factors, the oblimin rotation was performed. The rotated solution revealed the presence of a simple structure, with several strong loadings and all variable loading substantially on four components. The item that cluster on the same factor (cross-load) suggest that factor 1 represents Ethical Integrity, factor 2 represents Health and Safety, factor 3 represents Societal and Environmental Impact, and factor 4 represents Engineering Professionalism & Responsibility. The Ethical Integrity, Health and Safety, Societal and Environmental Impact, and Engineering Professionalism & Responsibility of the importance measure had high reliabilities, Cronbach's $\alpha = 0.853$, 0.837, 0.864 and 0.744.

The 32 items of the development measure scale were subjected to Principle Component Analysis (PCA) using SPSS version 25. Prior to performing PCA, the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Mayer-Olkin value was .941, exceeding the recommended value of .6 (Kaiser, 1970), and Bartlett's Test of Sphericity reached statistical significance (Bartlett, 1954), supporting the factorability of the correlation matrix. Principle components analysis revealed the presence of six components with eigenvalues exceeding 1, explaining 48.632%, 5.074%, 4.217%, 3.654%, 3.204% and 3.070% of the variance respectively. An inspection of the scree plot (Cattell, 1966), was ambiguous and showed inflexions that would justify retaining 3

factors. This was further supported by the results of oblimin rotation, which revealed the presence of a simple structure, with several strong loadings and all variable loading substantially on three components. The item that clusters on the same factor (cross-load) suggest that factor 1 represents Concern for Others, Society and the Environment, factor 2 Work Responsibly for now and the future and factor 3 represents Risk Evaluation & Management. The Concern for Others, Society and the Environment, Work Responsibly for now and the future and Risk Evaluation & Management of the scale of development (scale 2) had high reliabilities, Cronbach's α =0.918, 0.890 and 0.925.

These measures' four scales were tested for reliability, and the results showed that:

- Factor 1: Ethical Integrity Cronbach's α = 0.853
- Factor 2: Health and Safety Cronbach's α = 0.837
- Factor 3: Societal and Environmental Impact Cronbach's α= 0.864
- Factor 4: Engineering Professionalism & Responsibility Cronbach's α= 0.744

Factor analysis test results indicated that for the RAEng's SEPs, the ratings of the level of development measure were structured into four factors, and each item number indicates the number of the actual item in the survey:

This measures three scales were tested for reliability, and the results showed that:

- Factor 1: Concern for Others Cronbach's α = 0.918
- Factor 2: Work Responsibly for now and the future Cronbach's α = 0.890
- Factor 3: Risk Evaluation & Management Cronbach's α= 0.925

Both measure's scales came up with Cronbach's alpha coefficients values > 0.7, which is considered good (Pallant, 2013.p.101).

7.5 Summary of the findings

This Phase of Study 2 provided an exploratory study of the RAEng's SEPs, in which the students' ratings of the level of importance and the level of development of four main ethical principles were investigated. According to The Royal Academy of Engineering's (2012), the SEPs try to set a standard for professional engineers which they should follow in their working relationships and habits. These principles were listed starting with Accuracy and Rigour, Honesty and Integrity, Respect for Life, Law and the Public Good and Responsible Leadership: Listening and Informing. However, this order does not imply the order of importance of the principles and their statements. The list was ordered

from the most technical to the more general. This study gave empirical support to these notions as the students rated the first three principles higher than the last set, although the rating of the last principle was in the range of '4' which is important to the profession. Overall, and since there is no empirical literature to compare, agree or disagree with, the results of this study's findings form the first empirical study that adds to the literature.

In summary, this study found no statistically significant differences between the gender ratings of the level of importance and the level of development of the four ethical and professional sets. The study found one statistically significant difference between the ratings of British and Chinese students, where the British students rated the level of importance of Honesty and Integrity higher than the Chinese students. Three statistically significant difference were also found, where the students with no work experience rated their level of development in Accuracy and Rigour, Honesty and Integrity and Respect for Life, Law and the Public Good higher than the other group. The study also indicated no statistically significant difference between the ratings of students who had ethics educational interventions and students who had none in terms of rating the level of the importance and the level of development of the four ethical principles. However, the study found seven statistically significant differences between the ratings of students at the UoY and CU. CU students rated the level of importance of Accuracy and Rigour, Honesty and Integrity and Responsible Leadership: Listening and Informing higher than the group at the UoY. Also, students of CU rated the level of development of Accuracy and Rigour, Honesty and Integrity, Respect for Life, Law and the Public Good and Responsible Leadership: Listening and Informing higher than the students at the UoY.

In addition, this phase identified that based on the students' ratings, the RAEng's SEPs are grouped differently. For the importance measure:

- Factor 1: Ethical Integrity
- Factor 2: Health and Safety
- Factor 3: Societal and Environmental Impact
- Factor 4: Engineering Professionalism & Responsibility

For the development measure:

- Factor 1: Concern for Others

- Factor 2: Work Responsibly for now and the future
- Factor 3: Risk Evaluation & Management

The Royal Academy of Engineering's (2012) SEP, on the other hand, focused on the importance of developing the following:

- Accuracy and Rigour
- Honesty and Integrity
- Respect for Life, Law and the Public Good
- Responsible Leadership: Listening and Informing

However, the reliability tests for both, RAEng's SEPs and the resulting factors indicated high reliability, and both measure scales can be used.

To conclude the findings of this phase of the analysis, some elements of the proposed conceptual model were evident in the analysis of this phase, such as the effect of individual differences like education and employment, where students who had no prior work experience felt that they have improved their ethical knowledge (Hunt and Vitell, 1986) (Hunt and Vitell, 2006). Another evident element was the effect of the university's code of ethics (Newberry, 2004) (Besterfield-Sacre et al., 2001). However, the gains in ethical and professional skills that influenced students' ratings were not clear in the analysis. Thus, it is difficult at this stage to confirm the reasons for the students' ratings and to fill this gap. Hence, the findings necessitate conducting further research to provide more clarity and complement the findings, be the basis of the next set of method and to triangulate and validate the findings of Phase I. Thus, phase II was planned, designed and conducted.

7.6 Limitations and highlights of Phase I Study 2

There are some limitations that are associated with the survey responses in general as discussed earlier in Chapter 5, and they might have taken place during the process of data collection. For example, some respondents might have overrated their responses to avoid giving a potentially negative impression, therefore, social desirability might have affected some responses (Randall and Fernandes, 1991) (Randall, Huo and Pawelk, 1993). However, these limitations are expected in survey responses specifically when researching ethics in general. Another potential limitation of this study could be that the researcher has not indicated or specified the nature and the length of the work experience

some students might have had. The work experience section in the survey can be modified to include a specification of the nature of the work experience and the length of this experience to provide more details and information for further analysis, as it may have further effect on the students ethical perceptions (O'Fallon and Butterfield, 2005) (Craft, 2013). Furthermore, a few international students seemed to struggle and misunderstand the differences between item number 8 and 9 "Not knowingly mislead others about engineering matters" and "Not knowingly allow others to be misled about engineering matters". This was assumed as some of the students asked the researcher about the difference, and students left these two items uncompleted, a few responded with small question marks, and a few selected '(1) Not important' and '(1) Strongly Disagree' options in the survey. This was one of the issues that were identified and evident in Phase II of this study.

The findings from the first phase of the mixed method (quantitative) were able to successfully identify some differences related to ethnicity, work experience, and educational institutions, among students studying Engineering in the two Higher Education Institutes in the U.K, as represented by the sample. Some of the highlights of the survey are that it enabled the researcher to reach many engineering students, and it was easy to collect data from two universities. The factor analysis tests results indicated that the importance measure factored in four sets, while the development measure factored in three sets. The two parts of the survey with their scales proved to be reliable and fit to measure what they intended to measure, based on Cronbach's alpha test results, which all had values that are > 0.7. Overall, this approach can be considered as one of the pioneer empirical investigations that employed the RAEng's SEPs into a survey instrument design. Thus, this approach can be expanded in the future to test other variables and use confirmatory factor analysis to confirm the results of this study.

On the other hand, the results that emerged from exploring the students' perceptions of development were limited and needed more insights and more understanding of the reasons behind these ratings. In addition, there is a need to understand why some students believed that they have developed certain ethical skills but not others during their study time on the programme in York. Thus, Phase II of Study 2 was considered to provide more depth and understanding of these perceptions, and to be able to provide some information to the educational programme developers at the UoY, Department of Electronic Engineering.

7.7 Phase II semi-structure interviews

After completing the survey, respondents were asked to provide their emails if they were interested in participating in future studies in this area, and 19 students provided their emails for further future studies. 9 emails were invalid, 3 did not reply, and only 7 students replied and agreed to participate in the interviews. Providing invalid emails and non-response could be related to the possibility of students feeling sceptical about the real reasons for conducting the research but wanting to show that they are interested in participating in future research. The researcher then agreed the times and location of the interviews with the interviewees. The interviews took place at her office on campus. After collecting and analysing most of the quantitative data, the researcher conducted semi-structured interviews with some of Phase I, Study 2 participants, as part of the sequential explanatory mixed method approach. This was also done in order to collect qualitative data and understand the reasons why students in the Electronic Engineering Department had made their choices of ratings in the survey, and to justify their choices (Saunders, Lewis and Thornhill, 2009). In this Phase, data collection involved interviewing individuals using semi-structured methods. Table 7.16 illustrates Phase II of Study 2, sample characteristics.

Respondent Code	Culture	Discipline	Working Experience	Gender
1	Asian	MSc in Engineering Management	5 Years	Male
2	Chinese	MSc in embedded Wireless systems	7 months	Male
3	Middle Eastern/British	MSc in Engineering Management	7 years	Male
4	Middle Eastern	MSc in Engineering Management	11 years	Male
5	Middle Eastern	Undergraduate in the Electronic Engineering	1 year	Male
6	Chinese	MSc in Engineering Management	No	Male
7	Chinese	MSc in Engineering Management	2 years	Female

Table 6.16 *Phase II of Study 2 sample characteristics*

As shown in Table 7.16, the total number of students who participated in the interviews were 7 and they were all from the UoY. 6 were enrolled in the Engineering Management Masters programme in the 2016/2017 and 2017/2018 academic years while one was a 3rd-

year Electronic Engineering student. The interview questions attempted to build on the quantitative findings and tried to explore the explanatory contextual justifications and reasons perceived by the engineering students. This phase tries to understand the students' ratings in terms of importance and development. The sample included six male students and one female student, one undergraduate and 6 Masters students. The sample presented a diverse cultural mix, one from Central Asia, two from the Middle East, one from the UK, and the rest were from China. The interviews were guided and conducted according to the interview guide that the researcher had developed previously and obtained ethical approval to conduct the interviews, and this interview guide is provided in Appendix 8. Each interview discussion lasted for approximately 30-45 minutes, and Appendix 9 illustrates the interview questions that have been given to the interviewees. Responses were audio recorded and then transcribed for each interviewee. For each scenario, different responses were manually reviewed, and coded to derive the emerging themes needed for analysis.

7.8 Analysis results

After the transcripts of the interviews had been coded, different responses were reported for the participants. This was done to understand and explain why some students believed that they have not developed certain sets of ethical skills during their period of studying at the Electronic Department of the UoY.

During the ice breaker at the start of the interviews, some students expressed that the ethical knowledge that they gained from their workplaces might have affected their perceptions of the level of importance of certain ethical principles (Ford and Richardson, 1994). For example, *"I did internships at two companies where they followed two different codes of ethics, and both affected me differently. The first is (X), and the other is (Y). The first company adopted an English code of ethics, and the other one followed the Egyptian governmental code".* This support Bommer's et al. (1987) suggestions that the work environment and the ethical culture and climate can influence an individual's ethical perception (O'Fallon and Butterfield, 2005). Moreover, some students reported that their past educational experiences shaped their ethical perceptions (Atesh, Baruah and Ward, 2017) (Baruah, Atesh and Ward, 2017). For instance, *"I reflected on my previous education and answered the survey questions"*. Other students specified that a module that they had studied at the UoY helped them to identify the importance of many ethical statements in the survey. This was said as "*I have learned in a module called law,*

about the things you asked me about in your survey". On the other hand, other students declared that the way they were raised might have affected their ethical perceptions and their responses to the survey questions. This was highlighted by *"maybe my parents. They always tell me to follow the law and be honest"*. The family effect was something that Bommer et al. (1987), Creyer (1997), Koiranen (2002) and Hanson and Moore (2013) indicated, and that familial values, such as obeying the law, honesty, and other types of ethical conduct can all influence the individual's choices (Creyer, 1997) (Hanson and Moore, 2013). Besides all these impacting factors, some students stated that their societal orientations impacted their personal ethical views, and responses in the survey (O'Fallon and Butterfield, 2005) (Craft, 2013). This was stated as *"all students in the Chinese universities must learn about Marks and Linen. These concepts taught us to be loyal to our society, and our country".* At the beginning of one of the interviews, some interviewees indicated surprise at how a list of ethical principles could include few unethical statements "*No no no I disagree with this one* [indicating to - Not knowingly mislead others to be misled about engineering matters, and Not knowingly allow others to be misled about engineering matters], *because keeping your skills and knowledge up to date and assisting the development of engineering skills and knowledge in others, Not Knowingly mislead! So, I think it's wrong!!*

[I explained what this statement means]

(mmm)... *oh* (pause) *I thought it was the opposite!!"*. This indicates that some respondents have rated these two items lower than the rest of the survey items due to misunderstanding the statement (Tourangeau, Rips and Rasinski, 2000).

The researcher then moved to ask the first question in the interview guide that matched the survey's first question (How would you rate the importance of the following to the work you are expected to do as an engineer?).

7.8.1 Importance of accuracy and rigour

Based on the interviews conducted, three students believed that accuracy and rigour were the most important set of ethical principle in the engineering profession. Some of them indicated that one reason for this rating was the influence of their study (Craft, 2013) (Ford and Richardson, 1994). For example, *"it's the influence of education. I was in a German school, and in German HE, accuracy and honesty are very important, and that's why I ranked them as highest".* Other students added that accuracy and rigour did align

with the main purpose of engineering, and that carelessness in engineering could lead to failure of engineering projects, which could mean accidents and deaths (The Royal Academy of Engineering, 2011.p.10). This was discussed by saying "*some engineers have to design buildings, and to mind people's lives, I think is extremely important, and that's why I rated these ethics as very important".* Furthermore, other students referred to what they learnt in the ethics workshop about the space shuttle Challenger and that this disaster had an impact on their ratings in the survey. This was conveyed in *"I rated accuracy as highest, because you have to be very accurate in your work as an engineer, and when I read the questions, I remembered the NASA's disaster"*. This is in line with Colby's and Sullivan's (2008) proposals that discussing well-known historical disasters of engineering failures might illustrate the essentiality of honesty, care, technical precision, potential risks, and what might happen if these standards are not adhered to (Baruah, Atesh and Ward, 2017).

On the contrary, other students said that they ranked accuracy and rigour as the least important ethical skill to the engineering profession. This is because they believed that these skills were totally dependable on the engineer's overall skills (The Royal Academy of Engineering, 2011.p.17), which is something the engineers should not be punished for. This was suggested in the statement *"accuracy is dependent on the skills and experiences the person have, so maybe an engineer can't do a totally accurate task, because you have to do some mistakes or errors, and that's why the engineer shouldn't be punished"*.

7.8.2 Importance of honesty and integrity

Two interviewees expressed that they rated honesty and integrity as the most important set of skills to the engineering profession. They justified this choice as an impact of the nature of their employment type (Saunders, Lewis and Thornhill, 2009.p.27) (Bommer et al., 1987) (Baruah, Atesh and Ward, 2017) (Atesh, Baruah and Ward, 2017). For example, saying that *"honesty in my area of expertise, the area of electrical engineering, is vital, because someone's life and people you work with will depend on your honesty"*.

On the other hand, other students argued that honesty and integrity are less important for the engineering profession, compared to the other ethical skills. This is believed so due to different social and organizational aspects that can interfere. For example, suggesting that "*you can't be 100% honest, because when interacting with customers and clients you will end up giving gifts…it is not bribery, but its marketing your stuff… if you are strictly*

honest, you won't succeed as much....you need to be honest with your managers, but with clients, you need to not cheat, but divert them away from the right question, that's why I believe its moderate for me compared to the rest". This statement supports Rodzalan's and Saat's (2016.p.296) indications that honesty is perceived differently from one student to another, because "*One person's bribe is another's gift*".

7.8.3 Importance of respect for life, law and the public good

One interviewee indicated that they rated Respect for life, law and the public good as the most important set of ethical skills to the engineering profession. They related these perceptions to some famous unethical incidents that took place in their countries which affected their rating and their overall perception of importance. These students also reflected that the RAEng's vision of professional engineers are those who consider the safety of others who might get affected by their work (The Royal Academy of Engineering, 2011.p.40). This is evident in these comments *"in the past there was no standard of LED light in the Chinese market, and some companies aim at decreasing costs and increasing money incomes, so they choose bad materials to create those LED lights. That's why more and more children wear glasses in China, and that's why I think this is the most important ethical rule we should obey as engineers".*

7.8.4 Importance of responsible leadership: listening and informing

One interviewee also indicated that they rated Responsible leadership: listening and informing as the most important set of ethical skills that are required for the profession, as one of the engineers' duties is informing (The Royal Academy of Engineering, 2011.p.54). For instance, noting that *"... people need to listen and be informed regardless of how bad the situation is, they need to know the risks involved in engineering tasks. In engineering there are lives at stake…and people who do not have leadership skills, will give the chance to their employees to do whatever they like, and they might jeopardize the lives of themselves and others. This is very important, because I've seen things in my work believe me!"*. On the other hand, some interviewees indicated that they believe that these skills are not important to the engineering profession. For example, believing that *"all minds are different, and it's hard to convince and make everybody believe and follow the steps of an engineers, besides, It's not the engineers' jobs to do that* [pointing to the statement of to promote public awareness], *I think it's not necessary"*. While this might be acceptable for an individual engineer to choose not to get involved in political debates and changing laws, according to the Royal Academy of Engineering's (2011), engaging

in the wider activities are still part of the engineer's responsibilities. Activities, such as sustainability of energy, ensuring security, interest in climate change and protecting personal data are high profile issues that are related to policy, and the engineering profession should make contributions too. Other students indicated that they think it is important, but not as much as other ethical skills, and they believed leadership is related to personal skills and charisma. This was stated as "*Leadership is important, but it depends on the individual engineer, some engineers don't have the leadership skills or charisma to lead others, which makes it difficult to lead teams"*. The comments suggest some misconceptions about leadership, in which the students believed that leadership always involves leading others, and not understanding the breadth of the leadership terminology, in which it includes leading one's self and leading performance and change (Zapalska, Jackson and Zelmanowitz, 2016). Furthermore, other students believed that it is not the main responsibility of an engineer to inform the public, and that it is more a responsibility of the government. This was conveyed in *"I think it's not an engineering task, especially if you don't have enough power to make people understand and listen. Maybe the company's manager or the government have more power and authority, and people then will respond to them. Yes, it's one of the responsibilities of an engineer but not the main one"*. The student argued that promoting public awareness is the responsibility of people in charge, and that is something out of their control (Ajzen, 2002) and that achieving such a task might be considered difficult (Ajzen, 2002) (Ajzen, 1985). Other students added that their cultural, educational, and employment environments and backgrounds have affected their ethical perceptions, especially their working habits with others. This was something expressed by saying "*From my work experience, leadership is not so important and not been emphasised on in the Chinese education"* and *" usually, we are just members who work in a team, and we only have to achieve the team goals without arguing".* This reflect Jones's (1991) indications, that in organizational environments, it is more complex and complicated to think and act in an ethical way individually, and therefore, the organizational factor can create obstruction to the individual's moral thinking and it is affected mainly by the cultural effect on professional ethics principles where the Collectivistic strategies are dominant (Hofstede, 1983).

The researcher then moved to the second question in the interview guide that matched the survey's second question (To what extent do you agree with the following being developed by your programme?).

7.8.5 Development of accuracy and rigour

Four interviewees indicated that they developed accuracy and rigour, and they had many different opinions about why they thought this set of ethical principles were mostly developed. Some of these students think that their writing skills improved their accuracy and rigour abilities (The Royal Academy of Engineering, 2011.p.22). This was something explained as *"Accuracy was developed by improving our writing skills, learning to work in groups, and learning how to do peer reviewing"*. Moreover, some students added that they developed accuracy and rigour due to some modules and the ethics workshop (Colby and Sullivan, 2008). This was implied by expressing that *"we were taught in the enterprise module how a business might fail if we are not accurate".* This indicates the possible effectiveness of the case methods that have been used to teach professional ethics to engineering students, and fostered the development of their ethical cognitive skills (Leake, 1994) (Kolodner, 2014).

7.8.6 Development of honesty and integrity

As for the ratings of honesty and integrity skills, only one interviewee mentioned that these skills were developed while studying at the UoY. Some of them stated that "*here at York, there is a lot of emphasis on referencing, and plagiarism, but compared to my previous university in Germany, I never considered referencing before coming here"*. This substantiates Rest's et al. (1986) and Narvaez's (2009) suggestion that ethics education can improve participants' self-management of ethical conduct. Some students did not remember whether they had any formal standalone educational intervention specifically dedicated to honesty and integrity while studying at York (Ruspini, 2002) (Cubitt, 2007). This was stated by saying *"I have enough knowledge in honesty, and I have some job experience, but I don't remember which module provided me with honesty skills, because our modules were mainly based on engineering management"*. Others believed that this set was least developed because they suggest that these ethics are already shaped in their early years *"I believe these two ethical standards we learned as we grew up, and we are expected to hold high ethics in accuracy and rigour, not like the other professional ethics"*. This opinion supports McDonald's and Donleavy's (1995) indications that ethics are usually viewed as a personal matter and are already set and shaped in individuals in their early years.

7.8.7 Development of respect for life, law and the public good

One interviewee, who claimed to have no work experience, reported developing the set of Respecting life, law and the public good, as the most. The student believed so due to having studied a law module *"For respect for life, we have a module of International business. We learned that the public opinion is valued, especially when starting a new business, and we also learned about the importance of knowing legal laws and regulation of the country that will host this new business establishment".* This suggests that undertaking ethics educational intervention have an influence on ethical perceptions and awareness among students (Craft, 2013). On the contrary, some students believed that skills in relation to respect for life, law and the public good has not been developed, because according to them, they came to the university to study a one year MSc degree, and one year is barely enough to learn other important subjects (Newberry, 2004). This was assumed due to students stating that "*in my opinion, we came here to learn and improve our engineering management skills, which we need to focus on most. We only have one year to do our master's degree, and we don't have enough time to learn not so important topics, such as respecting life or leadership and improving my skills on how to make others believe me or listen to me".*

7.8.8 Development of responsible leadership: listening and informing

One interviewee indicated that they rated their development in this set of skills as their highest. The interviewee believed this is so due to learning to work in teams and dividing responsibilities (The Royal Academy of Engineering, 2011.p.36 and 55) (Bucciarelli, 1994). This was confirmed by some of the other students saying *"we have been divided into groups where we did a group project, and we were expected to work as a group. I think this has developed our leadership skills, and every now and then we were advised to change the team leader so that all of us take chances in leading the group".* In contrast, five out of the seven interviewees believed that they did not develop leadership skills during their study time in York. A few students said "*I and some of my friends doing engineering ranked our leadership skills as the least developed set of skills that we acquired from the engineering degree here, because here they focus more on the technicality. Am not sure if it's important or not, but the fact is there is a lack".* This lack of development could be the reason for rating it as less developed due to a lack of ethical awareness (Rest et al., 2000). In addition, some students argued that there were not enough learning topics about ethics, but more about research misconduct, and therefore

did not develop their ethical skills in general. This was implied by expressing that *"in the programme, there was nothing much about learning ethics, they are mostly focusing on the ethical sides of research areas. Although we have been taught ethics in the law module"*. Possibly due to the long period of time since the educational events had occurred, and the degree of importance of that event to the interviewees, their memory of the degree of information might have reduced (Cubitt, 2007). The students had several modules in which engineering ethics were embedded in other technical topics (University of York, Law for Engineering Management for MSc, 2019). Therefore, there could be a possibility of interfering and disturbing effects from similar events' that influenced their memories and affected interviewees' abilities to distinguish between similar events (Ruspini, 2002). In addition, some of the interviewees indicated that the lack of development is due to their cultural orientation and origins (Hofstede and Bond, 1988) "*I and other people from China don't like to debate…it's hard for us to stand out, so I think in my opinion it's just a personal nature, I prefer someone to lead me and my group and he will make this work better, but not me"*. This also supports Ajzen's (2002) proposals on self-efficacy and controllability factors, where he suggested that the individual's perceptions of the degree of difficulty or ease and of rewards and punishments can all influence perceptions in general (Zapalska, Jackson and Zelmanowitz, 2016) (Ajzen, 2002). Many students who stated this set as least developed proposed different solutions to improve ethics education in the engineering programme at York.

7.9 Summary of the findings

In general, the students talked about different factors that had impacted their ethical views and reflected on their ethical perceptions in the survey. The interviewees mentioned factors, such as their work (Saunders, Lewis and Thornhill, 2009.p.27) (Ford and Richardson, 1994) (Bommer et al., 1987) and educational background (Craft, 2013) (Ford and Richardson, 1994), the way they were raised up , and their societal orientation and culture (Creyer, 1997) (Koiranen, 2002). Many students referred to the impact of the ethics education they had during their study at York, and how it impacted them to increase their overall ethical awareness and judgements (Baruah, Atesh and Ward, 2017). In addition, many of the interviewees believed that the first two sets of accuracy and rigour, and honesty and integrity are the most important sets of ethical principles to the engineering profession, and few of them summarised "*without being honest, accuracy can be affected, so I think both of them are the core important principles to engineering*".

On the other hand, many students had controversial options for responsible leadership: listening and informing. Some perceptions were related to cultural beliefs (Hofstede and Bond, 1988). Others were related to misconceptions about leadership terminologies (Zapalska, Jackson and Zelmanowitz, 2016). On the other hand, some students seemed not to properly remember and gave conflicting information about some of the ethics education interventions. This perhaps is related to the long period of time that had passed since the educational event had occurred, and the low degree of importance that was given by the students to that event (Cubitt, 2007). Specifically, the Masters level students had several modules in ethics and the undergraduates are taught engineering ethics in the other technical modules (University of York, MSc Engineering Management, 2019). Therefore, there could be a possibility of interfering and disturbing effects of similar events that influenced their memories and affected interviewees abilities to distinguish between similar events (Ruspini, 2002).

To conclude the findings of this phase, some elements of the proposed conceptual model were evident in the analysis of this phase, such as the effect of individual differences like ethics education and employment, which supported the previous phase's findings, that students who had no prior work experience felt that they have improved their ethical knowledge (Hunt and Vitell, 1986) (Hunt and Vitell, 2006) . Another element that was evident is the cultural effect, especially Hofstede's (1983) and Hofstede's and Bond's (1988) proposals on the cultural effects of uncertainty avoidance, power distance (Hofstede, 1980), Confucian cultural beliefs (Gong, 2010), and Ajzen's (2002) self-efficacy and controllability. However, as for the effect of the universities micro-ethics (Roddis, 1993) (Bielefeldt, 2018) (Herkert, 2005), there is also some evidence in this study phase that it has effects in shaping students' ethical perceptions.

7.10 Limitations and highlights of Phase II study 2

There is one limitation associated with the semi-structured interview method that was used in Phase II, and that is reaching saturation (Guest, Bunce and Johnson, 2006) (Mason, 2010). This phase might be criticised for including seven interviewees who are students from York only and not from Coventry, which was due to the PhD time limitation. A broader heterogeneous sample should be considered in the future to include more cultures, gender, sub-disciplines and universities to fully cover a similar heterogeneity sample as the one that responded to the survey (Guest, Bunce and Johnson, 2006).

On the other hand, there are some highlights of the semi-structured interviews that were conducted. For example, many students referred to the impacts of the ethics interventions in the programme and how these interventions helped them improve their ethical awareness, judgement and skills. The interviews also help in highlighting the usefulness of historical cases in teaching ethics education to engineering students, where they could relate to the importance of ethical skills and considering potential risks (Colby and Sullivan, 2008) (Richards and Gorman, 2004). In addition, they discussed a few other things that they have learned during these educational interventions such as the importance of public opinion when considering opening a new business, the importance of knowing the laws and legal regulation in the country which they learned in the International business module (Craft, 2013), what might be considered as a bribe or a gift and why, and reflecting on general ethical issue such as academic misconduct. On the other hand, the interviews revealed some misconceptions the student held regarding some terms and beliefs, which is something to be considered in the curriculum in future.

7.11 Discussion of Study 2

As indicated earlier, this study consists of two phases that were designed to complement one another and overcome the limitations that might emerge from one study design. Phase I have achieved the objectives of conducting the quantitative phase of the study, that is to collect statistical data and give priority to the quantitative data to design the second phase depending on the quantitative results to be followed up. The first Phase found that:

- There was a statistically significant difference in the perceptions of the importance of Honesty and Integrity scores, in which the British students scored higher than the Chinese students
- There was a statistically significant difference in the perceptions of the development of Accuracy and Rigour, Honesty and Integrity and Respect for life, law and the public good scores, in which the students with no work experience scored higher than the other group.
- There was a statistically significant difference in the perceptions of the importance of Accuracy and Rigour, Honesty and Integrity and Responsible Leadership scores, in which the students of Coventry scored higher than the students of York. In addition, there was a statistically significant difference in the perceptions of the development of Accuracy and Integrity, Rigour Honesty, Respect for life, and Responsible

Leadership scores in which the students of Coventry scored higher than students of York.

Phase II also has achieved its intended aims by providing some insights and explanation to the primary data that were collected from the previous phase and validating them to confirm and strengthen some of the results that emerged from the first phase. For example, in one of the findings of Phase I indicated that the group of students who had no work experience rated their development in Accuracy and Rigour, Honesty and Integrity, and Respect for life higher than the other group. This was assumed to be because the group with work experience might have already gained some ethical skills from their work (Stevens, 1984) (You, 2014), therefore, felt no change or additional skills were gained. This was further confirmed by some interviewees with little to no work experiences, which support the idea that undertaking ethics educational intervention influenced their ethical awareness, judgements and perceptions (Craft, 2013).

As indicated in subsection 7.6, there were some limitations that were observed in some responses in the survey, which are related to the difficulty in understanding the differences between question items 8 and 9. That is further confirmed in Phase II analysis results when one student expressed and justified that, which confirmed the researcher's suspicions.

As discussed in subsection 7.5, the students rated the perceived level of importance and level of development of Respect for life, law and the public good as the highest in both measures. Some students referred to reasons such as social issues related to their communities, in which unethical acts affected children and their wellbeing. Other students referred to studying historical disasters such as the space shuttle disaster, and studying a module in international law which expanded their views about the responsibilities and roles of engineers, and how these roles can impact other people (The Royal Academy of Engineering, 2011). On the other hand, Phase I indicated that many students reported their perceptions of importance and level of development in Responsible Leadership: listening and informing as the lowest. Phase II provided more insight into the possible reasons for why such perceptions were taking place. Some students indicated that leadership is not the core of the engineering profession. While others agreed that it is important, they argued that it is not as essential as Accuracy and Rigour or Honesty and Integrity (The Royal Academy of Engineering, 2011). Others added that due to they're cultural believes, they did not perceive this set of principle as

important as the rest, and for this, they did not have the motivation to develop it (Jones, 1991).

The factor analysis of Phase I also showed that four factors have resulted from the importance measure, factor 1: Ethical Integrity, factor 2: Health and Safety, actor 3: Societal and Environmental Impact and factor 4: Engineering Professionalism & Responsibility. As for the development measure, three factors that have resulted from the analysis are factor 1: Concern for Others, Society and the Environment, factor 2: Work Responsibly for Now and the Future and factor 3: Risk Evaluation & Management. The reliability test indicated that the scales of the two measures were fit to measure the intended measure, and the RAEng's four scales of the two measures were also tested and found to be fit to measure the intended measures. The two measures' reliability results were compared in terms of values of their scales and both were higher than 0.7, which suggest that no scale is better than the other, in terms of goodness, and any of the two, whether resulted from the factor analysis or proposed by the RAEng can be used.

7.12 Connecting findings to the new integrative model proposed

The findings of this study support and highlight some of the proposed elements of the "The New Integrative Model for Evaluating Ethics Education", that was discussed and illustrated in Chapter 3 subsection 3.6 Figure 3.2. The model started by stating that the environment has effects on an individual's ethical perceptions, and in both phases of this study there were several examples of this effect. For example, in Phase I, there were some indications that British students perceived Honesty and Integrity higher than the Chinese students, but overall, no significant difference was found in the four scales of the perceived importance and development among the two groups. This is consistent with Haidt's and Graham's (2007) suggestions that all cultures base and build their virtues on the same foundations of morality, but they can vary on the degree to which the emphasis on them. The other essential factor that can affect students' ethical perceptions is moral intensity and characteristics of the moral issue (Jones, 1991). In addition to the influence of different ethical dilemma paradigms (Kidder, 1996) (O'Fallon and Butterfield, 2005) (Craft, 2013). In regard to the effect of individual differences in perceiving ethical issues, some students during the interviews acknowledged the effect of individual difference in terms of potential influence on ethical perceptions (The Royal Academy of Engineering, 2011) (Zapalska, Jackson and Zelmanowitz, 2016). Moreover, other students indicated that ethical principles, such as accuracy and rigour are learned as the individual grows up

rather than at later stages, and that's why some of them believed that they did not develop these skills (Kohlberg, 1969). This was further supported by some findings in Phase I in which the group that had no work experiences rated their development in Accuracy and Rigour, Honesty and Integrity and Respect for life, law and the public good higher compared to the group with work experience (You, 2014). The other component of the model which the researcher believed this study has supported is moral reasoning and development. Some students suggested that being introduced to different modules, such as law and international business, and working in teams, improved their ethical awareness and judgements (Kohlberg, 1969) (Rest et al., 1986). Another element this study supported is the effect of micro-ethics, whether it is the university's code of ethics or the sub-disciplinary. In Phase I several statically significant differences were observed among the two groups of students from the two HEIs, which indicated differences in perceptions of the students in relation to these micro-ethics. Phase II was also able to capture an indication to the effect of these codes on students' ethical perceptions, yet due to some limitations discussed earlier in subsection 7.10, including a broader perspective regarding the micro-ethics effect from students at Coventry was not possible. Therefore, evidence from both phases was identified, yet not from both universities. Thus, the findings of Study 2 provide more support to the proposed model overall.

7.13 Chapter summary

This chapter has presented the findings of Study 2 with its two phases. The first phase sought to identify differences among different groups of students, in terms of gender, culture, work experience, ethics education, and educational institution micro-ethics effect. To meet these objectives, data from two engineering departments at the UoY and CU were modelled using descriptive statistical analysis using Independent Sample T-Test to establish five comparative studies. The results of these comparative studies indicated mixed results. Thus, the findings from the first phase of the mixed method were able to successfully identify some differences in relation to culture, education, and educational institution's micro-ethics effect among students studying Engineering in two HEIs in the U.K, as represented by the samples. This study found one statistically significant differences between the ratings of British and Chinese students, where the British students rated the level of importance of Honesty and Integrity higher than the Chinese students. Three statistically significant differences were also found, where the students with no work experience rated their level of development in Accuracy and Rigour, Honesty and

Integrity and Respect for Life, Law and the Public Good higher than the other group. Finally, the study found seven statistically significant differences between the ratings of the students of the UoY and CU. Coventry students rated the level of importance of Accuracy and Rigour, Honesty and Integrity and Responsible Leadership: Listening and Informing higher than the group of York. They also rated the level of development of Accuracy and Rigour, Honesty and Integrity, Respect for Life, Law and the Public Good and Responsible Leadership: Listening and Informing higher than the group of York. This chapter also presented the findings from the scales' factorial structure analysis, which sought students' ratings of the RAEng's ethical principles to identify and compare the factorial structures of the students' ratings to the RAEng's four main principles. This objective was successfully achieved using Exploratory Factor Analysis of data collected from the engineering students at both UoY and CU. The findings suggested that the factorial structure of the students' perceptions differ from the RAEng's four main principles structure. For the rate of importance measure, four factors resulted from the analysis, and for the rate of development measure, three factors resulted from the factor analysis.

Phase II of the mixed method study tried to explore and understand why engineering students at the UoY, Department of Electronic engineering perceived the level of importance and development of ethical principles and skills differently. This objective was achieved through the collection and analysis of qualitative data from semi-structured interviews held with a small sample of engineering students studying at the UoY. The findings of the qualitative analysis identified some of the factors that influenced their ratings of importance and identified the students' perceptions of their development in ethics skills. It also helped to identify some of the perceptions about the extent to which they think the programme was able to help them improve these skills, and how to improve them in the programme. After discussing some of the key findings from both phases, these results were triangulated and merged to form the overall results of Study 2.

The next chapter will provide a discussion of the thesis and the conclusions which will focus on answering the main research question with its two sub-questions, and the contribution of this research thesis to the body of literature and Engineering Education in particular.

Chapter 7 Discussion and Conclusions

8.1 Chapter overview

This chapter aims to critically examine the thesis findings, make and present judgements about what has been learnt to tell the readers what the findings in this thesis may mean as well as how and why these findings are valuable. This chapter will also provide a summary of the interpretations and a triangulated answer to the main research question, 'How effective is ethics education in the engineering curriculum?'. This chapter restates the research aims and objectives and summarizes the key findings of this thesis in addition to outlining the original empirical and theoretical contributions that this research makes to literature. This chapter introduces some recommendations and future considerations for the design of ethics education in the engineering curriculum. Finally, it outlines a few future recommendations for the RAEng and few topics for further research.

8.2 Summary of the findings

The findings from this multi-phase multiple methods methodology provide new evidence for the effectiveness of ethics education in the engineering curriculum, and for the way different individual and organisational factors can affect students' ethical perceptions. A summary of the findings of this thesis and how they contribute to the existing body of literature are discussed and presented below, in which all findings from the four phases of the two studies are integrated and triangulated to answer the main research question.

8.2.1 Rest's FCM

The discussion in Chapter 2 of Rest's et al. (1986) four components model (FCM) indicated that an individual goes through four cognitive processing stages during an ethical decision-making process, which are moral awareness, moral judgement, moral intentions or motivation and moral behaviour. Chapter 2 also stated that researchers, such as Jones (1991), Trevino (1986) and Shah and Amjad (2016), argued that most of the models that have been developed so far in the field of ethics were based on Rest's model. Rest looked at ethical decision-making process as a process that purely involves reason, neglecting the possible individual and organisational factors that can impact moral reasoning and stray the individual's ethical compass. Thus, Rest's model cannot be considered the most persuasive model for ethical decision making as it neglects psychological and social aspects. Therefore, researchers, such as Jones (1991) and Kidder (1995) tried to extend Rest's model by providing some possible factors that can impact the individual's ethical decisions. Jones (1991) and Kidder (1995) focused on the effect

of the characteristics of the moral issue and the conflicts of several ethical paradigms that can be embedded in an ethical dilemma. In other words, extending Rest's FCM. On the other hand, Gino (2015) also provided another addition to Rest's 'ethical/unethical decision making' behaviour outcome, and suggested a third possibility, that is unintentional unethical behaviour. Unintentional unethical behaviours are decisions or behaviours committed due to being unaware or bounded ethicality (Shalvi, Gino and Barkan, 2015) (J. Haidt and C. Joseph, 2004). Further, Haidt and Joseph (2004) argued that moral judgment involves quick feelings and intuitions, which then trigger moral reasoning, placing emotions as the main drive of moral decisions, and criticising Rest's FCM as neglecting the important role of emotions in this process. Jones (1991) also addressed the impact of Ferrell and Gresham (1985) proposals of opportunity and the role of rewards and sanctions in motivating or demotivating individuals to behave ethically. This aspect was also not present in Rest's FCM. Thus, the new conceptual model proposed in this thesis is considered a better version of Rest's FCM considering the extensions provided and concepts highlighted by the other researchers.

In this thesis, Rest's FCM was used as a basic element to develop a new conceptual model "The New Integrative Model for Evaluating Ethics Education". The results of the analysis of this thesis indicated that Rest's four stages of ethical decision making were evident during the focus group discussions and the reflective writing interviews in both groups , and as discussed in Chapter 3, the Royal Academy of Engineering (RAEng's) Statement of Ethical Principles (SEPs) are also aligned to Rest's FCM. Rest's FCM stages were evident as students were able to recognise and identify the ethical issues in the given case scenarios, and they showed awareness that their actions might have potential harm or benefit to others (Rest et al., 1986). The students also showed various degrees of ethical and non-ethical judgements and intentions, which confirms that being aware of the ethical implications in a situation does not necessarily mean that students will always hold ethical judgements and intentions, or behave in an ethical manner (Rest et al., 1986) (Rodzalan and Saat, 2016). The students demonstrated their ethical reasoning by indicating the potential choices and the potential consequences of their choices, to determine which might be the more ethical choices (Rest et al., 1986). Moreover, the analysis identified some patterns of the students' skills in prioritising moral issues over other issues and forming moral intents. Thus, Rest's model is proved to be an effective tool to explore an individual's internal process of ethical decision making, and it includes all the key

elements in moral decision making and moral behaviour (Jones, 1991). Moreover, Rest's model proved to be able to offer a simple illustration on how each stage in the process can influence each other via feed-forward and feedback cognitive loops affecting intentions and behaviours, which all played important roles (Rajeev, 2011) (T. Moores J. Chang, 2006). This model also provided an understanding and description of the other components of ethical decisions and their dynamics (Rajeev, 2011). These findings support the current literature that Rest's model can be applied in many disciplines, particularly in engineering (Atesh, Baruah and Ward, 2017) (Atesh, Baruah and Ward, 2016), and provides more insights to the other possible factors that can affect ethical decisions besides Rest's FCM. The findings also confirmed Rest's et al. (1986) proposals that one stage can influence and interact with the other stages, but each of the four stages performs unique functions at an individual level. For example, being aware of the ethical implications in each scenario does not necessarily mean that the individual will hold ethical judgements or intentions. Furthermore, the findings of this thesis extend Rest's model and supports Gino's (2015) suggestions that two forms of behaviours can take place, unintentional unethical decisions, and intentional unethical decisions. In the first form, decisions or behaviours are committed as a result of being unaware or being ethically bounded. On the other hand, intentional unethical behaviours are committed by individuals who intentionally bend ethical rules, either to serve themselves or their group (Shalvi, Gino and Barkan, 2015) (Gino, 2015). The findings of this thesis also highlighted the impact of Jones's (1991) MI and Kidder's (1995) four ethical dilemma paradigms on the students' understandings and ethical perceptions of a given ethical case scenario. Furthermore, this research thesis's analyses demonstrated the important role of moral emotions in the ethical decision-making process (Haidt and Joseph, 2004), as in some cases students' moral obligation feelings motivated them to hold ethical intentions. Moreover, the findings emphasised that ethics education also impacted the personal goal orientations of the students. Students who were exposed to ethics education demonstrated higher tendencies to obey the law out of respect and not fear of punishment and maximise internal and psychological rewards such as being guilt free. On the other hand, the other group who were not exposed to ethics education demonstrated higher tendencies to maximise self, physical and external rewards and obeyed the law out of fear of punishment, which highlighted Ferrell and Gresham's (1985) rewards and sanctions.

The findings of this thesis provide empirical evidence on some of the theoretical literature, such as Kidder's four paradigms, extending and filling the gaps in Rest's FCM. Therefore, they are vital, because they provide more understanding to Rest's process of ethical decisions, since the factors affecting different aspects were addressed in this process, such as individual difference, demographics, professional experience and micro-ethics. Therefore, this can provide a better understanding of how ethical decisions are made and followed through, which is the first step of making better ethical choices. Understanding this can give ethics educators in the engineering curricula the opportunity to build their own strategies to teach ethics to engineering students and maximise the effectiveness of ethics education in the engineering field.

8.2.2 Key factors affecting ethical decisions

The literature in Chapters 2 and 3 discussed the effect of certain factors on the students' ethical perceptions and reasoning. Factors, such as socio-legal and socio-cultural attitudes (Simpson, Banerjee and Simpson Jr., 1994), definitions of cheating and personality characteristics can all influence ethical reasoning and perceptions (Barnett and Dalton, 1981). The literature also added that perceptions of rewards, sanctions (Ferrell and Gresham, 1985) (Buch and Rivers, 2001), risks (Mulder, 2018), micro-ethics (Herkert, 2001), ethical blind spots and implicit biases (Sezer, Gino and Bazerman, 2015), parents (Creyer, 1997) (Koiranen, 2002) and peers (Treviño, Nieuwenboer and Kish-Gephart, 2013) can all affect students' ethical reasoning, perceptions and behaviour. In addition, there are the effects of cultural norms (O'Fallon and Butterfield, 2005), different ethical development levels (Kohlberg, 1969), loyalties (Kidder, 1995), past experiences (Schwartz, 2016), emotions (Greene et al., 2001), and work environments (O'Fallon and Butterfield, 2005) (Bommer et al., 1987).

The results of this thesis's analyses confirmed the effect of these factors, that were theoretically stated by the previous researchers, on students' ethical reasoning and perceptions. Examples of such factors that were evident in the analysis results were the individual differences in perceiving rewards and sanctions (Kohlberg, 1969), personal priorities (Fitzsimons and Fishbach, 2010), perceptions of risks (Mulder, 2018) as well as ethical blind spots and implicit biases (Sezer, Gino and Bazerman, 2015). These were in addition to the effect of significant others (C. Moore and F. Gino, 2013) (Treviño, Weaver and Reynolds, 2006) such as parents, familial values (Creyer, 1997) (Koiranen, 2002) and peers (Treviño, Nieuwenboer and Kish-Gephart, 2013), the effect of cultural norms

(O'Fallon and Butterfield, 2005), pressures to be the best, emphasis on perfectionism, misconceptions about making mistakes, and time pressures (Gaberson, 1997) (Barnett and Dalton, 1981). Other factors are competitiveness, fatigue (Gaberson, 1997), different ethical development levels (Kohlberg, 1969), loyalties (Kidder, 1995), and past experiences (Schwartz, 2016). Moreover, factors such as personal perceptions of the probabilities of harm and moral intensities of the moral issues (Jones, 1991), emotional engagements (Greene et al., 2001), work environments, and ethics education experiences (Atesh, Baruah and Ward, 2017) can all influence the students' ethical perceptions (O'Fallon and Butterfield, 2005) (Bommer et al., 1987) which were also evident in the results.

The findings of this thesis highlighted and confirmed three factors that were previously mentioned in the literature without empirical evidence, namely, the effect of the micro-ethics of different educational institutes, cultural effect and perceptions of rewards and sanctions. The findings of this thesis, confirmed some of the empirical evidence discussed in Chapters 3 and 4 about the effects of micro-ethics (Rodzalan and Saat, 2016) (Carter et al., 2016) in shaping students' ethical perceptions and reasoning, and gives more empirical details about the effect of sub-disciplinary micro-ethics effects. The thesis demonstrated that the Electronic Engineering students from the University of York (UoY) rated sets of the RAEng's SEPs professional ethics differently compared to the Mechanical Engineering students from Coventry University (CU). Therefore, this thesis provided an extension to the empirical evidence that was provided earlier in Chapter 4, that students' ethical perceptions can vary depending on the HEI's code of ethics and on the sub-disciplinary professional codes of ethics, and this is a new value added to the body of literature. In addition, the findings of this thesis, add to and extend the currently existing literature that was previously discussed in Chapters 2, 3 and 4 on the many factors that can play important roles in affecting students' ethical perceptions and decisions. Hence, these findings suggest that all these factors are equally important and have different degrees of impacts on students' ethical perceptions and awareness, but since this thesis is focusing more on assessing the effectiveness of ethics education, the main aim is to focus on this aspect with respect to other influencing factors. This thesis is different from other studies done in the past, as some studies focused on certain aspects of ethical skills, such as leadership, and the effect of culture on these skills without giving more details on how culture affected these perceptions (Schuh et al., 2014) (Yukl, 2013). Other

researchers, such as Hofstede (1998) and (2011), mentioned the effect of culture on perceptions and behaviours in general, without specifying certain ethical behaviours or perceptions. The findings of this thesis provided more clarity and insights on how the cultural dimensions of un/certain avoidance and power distance affected some Chinese students' motivations to increase their knowledge about topics involving leadership skills. Thus, this thesis adds new aspects to the cultural dimensions of the literature on ethics education, which was not evident in the literature review, and is a new contribution to the body of literature. Finally, Chapter 2 discussed how certain perceptions of rewards and sanctions can affect the students' ethical motivation, and eventually perceptions (Ajzen, 2002) (Ferrell and Gresham, 1985) (Mulder, 2018). This was based on theoretical theories and frameworks, that related them to the ethical maturity levels (Kohlberg, 1969). Kohlberg (1969) theorised his proposals based on observations and psychological measurement scales he developed, indicating the general tendencies and goal preferences for each level of moral development, without giving details as to what these goals could be. In addition, Kohlberg (1969) did not provide details nor examples of rewards and sanctions at an HEI level, nor the effect of culture and different HEI code of ethics on the students' ethical moral reasoning level. Therefore, this thesis gave more details and examples of what such rewards and sanctions could be, such as internal/external and physical or psychological, and highlighted the role of culture and HEIs' micro-ethics in shaping students' ethical reasoning and perceptions. This thesis expanded Ferrell and Gresham's (1985) theoretical suggestions and Kohlberg's (1969) empirical suggestions by explaining how these perceptions occurred and were supported by qualitative evidence from the HEI students, which was not evident in the literature that was discussed in Chapter 2. Hence, this thesis contributed to the body of knowledge by providing an understanding of the importance of these factors and how their roles in affecting and shaping students' ethical perceptions can help educators identify the needs of their students and improve ethics education and their teaching tools and methods.

8.2.3 Key ethical skills

The literature discussed in Chapter 3, indicated two streams of important skills in moral reasoning, that is ethical sensitivity and engineering professional ethics. The literature on moral reasoning suggested that there are several key skills that can contribute to moral sensitivity, such as metacognition and self-regulated learning (Schraw, Crippen and Hartley, 2006), abilities to analyse reasons beside developing particular ethical

judgments, and being aware of the strategies that are used to reach that judgment (Cheruvalath, 2019). Others included having the ability to analyse one's own weaknesses and strengths, being aware of the possible factors that can affect these ethical judgments, such as one's own emotions and culture, ability to control and manage these emotions (Gauthier, 2013), and regulate them when needed (Cheruvalath, 2019). The literature also suggested that ethical skills include leadership and possessing strong ethical characters along with critical thinking while considering consequences (Kulju et al., 2015), which are also essential skills for professional behaviour, where leadership includes leading self, others, and performance (Zapalska, Jackson and Zelmanowitz, 2016). Additionally, the literature indicated that having emotional skills, such as showing empathy and compassion (Kulju et al., 2015), moral obligation, and professional concerns also contribute to ethical sensitivity (Weaver and Mitcham, 2016) (Cronan and Al-Rafee, 2008) (Bairaktarova and Woodcock, 2017). On the other hand, The Royal Academy of Engineering's (2012) SEPs indicated that, besides Rest's et al. (1986) four components, professional engineers should develop their professional ethical skills in four main sets of ethical principles. These four sets are Accuracy and Rigour, Honesty and Integrity, Respect for life, law and the public good and Responsible leadership: listening and informing, which include more ethical statements, and these two perspectives were considered and combined in this thesis.

The analysis of this thesis revealed several key ethical skills that were highlighted by the literature but without empirical evidence. For example, some aspects of ethical sensitivity, such as metacognition (Schraw, Crippen and Hartley, 2006) (Pintrich, 2002) was stated in the literature as being important to ethical sensitivity, yet, no empirical evidence nor examples were provided. The analysis provided several examples of metacognition where students reflected on their past unethical behaviours, highlighted the weaknesses and errors in these behaviours, and some indicated their future ethical intentions while others stated that their behaviour has already been changed. Based on these findings, this thesis provides new empirical evidence that supports metacognition as a key ethical skill for ethical sensitivity. Another important key ethical skill that was highlighted by the analysis is leadership, where the literature indicated three components of leadership (Zapalska, Jackson and Zelmanowitz, 2016). The qualitative analysis revealed some misconceptions held by the students regarding this concept, that leadership only focuses on leading others, which also was not highlighted in the literature (Zapalska,

Jackson and Zelmanowitz, 2016). Moreover, the literature emphasised on emotional skills, such as showing empathy and compassion when referring to ethical sensitivity but lacked empirical evidence and examples to show how empathy and compassion can be shown by students. Furthermore, the literature indicated that there is a gap in assessing ethical behaviour (Mumford et al., 2006), and this thesis helps to address this gap by finding that students have changed their ethical views and behaviours after being exposed to ethics education. Therefore, these empirical findings add new value to the existing literature in evaluating the effectiveness of ethics education.

In addition to the new addition in the moral reasoning literature, using the RAEng's SEPs framework in combination with the moral reasoning classical framework, is a novel new addition to the body of literature. As discussed in Chapter 3, The Royal Academy of Engineering (2012) urged engineering schools and programmes to develop certain sets of ethical and professional skills, and introduced these sets of professional skills in their SEP. The analysis' results showed that students believed these ethical principles were important to their careers as engineers, especially the first three sets of ethical principles, as they believed that these sets are the core sets for the engineering profession.

8.3 What has been learnt?

The discussion in Chapter 3 shows that Rest et al. (1986) and Rohatyn (1987) emphasised the importance of ethics education and how it is essential in shaping a student's ethical decision making, reasoning, and what is considered right and wrong. The findings of this thesis indicated that the group who did undertake the ethics educational intervention demonstrated superior skills in meta-ethical-cognition and awareness about their own ethical cognition (Cheruvalath, 2019), higher levels of moral obligation feelings (Bairaktarova and Woodcock, 2017), and clear ethical future intentions (Rest et al., 1986). Moreover, this group of students in comparison to the other group, expressed ethical future intentions (Rest et al., 1986) (Kulju et al., 2015), more ethical sensitivity in general (Cheruvalath, 2019) (Batha and Carroll, 2007), and more awareness of developing their ethical cognition levels (Batha and Carroll, 2007). On the other hand, the group who did not take the ethics educational intervention demonstrated biased ethical judgements most of the time, as they sought to satisfy their personal needs and desires (Kohlberg and Hersh, 1977), and obey the rules out of fear of punishment (Kohlberg, 1969). Some of them demonstrated little care about how they did things (Carroll and Shaw, 2012) (Curran, 2008), lacked emotions (Lewis, Amini and Lannon, 2001), and justified their personal

interests as morally right by appealing to their personal benefits (Trevino, 1986). These distinctive skill patterns suggest that ethics education affects ethical decision making and behaviour, because it appears to have an impact on shaping a student's ethical decision making, reasoning, and what is considered right and wrong (Rest et al., 1986) (Rohatyn, 1987).

The findings of the thesis contradict Borkowski and Ugras (1992), Davis and Welton (1991), Martin (1982) and Salmansaug (1987) arguments, in which they believed that ethics education cannot affect student's ethical reasoning and decision making. The researcher partially agrees with McDonald and Donleavy (1995) assertions, that studying ethical decision making might be considered as 'invasion of privacy', as there were some observations suggesting that social desirability phenomena may be taking place on different occasions. This phenomenon could be related to several reasons in relation to this study. For example, social desirability biases and insecure feelings are expected in almost all studies studying ethics (Randall and Fernandes, 1991)(Randall, Huo and Pawelk, 1993)(Woodyatt, Finneran and Stephenson, 2016). Participants tend to use social desirability strategies to present themselves in favourable images and to avoid negative judgements or evaluations. This happens because some of them might think that some questions ask them to expose unpleasant sides of their personalities or perceptions, so, to avoid embarrassment, distress and unease when revealing socially undesirable responses, they tend to underreport or overreport their answers (Kaminska and Foulsham, 2013).

Moreover, the focus group discussion method has some potential limitations itself, such as the possibility of participants feeling insecure about their anonymity, because they will be sharing their personal information with others and in the presence of the recording devices, which may prevent participants from speaking openly (Woodyatt, Finneran and Stephenson, 2016). This was observed on some occasions, among few groups that were not exposed to ethics education interventions, so it could be a result of lack of ethics education. Thus, 'invasion of privacy' and social desirability are possible issues some participants might experience, and this is true for almost all social science research, where there are possibilities of 'invasion of privacy'. Furthermore, before giving participants any assessments, they were asked to sign the consent forms, to ensure their approval in taking part in the study (Creswell, 2013.p.37-38), which gives them the right to withdraw at any point in the assessment process, if they felt unconformable (Coolican and Coolican, 2014). Thus, the researcher does not think that ethics education or researching students'

ethical perceptions is an 'invasion of privacy'. In addition, Borkowski and Ugras (1992) , Davis and Welton (1991), Martin (1982) and Salmansaug (1987) argued that dealing effectively with integrity issues in professions is impossible at any level, therefore, most of the ethics education courses at the university level would become useless exercises. Yet, this study demonstrated some positive indications that students who were exposed to ethics education tend to use less justifications for their unethical behaviours or perceptions. Also, this group sought internal psychological rewards and guilt-free satisfactions rather than materialistic and self-serving goals and justifications to make these self-serving biases sound ethically reasonable. These findings support Mayhew and Murphy's (2009) findings, that students who undertake courses of ethics were less likely to lie for money than the control group. Another argument this study partially agrees with is Loui's (2005) indications that students usually learn ethical values from their peers only, rather than from educational taught courses. Indeed, the first phase of study 2 indicated that peers can affect students' ethical decision, and sometimes make them stray away from their ethical compasses, but, students do not gain their ethical skills and perceptions from peers only. In this study, particularly in Phase II, students demonstrated how their professional ethical perceptions have changed and developed compared to their past ethical perceptions. Professionalism includes professional ethical skills that are not possible to learn from peers alone. These findings also contradict Martin (1982) conclusions, which argued that by the time students reach higher education age their moral formation is someway complete, therefore, formal ethics educational interventions will have little effect on students' ethical learning and behaviour. The study confirms that ethical perspectives are shaped as a result of exposure to ethics education in HEIs.

The findings of this thesis extend the literature that was discussed in chapter 3, in which attributes of ethical sensitivity were evident. In addition, the findings of the thesis present empirical evidence supporting the RAEng's SEPs, which is a valuable addition to the literature in general, and the literature supporting these statements. The findings of this thesis support, encourage and strengthen using the RAEng's SEPs as an instrument to explore engineering students' development of ethical and professional skill sets. Understanding the importance of these skills and their essential roles in improving engineering students' ethical abilities can help educators identify the key ethical skills that their students might be lacking and provide remedies for these lacks. Thus, and after understanding the process of ethical decision making and the factors and skills that can

enhance or hinder ethical decisions, taking an ethical systematic approach is the third step, which is assessing the effectiveness of ethics education.

8.4 Limitations and highlights of the research methodology

There are some limitations in some aspects of this research due to time constraints. This section outlines the challenges and how they were solved, the limitations and what would have been done differently if there had been no restrictions, and finally the major highlights and benefits of this research methodology.

Many challenges were faced during the completion of this PhD thesis. The first challenge was conducting research in social science. The researcher's main discipline is Electrical and Electronic Engineering, and she studied a master's degree in Personal Mobile and Satellite Communications, which is a purely technical field. Doing a PhD in Engineering Education was completely new and challenging for the researcher. Engineering mainly focuses on results and less attention is usually given to the writing structure and the writing tone. This challenge was managed by attending workshops on improving writing skills and consulting friends from the English Literature and Education departments. Another challenge is learning statistical analysis using SPSS with no prior knowledge of statistics whatsoever, however, the researcher was able to conduct factor analysis in the end. Moreover, Chapter 5 discusses the challenges of triangulating multiple methods, while Chapter 6 and 7 discussed how methods were integrated and merged to ensure valid and reliable data collection. One of the challenges that were expected and discussed in Chapter 5 was the philosophical conflicts that might happen when triangulating multiple methods. This was evident, due to the difficulty in equating one school of thought to another, therefore, the pragmatic school of thought was chosen to avoid this conflict and to avoid the "war of paradigms". Yet, the biggest challenge was to bring all the research aspects, aims, questions and findings together, as there is no clear way to do this for a broad research thesis, especially with the time frame of the PhD programme.

But for time constraints, the researcher believes that she would have enhanced the findings of this thesis by conducting semi-structured interviews with some of CU's students, to get more insights of why their ratings were high, and in fact higher than those of UoY's students. Phase II of study 2 is generally considered the weakest since only 7 students were interviewed, and the researcher would prefer to interview a more diverse population sample of students. Yet, this was limited due to time constraints.

Another limitation related to this thesis is the social desirability observations that emerged in Phase II of study 1, where students who were not exposed to ethics education interventions demonstrated tendencies to hide their true perceptions. This phenomenon is expected to emerge in topics that study and research ethics, but, its emergence among this group of students was interesting, and the researcher could not make a judgement as to whether this was as a result of lack of ethics education or due to social and cultural effects.

On the other hand, there are several clear strengths to this research, such as its validity, usefulness and the clear empirical and theoretical contributions. These benefits and contributions are discussed in the following section.

8.5 Original empirical contribution

This thesis provides several original empirical contributions to the literature on ethics education in the field of engineering education. It identifies several key factors that influence engineering students' ethical reasoning and decisions, explores students' professional and ethical perceptions and provides a rich and contextual understanding of the perceived level of importance and level of development of professional skills. The RAEng's SEPs approach that has been integrated into the conceptual model and used to measure engineering students' ethical perceptions is a new and unique approach in the body of literature, and this is the first academic attempt to take this approach and consider using an engineering code of ethics to develop and test engineering students' ethical perceptions. This approach is also the first piece of literature to test the reliability of the RAEng's SEPs as a survey instrument to measure what is designed to measure. Moreover, this approach provides, for the first time, alignment and comparison of students' ethical perceptions to the RAEng's perspectives and explores the reasons behind the students' perceptions.

This thesis provides clarity and insight into the internal and external factors that affect students' ethical awareness, reasoning and perceptions, such as the effect of ethics education, perceptions of rewards and sanctions, gender, culture, work experiences and micro-ethics and how they impact ethical views. It found some differences among different groups of students, where students who were exposed to ethics education approached ethical problems in a different way compared to students who were not exposed to these interventions. Moreover, the group which was exposed to these

interventions demonstrated higher ethical sensitivity skills compared to the other group and showed more consistent opinions and justification for their judgements, whereas the other group kept changing their minds and views.

In addition, this thesis provides a practical and empirical way of how triangulation can take place as several examples of triangulation types were accomplished. For example, using one theoretical drive and one broad research question to integrate the answers of the several sub questions, hypothesis and sub-hypothesis, that all contribute to answering the main research question. This was done by developing the main research question which included two sub-questions involving ethical reasoning and professional perceptions. Also, another form of triangulation was accomplished, that is integrating the results and findings of different data collection methods to form one broader empirical answer, that contributes to one aspect of the research question. For example, dividing the research question into two main themes and frameworks, and each framework included two phases to answer the research aims, sub-questions and hypothesis. This approach provided more depth and breadth to the research design and answers. This thesis provided information on high-quality multiple method research study. Designing multiple methods require researchers to understand and carefully consider each dimension of the mixed method design. In Chapters 2,3 and 4, the researcher discussed two dimensions of her integrated mixed design, namely the purpose and the theoretical drive. In Chapter 5, the researcher discussed three other dimensions, which are the timing of each method, point of integration, and type of design (e.g. planned or emergent). Chapter 6 and 7 showed that this thesis approach contains a complex dimension, which makes it unique and novel. The research design not only used several designs and methods, but also demonstrated how each component or method depended on other methods and other methods' findings. For instance, Phase II of study 1 depended on the findings that emerged from the previous phase of the same study to be constructed and designed, while both phases of study 2, were both planned.

In addition, the research question, which is the theoretical drive for this thesis, was another form of integration point, that combined and integrated study 1 and 2, besides the other analytical integration points. Moreover, the thesis approach used the concurrent and sequential concepts of the mixed methods and combined them to develop a broader method that can look at different perspectives at the same time. As discussed in Chapter 5, the thesis research design tried to touch multiple types of the triangulation approaches,

which are the main essence of mixed methods methodology, such as methodological, data source, environmental and theory triangulation. Chapters 6 and 7 demonstrated how these approaches were achieved in the thesis to reach the conclusions. This thesis used methodological triangulation and it's two concepts of a cross-method and within-method. The within-method was achieved by using the multi-method design, where two qualitative data collection methods were used, and this was done for study 1, in which Phase I and Phase II were designed and conducted, then their findings were eventually integrated. On the other hand, the across-method design involved combining a quantitative and qualitative data-collection technique, using an explanatory sequential mixed method. Achieving data source triangulation was done through collecting data from different data sources, such as different students' groups, and the aim of this was to gain multiple perspectives and data validation. As for the environmental triangulation, the data were collected from two different HEIs in the U.K, which is collecting data from different location settings, and this was found to have an influence on students' ethical perspectives. Finally, theory triangulation was accomplished by using multiple theories, concepts and perspectives to interpret the study results.

8.6 Original theoretical contribution

This thesis takes a step towards filling a theoretical gap in the overall ethics education literature and in ethics education in engineering. This is done by focusing on some aspects of the interpersonal ethical reasoning and some aspects of intrapersonal processes that can affect students' moral judgment and perceptions, which is a topic of increasing interest in academia. Drawing connections between a classical research approach in moral psychology, social psychology and organizational literature, this thesis attempted to develop a new integrative model that is based on two frameworks of the factors that can influence ethical reasoning and perceptions.

As discussed in Chapter 4, experts in the effectiveness of ethics education suggested that a possible future direction in ethics education research is addressing the lack of behavioural ethics assessments, which can be addressed by comparing a group of trainees that have been exposed to ethics education to another who did not undertake ethics training intervention. This thesis achieved this by integrating two conventional assessments methods, that is assessing ethics learning and behaviour, in which a case scenario method was first used to inspire and guide the second method which involved self-reflective writing interviews.

Another empirical contribution is using the RAEng's SEPs. As indicated in Chapter 4, using the RAEng's SEPs is new in researching the effectiveness of ethics education in engineering in the U.K. The first evidence that supports the originality of this work is the comments that were received from Dr Jane Andrews, Board Member and Secretary of the Engineering Education Research Network (EERN) and Professor Robin Clark, Chair of the UK and Ireland EERN. The researcher submitted a paper to present at the Royal Academy of Engineering in London for the UK and Ireland Engineering Education Research (EERN) Symposium on the 23rd of November 2018. Dr Jane informed the researcher that she was pleased to inform her that the Conference Review Board has decided that this research method framework was suitable for publication on the RAEng's Website Conference Proceedings Page with very little or no amendments. Professor Robin Clark added that the paper is "*An interesting paper which focuses on measuring ethics in engineering and engineering education. The topic is relevant to contemporary debates. Good use of methodology*". Furthermore, after presenting this paper at the Royal Academy of Engineering, a senior lecturer at the Automotive Mechanical Engineering Department at CU, showed interest in the method and asked the researcher to go to CU to expand the population sample. Accordingly, the population sample was expanded to include some students from CU, Mechanical Engineering Department. Moreover, the RAEng's SEPs framework also had an impact on ethics education in the engineering discipline in other countries, such as Australia. A PhD student and academic at the University of Western Australia emailed the researcher and showed interest in using the survey instrument that has been used to publish the findings of the paper entitled "A new framework for measuring the ethical awareness and perception among engineering students in Higher Education". The academic researcher indicated that she needed the survey instrument as she was completing her thesis in "The Effectiveness of Virtual Work Integrated Learning to Teach Ethics to Engineering Students", and that she was seeking a method to analyse the effectiveness of the module she was teaching. These examples can confirm the impact of this research approach on engineering education, and the interest that has been shown in this research so far.

8.7 Filling the literature gaps

Chapter 3 discussed and presented the various ethics education methods and approaches that are followed and applied in engineering HEIs. This variation in educational methods has resulted in a lack of clarity in deciding which approach could be the best and most

effective way to teach ethics to engineering students. These variations are based on the different and various expected learning objectives and aims of each engineering educational programme and curriculum. As discussed in Chapter 3 and 4, these variations have led to various assessment methods being developed to evaluate the effectiveness of ethics education in different engineering programmes. This, again, caused further uncertainties and lack of clarity on what is the best approach to assess ethics education in engineering programmes.

This thesis introduced a classical but original way to solve this problem, which is the new conceptual model introduced in Chapter 2. Many researchers in different disciplines, such as moral psychology and business ethics, introduced their conceptual models to provide more understandings to the process of ethical decisions and the factors that can impact this process. However, these models that have been discussed in Chapter 2 usually have limited scopes and perspectives, and this created a need for a new conceptual model that integrates all the important elements and factors of these different models and concepts but overcomes their limited focus. The purpose of this new conceptual model is to present a new tool for ethics educators to assist them in enhancing their teaching methods.

This thesis goes further and broader than the reviewed works of other researchers, by proposing this new model, and using it as a tool to develop a set of assessments and tests to identify the key characteristics that affect engineering students' ethical decisions and perceptions. One aspect of this model is that it employed some classical concepts from theories, concepts and models from different disciplines to develop the first framework that can be used by educators in general. This framework is aimed at assessing engineering students' moral reasoning, and the factors that can influence their ethical decisions. On the other hand, the second framework and novel aspect of this model is integrating the RAEng's SEPs to assess engineering students' professional ethical perceptions. As discussed in subsection 3.4 in Chapter 3, the RAEng suggested certain ethical skills should be developed by engineering students, and these objectives supported Rest's ethical reasoning components, which makes Rest's FCM the main foundation for this model. The RAEng's SEPs part of the model is aimed at assessing engineering students' perceptions of the level of importance and the level of development in professional skills among different groups differentiated by gender, culture, work experience, ethics education and cross-institutional micro-ethics. This model can still be

used in other disciplines as well, by replacing the RAEng's SEPs by any professional code of ethics, but under the condition that the code should align to Rest's FCM.

As discussed in Chapter 8, the new conceptual model was effective in tackling, investigating and identifying the ethical decision-making aspects that this model was designed to achieve. For example, the model identified the effect of culture, and provided some explanation on why certain ethical concerns, such as leadership, might dissuade students from some cultures from improving in such skills. In addition, the model assisted the researcher in identifying some potential biases that can be affected and improved by ethics education, such as social desirability. It was found that students who were not exposed to ethics educational intervention showed a higher level of insecurities and fears of being caught red-handed if they reported engaging in or expressing opinions supporting unethical acts. The argument in the literature regarding the latter example is that it could be something that cannot be changed due to ethics education, but there are lots of evidence in this thesis that indicate otherwise. Thus, this model can provide insights to other researchers, educators and professionals on what can affect ethical perceptions and the effectiveness of ethics education, especially in engineering.

8.8 Answering research questions

This thesis aims to increase engineering academics' understanding of students' ethical perceptions. Focusing on engineering students in two U.K HEIs engineering programmes, it considers how students interact with other students, the situations they face day to day, factors that can affect their perceptions, individual cognitive differences, and how these differences influence their ethical perceptions toward ethical issues and dilemmas. The aim of this research was to develop and introduce a new model for assessing engineering ethics education, to help understand the factors that affect ethical decisions, perceptions and education. In addition, it seeks to explore the factors and key skills that may affect this process, collect students' perceptions, and compare these perceptions. These aims have been achieved by developing the new conceptual model that identified several key factors that affect students' ethical perceptions.

At the beginning of this PhD research, one main research question was developed. This research question embeds two different but relatively close aspects of ethics education, that is moral reasoning and professional perceptions. Thus, two theme sub questions were developed, and these sub-questions had further sub-questions while hypothesis and sub-

hypothesis were developed to answer these two themed questions, to contribute to answering the main research question. The next section provides a brief summary of the findings of the two sub-questions in the first two subsections, then an overall summary of the answer for the main research question is presented in the last subsection.

8.8.1 How do engineering students differ in their moral reasoning abilities?

To answer this question, the literature emphasised on using Rest's FCM to explore the students' ethical reasoning and ethical decision-making process. This model proved to be simple to apply and effective in comparing students' ethical abilities. However, this model was not able to give details in terms of what factors and skills could affect ethical reasoning. Thus, concepts in ethics pedagogy and professional ethical codes were also used to give more depth to the findings. The thesis found that factors, such as ethics education, culture, work experience, perceptions of rewards and sanctions, motivation level, and micro and macro ethics of cross-institution and sub-disciplines all affected students' ethical reasoning and perceptions. These factors were not indicated in Rest's FCM, and other researchers from social psychology criticised Rest for not considering them in the FCM. Students who were exposed to ethics education demonstrated superior skills in solving ethical issues, whereas they showed genuine difficulties in solving right versus right issues, and in some cases demonstrated biased judgements which were influenced by loyalties to their peers. The other group of students, on the other hand, demonstrated more biased judgements that were based on maximising self-serving goals, and inabilities to resist moral temptations. These self-serving biases, in turn, affect their ethical awareness, judgements and intentions. Students who had ethics education demonstrated higher skills in self-regulation and reflection, and they expressed their newly learnt attitudes, by expressing their intentions of not repeating past unethical behaviours, because they learnt the ethical and acceptable way of doing things. In contrast, the other group indicated no clear future intentions to act ethically, and many referred to the roles of 'circumstances' and 'opportunities' as determinants of their future behaviours. Thus, ethics education is found to be effective in changing some of the students' perceptions and old unethical beliefs and attitudes, as students who took these educational interventions admit their maturity and having grown up ethically compared to before.

8.8.2 How do engineering students compare in perceiving professional ethics?

To answer this question, the researcher used the RAEng's SEPs as a framework to explore engineering students' professional ethical perceptions. The survey instrument developed proved to be a valid and reliable tool to be used for measuring students' perceived level of importance and level of development of professional ethical skills. This survey is used to compare students' groups based on gender, culture, work experience, ethics education and cross-institutional sub-disciplinary micro-ethics effects. Some statistically significant differences were found between British and Chinese engineering students in terms of the ratings of the perceived level of importance of honesty and integrity at the UoY and CU. In addition, statistically significant differences were found in the perceptions of Development of Accuracy and Rigour, Honesty and Integrity and Respect for life, law and the public good, where students with no work experience rated these sets higher than students with work experience. This highlights the effectiveness of ethics education in the engineering curricula, where students with no prior work experience believed that they have improved and developed their professional and ethical skills due to the educational programme they are enrolled in when compared with those with prior work experience.

Furthermore, statistically significant differences were found among students from the UoY and CU. The group from Coventry rated almost all sets of ethical skills higher in terms of importance and development of these ethical skills sets than students from York. Several reasons might have contributed to such findings. For example, Coventry's group was a male-dominated group, while York's group was a mixed gender group, which could have resulted in different results for overall perspectives compared to single-gender perceptions (Rest et al., 1986). Another reason could be the differences in academic sub-disciplines, which might be one of the impacting factors (Rodzalan and Saat, 2016), as these differences are expected between different sub-disciplines. These differences are due to the different work, nature and motivation, which all might cause different impacts on students' ethical perceptions. This suggests that the importance of professional skills among different groups of students is similar, but micro-ethical emphasis can make some students perceive some ethical values as more important. In general, the findings indicate that Responsible leadership: listening and informing, although rated as important, was perceived as the least important and least developed set of ethical skills among students. The semi-structured interviews further explained that this set was perceived to be

developed least due to several reasons, such as cultural norms and beliefs, misremembering educational interventions and misconceptions held about what leadership terminologies. The RAEng's SEPs factor analysis showed that students' perceptions of the importance of these professional ethical sets of skills were grouped as Ethical Integrity, Health and Safety, Societal and Environmental Impact and Engineering Professionalism & Responsibility. While the RAEng's SEPs factor analysis showed that students perceptions of the development of these professional ethical sets of skills were grouped as Concern for Others, Society and the Environment, Work Responsibly for Now and the Future and Risk Evaluation & Management.

8.8.3 How effective is ethics education in the engineering curriculum?

This is the main research question that the previous sub-questions sought to answer and the main objective of conducting this thesis. The literature suggests that there is a debate on whether ethics education can be beneficial at HE level as some academics believe ethics education can shape students' ethical behaviour, while others believe ethics education is learned from home and then shaped by peers. This thesis supports the first group, and this support is based on several findings and confirmations of the benefits of ethics education found in this thesis.

The literature indicated that there is a gap between ethical awareness and behaviour. In other words, people who identify ethical issues will not necessarily act on this awareness, and that's why many people who claim to be ethical and advocate ethical behaviour sometimes act in the contrary. The literature suggested that this awareness behaviour gap is related to psychological challenges in balancing two competing goals, which are self-serving and others-serving goals. Individuals who are at the lower levels of moral development would show more tendencies to maximise their self-serving goals, meaning they lack moral emotions towards others and lack social emotions. The individuals who are at a higher level of moral development would show tendencies to serve others and follow social norms and rules. This thesis identified that students who were not exposed to ethics education approached the research tests questions from two perspectives, 'maximising-self-benefits', and 'complying- to-rules-out-of-fear' perspectives. On the other hand, students who were exposed to ethics educational intervention approached the questions from a 'socially-biased', and 'complying-to-rules-out-of-respect' perspectives. In addition, students who undertook the educational intervention reflected that, as results of ethics education, they had self-regulated their past unethical behaviours, such as

installing illegal copies of the software, cheating in assignments and not referencing sources accurately. On the other hand, those who did not take the intervention expressed that they have no intention to stop, while others indicated that this behaviour is totally dependent on circumstances and opportunities. Moreover, students who did take ethics interventions were faster in making ethical decisions and more consistent in their opinions, while the students who did not take the workshop were more hesitant and kept changing their opinions.

In addition, the statistical analysis indicated that students who do not have work experiences reported that they developed ethical skills in accuracy and rigour, honesty and integrity and respect for life, law and the public good the most. This indicated that students also believed that they have developed these sets of ethical skills due to the engineering programmes they were enrolled in. Furthermore, undergraduates reported higher perceived honesty and integrity compared to postgraduates, as a result of spending more time at the university and being exposed to rules of academic misconduct and plagiarism more intensively than the other group.

Moreover, the literature reviewed in Chapter 2 stated some differences about the ethical issue and the ethical dilemma, in which ethical issues consists of one ethical issue or dimension, while an ethical dilemma consists of two or more ethical issues that cover several ethical dimensions. Ethical dilemmas and issues are considered right versus right issues, which makes it complex in nature and challenging to solve, while right versus wrong issues are simply moral temptations that are not considered moral issues. From this perspective, this thesis found that students who had taken ethics intervention found ethical dilemmas challenging and most of them picked cases of right versus right to reflect on and convey the challenges embedded in providing a right answer to them. This suggests that this group of students saw the two or more ethical challenges of two right versus right conflicts. On the other hand, students who did not undertake the ethics educational intervention, simply picked cases of right versus wrong cases to reflect on, and justify their involvements in unethical behaviours as morally right, because they were saving money, and that high profile companies will not be affected by their acts. This suggested that the two groups differed in perceiving ethical issues, and the group which was exposed to ethics education demonstrated superior skills in perceiving right versus right issues compared to the other group.

The new conceptual model that is presented in this thesis forms an applied perspective and serves as a tool and a starting point for further research, and can assist educators in designing and delivering new teaching methods in ethics, by providing a theoretical and empirical base for understanding the key factors and characteristics that influence ethical perceptions and attitudes in the engineering profession. It is important for education in general, and engineering education, to understand what factors influence perceived ethical issues, ethical development, reasoning and professional skills.

Given all these evidence that are based on the findings of this thesis, ethics education is essential in the engineering curriculum, as it can develop the professional engineering character before students embark their careers as responsible engineers.

8.9 Potential benefits of the new conceptual model in ethics education

Given the benefits of the new conceptual model in assessing the effectiveness of ethics education in HE, there could also be several benefits of this model in improving ethics education as a result of using the assessments methods presented in this thesis and identifying what students may be lacking. The extended version of Rest's model that has been used in the model developed in this thesis can help ethics educators understand the effect of individual differences and organisational factors and differences in shaping students' ethical perspectives to enable them to develop strategies to meet the students' needs accordingly. For example, the analysis results of this thesis found that many students of Chinese origin are not motivated to improve their ethical skills in leadership due to some cultural beliefs and effects. Another example is that the students who had not undertaken ethics educational interventions showed high tendencies and preferences to commit digital piracy, and this group of students believed that this act is normal in modern societies. These kinds of information can be useful in determining what topics to include in ethics educational interventions in the engineering curriculum. In relation to the first example, instead of focusing on applying and transferring the universal Western leadership ideas, non-Western cultures and ideas about leadership can also be highlighted, where an intercultural integration of dialogues between educational ideas and practices can make the West meet the East in a reflective and open dialogue. In relation to the second example, digital piracy can be introduced to students by providing essential ethical information that are associated with the usage of computer technology to reduce cyber-related crimes. In addition, holding regular workshops and seminars to train students

about digital piracy and cyber-related crimes to set good examples of ethical behaviours in the classrooms. Moreover, joining efforts and collaboration between HEIs staff members, lawyers, judges and businesses can provide students with an overall picture of the consequences of these actions, thereby, reducing them. Hence, this model can impact ethics educators to improve their teaching strategies and enhance ethics education. In addition, the RAEng's SEPs part of this model can also help academics and engineering professionals, who are interested in ethics education and wanting to improve their ethics educational abilities and methods, to identify the differences among different groups of students and try to fill in the gaps. For example, this thesis found that when comparing a group of students from the UoY and another from CU, there were statistically significant differences among the two groups in perceiving the level of importance and the level of development of ethical skills. These differences can be taken into consideration when designing new ethics educational interventions, and more investigations can be done to identify the different educational approaches employed by CU's academics. Also, trying to identify the types of educational opportunities that are provided at Coventry and are not provided in York, or the facilities that might have helped to increase and facilitate ethics education at Coventry and try to apply them in York.

8.10 Recommendations to the RAEng

Based on the findings of this thesis study, there are multiple recommendations to the RAEng, which are aimed to improve the SEPs, as eventually, the understanding and application of these SEPs. The fist point is derived from the wider moral reasoning literature and supported by the finding of this thesis. Moral theory emphasises on improving moral sensitivity, and the essential role it plays in improving moral awareness. Moral theory gave many examples of the key ethical and moral skills that constitute to moral sensitivity, such as empathy, compassion, moral obligation, sympathy and many more. Yet, the RAEng's SEPs seem to neglect this important aspect of ethical sensitivity. For example, the only expression that is found in the 2012 SEPs version (see Appendix 10) and 2017 SEPs version (see Appendix 11), is: "always act with care and competence" and "always act with care". There is not much detailed examples or discussions on how this "care" act can be achieved, or the characteristics and components of "care". Moral theory does emphasise on the role of emotions, beside reason, on improving ethical reasoning and eventually ethical behaviour. The findings of this thesis also support these notions, and the researcher recommends that key ethical and moral skills, such as moral

emotions, do improve ethical decision making and leadership skills, and these ethical skills should be addressed and discussed in the future RAEng's SEPs. These ethical emotional skills will help and improve professional and ethical attitudes and behaviours, which are very much in demand by the RAEng and industry.

In addition, the first ethical principle in the 2012 version, included this statement "not knowingly mislead or allow others to be misled about engineering matters". The 2017's version also included a modified but similar statement "not knowingly mislead or allow others to be misled". The findings of this thesis study show that many international students misunderstood this statement and believed that the statement meant the opposite. Thus, reformatting this statement can be beneficial for some international engineers who seek working, or already work, in the United Kingdom, and want to apply the RAEng's SEPs. This step might improve the international engineers' understandings of the professional and ethical principles.

8.11 Avenues for further research

A validated conceptual model is developed and aims at providing a framework for further future research. Although the developed model illustrates the basic relationships and factors that can affect ethical reasoning and perceptions, the thesis provides a rich context for each of its constructs and there are several interesting areas for future further research.

In general, each component or construct in the model can be examined in more detail, deconstructing and analysing them to provide additional quantitative and or qualitative dimension and granularity, or to provide a more precise understanding of how ethical perceptions and reasoning interact with the influencing factors, and provide the constructs of a better and clearer relationship. For example, it would be useful to refine some constructs of the conceptual model and their meanings in more depth, such as the moral intensity of an ethical issue and the effect of the right vs right ethical paradigms, to provide more empirical understandings for these two impactful factors.

Furthermore, it would be useful to explore in more detail the extent to which moral obligations can affect students' current and future ethical behaviours by measuring students' ethical intentions. The researcher attempted to measure the effect of moral obligation, the 'lady McBeth's effect' and moral intentions, by observing students' tendencies to represent moral obligation feelings in physical acts and other sensation experiences. In other words, the effect of remembering past unethical deeds on students'

moral obligation feelings, and whether moral obligation impacts can encourage them to hold future ethical intentions for similar behaviours. The moral obligation was supposed to be measured by the students' sensory representations of their desires to cleanse themselves, using wipes, or feeling the room was darker and selecting items such as lamps and candles. This test was included in the reflective writing interview sheets, but due to several issues, the researcher could not analyse it. One reason for this was the effect of some students on their peers, as they advised their friends to select more useful items in the list, such as pencils, instead of the wipes. Moreover, some interviews were filled by hungry students who selected items, such as crackers and apple, and asked the researcher to provide these items because they felt hungry. These factors made the analysis of the data very difficult and required a researcher who is more experienced in psychology and constructing such psychological measuring scales. Thus, it might be interesting and beneficial to explore the effect of moral obligation on current and future moral intentions and behaviours.

Moreover, testing students' intentions to conduct unethical behaviours, such as academic misconduct, would be another useful avenue for further research in the future. Comparisons can be made based on gender, sub-discipline, year of study, work experience, ethics education and cultural backgrounds, using the modified version of Theory of Planned Behaviour (TBP), which was introduced by Harding et al. (2004), as a framework. Harding et al. (2004) added two variables to TPB which are moral obligation and moral reasoning that was based on Rest's et al. (2000) Defining Issues Test (DIT), in which students were given ethical statements and asked to report their answers from: (1) never- to- (5) every time. The researchers indicated that the actual study was conducted after conducting a pilot study, and a confirmatory factor analysis was conducted to confirm the constructs of the data analysis that resulted from the pilot study. The results supported the authors' assumptions that this modified model can predict students' cheating intentions, and the inclusion of moral obligation and moral reasoning variables improved the understanding of the multifaceted nature of ethical decision making and behaviour. However, the limitation of the study was not assessing the goodness of fit indicators to assess the modified version of the model, which can add more to the reliability of the model. Thus, this modified model can be useful in exploring students' intentions to behave unethically and provide another validated element to the

'ethical intentions' component of the model, and at the same time overcome the limitation of the model Harding et al. (2004) designed by testing its reliability.

In addition, the RAEng's SEPs has been updated to a new version in July 2017, as indicated in Appendix 11, and due to this update some ethical statements were removed and some new statements were added to the four main ethical principle sets. It would be useful to test this new version as survey instrument items to compare them to the results of this thesis, and further, compare the factors that have resulted from the factor analysis results and confirm them. Moreover, the developed RAEng's SEPs survey instrument employed the five-Likert scale, which resulted in mixed findings. The seven-Likert scale might provide more insights and significant results in terms of perceiving the level of importance compared to the five scales. Therefore, this can give an opportunity for more research to investigate why certain groups perceived certain ethical principle sets as higher than other groups or lower. Furthermore, modifying the work experience demographic in the survey instrument to specify the years and type of experience will provide more detail and explore further aspects of this effect on students' ethical perceptions, and provide more insights into the research and validity of the instrument. Additionally, conducting more semi-structured interviews to include wider and more diverse students' groups can further help identify the reasons why certain topics in ethics education motivate them and why some do not. Also, students can be involved in suggesting and recommending ways to improve and overcome the shortcomings of ethics education in the engineering programmes they are studying now. In addition, the survey tool can provide more insight into the research on ethics education by using it in pre/post designs, where groups of students are given the survey before undertaking the ethics educational interventions and afterwards, to measure any change in the students' ethical perceptions in relation to the educational intervention.

The results of this thesis indicate that some students are reluctant to get involved in leadership topics due to cultural effects. Academics need to understand and support the students' need to develop leadership skills and emphasize on the roles and responsibilities of the students' learning and developing these skills. Accordingly, further research on how to improve students' perceptions about leadership, willingness to develop and gain more skills in it, without conflicting their cultural values, can be of additional benefit to the educational research and enhance the teaching methods in engineering programmes. Moreover, the results indicated social desirability biases and possible cultural and

educational influences. At the end of Chapter 5, the researcher indicated that social desirability bias is an expected phenomenon that can take place in almost all research aspects that focus on ethics. Therefore, studying the phenomena considering ethics education and cultural effect can be a valuable addition to the area of ethics education in general, and the model construct in particular.

8.12 Final statement

This thesis has provided many original insights into what affects ethical reasoning and perceptions of engineering students. By establishing one basic model and two frameworks for investigating this area, it paves the way for future researchers to carry out research studies of more complex evaluations of the effectiveness of ethics education to ultimately develop a better approach to ethics education. Researchers will benefit from this model and it's two frameworks going forward, while engineering education in particular, and HE in general, will benefit from the rich and contextual information that is provided as part of this model and it's two frameworks, which researchers can use to improve their teaching methods, and the overall curriculum outcomes. Ethics education in engineering faces many significant and on-going challenges in attempting to fit in a theoretical based and multidisciplinary topic into loaded technical curricula and busy teaching schedules of engineering academics. There are also challenges in the diverse approaches in the teaching methods as well as engineering students' diverse cultural backgrounds and the factors that can influence them. Sceptics of ethics education in engineering programmes and ethical reasoning models should bear in mind that a jet engine was developed a long time ago, but it took decades of constant work, trial and error and frequent improvements to ensure quick, safe and economical services.

Moore and Gino (2013.p.71) stated that individuals are social animals that are "*motivated, influenced, structured, rewarded, and punished every day by other members of their community. Organizations add their own sets of motivations, influences, structures, rewards, and sanctions to encourage and facilitate their objectives*". This thesis tries to provide a view of the ways in which social and organizational forces can combine to create moral or immoral outcomes, both at an individual and a collective level. The researcher hopes that this thesis proves to be useful in enabling and encouraging researchers to take an integrative approach towards developing and testing theories about ethics education in general, and ethics education in engineering specifically.

Appendixes

Appendix 1

The consent form for the focus group interviews

Research Consent Form

We would like to thank you for your participation in this focus group discussion.

We will be recording this group discussion session on an audio recorder as it will assist us in analysing your responses more accurately.

All your responses will be anonymized, and the findings will only be used for our research purpose.

Thank you

Manal Atesh and Bidyut Baruah

Participant name and signature:

Date:

Appendix 2

Reflective writing consent form

Research Consent Form for Studying

the Impact of Ethics Education

I am asking you now to write a short reflective essay on the subject of ethics. The reflective essay will also be used for research purposes aimed at investigating ethical practices in Engineering. Nothing you write will be attributable to you personally in my research. This assessment is approved by the Physical Sciences Ethics Committee (PSEC), approval code is Atesh120417.

If at any point, you experienced any disturbing emotions and or destress by taking part in this study, please contact these numbers to offer relevant information and help point referrals:

- Your Academic Supervisors.

- York Night Line 01904 323735 (OR 3735 from any UoY phone)

- Your College wellbeing support https://www.york.ac.uk/students/health/help/college-support/

- Graduate Students` Association GSA- 01904 322 718 (internal 2718).

- University of York Students' Union (YUSU) Advice and Support Centre - 01904 32 3724.

- Student Support Hub - 01904 32 4140

By writing and submitting this reflective essay, you agree that what you write can also be used anonymously for the purposes of research in the Engineering Management Group at the University of York.

After completing the required task, please submit it to your supervisor, or directly to me: mhma506@york.ac.uk

Manal Atesh

Appendix 3

Survey consent form

Study of Learning and teaching ethics Questionnaire

We are asking you to participate in a study that takes your views on learning and teaching ethics. **The following questionnaire should take around 10-15 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, only aggregated data will be used.

This survey is approved by the Physical Sciences Ethics Committee (PSEC), approval code is Atesh010316.

****

By continuing, I agree to participate voluntarily 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 Manal Atesh, Engineering Management Research Group, Department of Electronics, University of York, Heslington, York, YO10 5DD by email at mhme506@york.ac.uk; if I have any questions or comments about this survey.

(Please write clearly)

Department: _____

Please read the instruction for each of the following questions. Review the response options carefully before you mark your answers. There are no right or wrong answers. Answer the questions as quickly and honestly as possible.

Appendix 4

Semi-structured interviews consent form

Study of Learning and teaching ethics

Thank you for your participation in this interview discussion.

We will be recording this discussion session on an audio recorder as it will assist us in analysing your responses more accurately. All your responses will be anonymised and the findings will only be used for our research purposes. The interview should take around 45-60 minutes.

****

I agree to participate voluntarily in this study ☐

The study has been explained to me and I have had a chance to ask questions ☐

I understand that any information provided by me will remain confidential with regard to my identity. ☐

I understand that by participating in this study I am not waiving any of my legal rights. ☐

I know to contact Manal Atesh, Engineering Management Research Group, Department of Electronics, University of York, Heslington, York, YO10 5DD by email at mhme506@york.ac.uk; if I have any questions or comments about this survey. ☐

(Please write clearly)

Department: _____

Participant signature:

Date:

Appendix 5

SPSS data codebook

CODEBOOK FOR ETHICS STUDY, PHD THESIS 2016

Variable Description	SPSS Variable Code	Coding Instruction
	Background information	
Student ID.	Ref. Number	[string]
Q1 Age at last birthday	Age	[numeric] Scale
Q2 Gender	Gender	[1=male, 2=female, 3=other] Nominal
Q3 Country(s) attended school	Hisch	[1=England, 2=China, 3=South Asia (India, Pakistan, Bangladesh, Afghanistan) 4=Europe (Excluding U.K), 5=East Asia (Japan, Taiwan, Thailand, Singapore, Brunei, Indonesia, Malaysia), 6= Africa, 7= Middle East, 8= North America & Canada, 9= South America, 10= Australia, 11=Other] Ordinal
Q4 Present nationality	Nation	[1=United Kingdom, 2=China, 3=South Asia(India, Pakistan, Bangladesh, Afghanistan) 4=Europe (Excluding U.K), 5=East Asia (Japan, Taiwan, Thailand, Singapore, Brunei, Indonesia, Malaysia), 6= Africa, 7= Middle East, 8= North America & Canada, 9= South America, 10= Australia, 11=Other] Ordinal
Q5 Working Experience	WE	[Yes=1, No=2] Nominal
Q6 What study level are you in at the moment	yr_nw	[Foundation=1, 1st= 2, 2nd= 3, 3rd= 4, 4th= 5, 5th= 6, MEng= 7, MSc= 8, PhD= 9] Ordinal
Q7 Ethics workshop	Ethic_Wrk	[Before=1, After= 2] Ordinal

S1. How would you rate the importance of the following to the work you are expected to do as an engineer?

Q1. To act always with care.	S1.Q1	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q2. To act always with competence.	S1.Q2	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q3. Perform services only in areas of	S1.Q3	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q4. Keep your knowledge up to date.	S1. Q4	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q5. Keep your skills up to date.	S1.Q5	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q6. Assist the development of engineering	S1.Q6	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q7. Assist the development of engineering	S1. Q7	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q8. Not knowingly mislead others to be misled about engineering matters.	S1.Q8	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q9. Not knowingly allow others to be misled about engineering matters.	S1.Q9	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]

Q10. Present engineering evidence, theory and bias.	S1.Q10	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q11. Review engineering evidence, theory and bias.	S1.Q11	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q12. Identify risks where possible.	S1.Q12	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q13. Evaluate risks where possible.	S1.Q13	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q14. Quantify risks where possible.	S1.Q14	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q15. Be alert to the ways in which your work	S1.Q15	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q16. Duly respect the rights and reputations of	S1.Q16	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q17. Avoid deceptive acts.	S1.Q17	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q18. Take steps to prevent corrupt practices.	S1.Q18	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q19. Take steps to prevent professional	S1.Q19	[Not important=1, of little importance=2, moderately

Q19. Take steps to prevent professional	S1.Q19	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q20. Take steps to prevent declare conflicts	S1.Q20	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q21. Reject bribery.	S1.Q21	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q22. Reject improper influence.	S1.Q22	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q23. Act for each employer in a reliable and	S1.Q23	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q24. Act for each client in a reliable and	S1.Q24	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q25. Ensure that all work is lawful and justified.	S1.Q25	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q26. Minimize any adverse effect on society or on the natural environment for your own and succeeding generations.	S1.Q26	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q27. Justify any adverse effect on society or on the natural environment for your own and succeeding generations.	S1.Q27	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q28. Take due account of the limited availability	S1.Q28	[Not important=1, of little importance=2, moderately

Q29. Hold paramount the health and safety of others.	S1.Q29	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q30. Act honourably, responsibly and lawfully.	S1.Q30	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q31. Uphold the reputation, standing and dignity of the profession.	S1.Q31	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q32. Be aware of the issues that engineering and technology raise for society.	S1.Q32	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q33. Listen to the aspirations and concerns of others.	S1.Q33	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q34. Actively promote public awareness.	S1.Q34	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q35. Understanding of the impact and benefits of engineering achievements.	S1.Q35	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]
Q36. Be objective and truthful in any statement made in your professional capacity.	S1.Q36	[Not important=1, of little importance=2, moderately important=3, important=4, Very important=5]

S2. To what extend do you agree with the following being developed by your program?

Q1. To act always with care.	S2.Q1	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]

Q2. To act always with competence.	S2.Q2	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q3. Perform services only in areas of current competence.	S2.Q3	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q4. Keep your knowledge up to date.	S2.Q4	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q5. Keep your skills up to date.	S2.Q5	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q6. Assist the development of engineering knowledge in others.	S2.Q6	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q7. Assist the development of engineering skills in others.	S2.Q7	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q8. Not knowingly mislead others to be misled about engineering matters.	S2.Q8	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q9. Not knowingly allow others to be misled about engineering matters.	S2.Q9	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q10. Present engineering evidence, theory and interpretation honestly accurately and without bias.	S2.Q10	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q11. Review engineering evidence, theory and interpretation honestly, accurately and without bias.	S2.Q11	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q12. Identify risks where possible.	S2.Q12	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q13. Evaluate risks where possible.	S2.Q13	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]

Q14.Quantify risks where possible.	S2.Q14	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q15.Be alert to the ways in which you work might affect others.	S2.Q15	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q16.Duly respect the rights and reputations of other parties.	S2.Q16	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q17. Avoid deceptive acts.	S2.Q17	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q18.Take steps to prevent corrupt practices.	S2.Q18	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q19. Take steps to prevent professional misconduct.	S2.Q19	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q20. Take steps to prevent declare conflicts of interest.	S2.Q20	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q21. Reject bribery.	S2.Q21	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q22. Reject improper influence.	S2.Q22	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q23. Act for each employer in a reliable and trustworthy manner.	S2.Q23	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q24. Act for each client in a reliable and trustworthy manner.	S2.Q24	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q25. Ensure that all work is lawful and justified.	S2.Q25	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]

Q26. Minimize any adverse effect on society or on the natural environment for your own and succeeding generations.	S2.Q26	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q27. Justify any adverse effect on society or on the natural environment for your own and succeeding generations.	S2.Q27	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q28. Take due account of the limited availability of natural and human resources.	S2.Q28	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q29. Hold paramount the health and safety of others.	S2.Q29	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q30. Act honourably, responsibly and lawfully.	S2.Q30	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q31. Uphold the reputation, standing and dignity of the profession.	S2.Q31	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q32. Be aware of the issues that engineering and technology raise for society.	S2.Q32	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q33. Listen to the aspirations and concerns of others.	S2.Q33	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q34. Actively promote public awareness.	S2.Q34	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q35. Understanding of the impact and benefits of engineering achievements.	S2.Q35	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]
Q36. Be objective and truthful in any statement made in your professional capacity.	S2.Q36	[Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5]

S3. Who do you think is responsible for teaching ethics as previously defined?

	Responsible body	
Q1. Industry/organization only	S3.Q1	[completely responsible=5, responsible=4, don't know=3, not responsible=2, completely not responsible=1]
Q2. Academics only	S3.Q2	[completely responsible=5, responsible=4, don't know=3, not responsible=2, completely not responsible=1]
Q3. Students only	S3.Q3	[completely responsible=5, responsible=4, don't know=3, not responsible=2, completely not responsible=1]
Q4. 1 & 2 Only	S3.Q4	[completely responsible=5, responsible=4, don't know=3, not responsible=2, completely not responsible=1]
Q5. 1 & 3 Only	S3.Q5	[completely responsible=5, responsible=4, don't know=3, not responsible=2, completely not responsible=1]
Q6. 2 & 3 Only	S3.Q6	[completely responsible=5, responsible=4, don't know=3, not responsible=2, completely not responsible=1]
Q7. All of the previous	S3.Q7	[completely responsible=5, responsible=4, don't know=3, not responsible=2, completely not responsible=1]
Q8. None of the above	S3.Q8	[completely responsible=5, responsible=4, don't know=3, not

Appendix 6

The focus group interview guide

The Interview Guide

For the researcher

Introduction

❖ **Introduction & Brief Description of the Research**

A. Introductory conversation (ice-breaking):

   a. Thank you for your time and voluntary interest

B. describing the purpose of the interview

   a. Assuring that participants are familiar with the discussion interview purpose, and acknowledging the time spent to do the interview and emphasising that anonymity of the discussion interview data will be maintained, managed and kept safe and secure at all times.

   b. Fill and sign the consent form.

Ethical perceptions

- **Q1:**
- **An assignment is due next week on MATLAB and a significant part of it involves presenting your simulation results. One of your classmates is struggling with the simulation analysis and he comes to you asking for some help. What will you do?**

    a. Why do you think so?

    - *Follow-up (do you think there is a certain circumstance or experience that influenced your choice?)*
    - *Follow up (can you tell me what was or is this experience?).*
    - *Follow up (how did this experience shaped your perception?)*

- **Q2:**
- **You are confident that your simulation data is 100% accurate. This student requests if he can use the simulation data from you in order to get a high score. Will this affect your previous decision?**

    a. Why do you think so?

    - *Follow-up (do you think there is a certain circumstance or experience that influenced your choice?)*
    - *Follow up (can you tell me what was or is this experience?).*
    - *Follow up (how did this experience shaped your perception?)*

- **Q 3:**
- **This student happens to be your best friend and you both have spent a lot of time studying together. On one of the previous instances, he even helped you when you were struggling with another assignment. Will this affect your decision?**

a. Why do you think so?

- *Follow-up (do you think there is a certain circumstance or experience that influenced your choice?)*
- *Follow up (can you tell me what was or is this experience?).*
- *Follow up (how did this experience shaped your perception?)*

❖ **Q4:**

❖ **You know that this best friend of yours is recently going through some hard times with relationships/family issues and couldn't dedicate much time to do the simulation. How will this influence your earlier decisions?**

a. Why do you think so?

- *Follow-up (do you think there is a certain circumstance or experience that influenced your choice?)*
- *Follow up (can you tell me what was or is this experience?).*
- *Follow up (how did this experience shaped your perception?)*

❖ **Q5:**

❖ **Sharing assignment data with your friends could be counted as an Academic Misconduct and could even hamper your Degree grade. It can also lead to your expulsion from University. What will you decide?**

a. Why do you think so?

- *Follow-up (do you think there is a certain circumstance or experience that influenced your choice?)*
- *Follow up (can you tell me what was or is this experience?).*
- *Follow up (how did this experience shaped your perception?)*

b. If there are no Academic Misconduct regulations, such as turn it in, would you reconsider your decision?

❖

❖ **Your best friend has recently been offered a high-profile job in one of the top organizations in the UK and you have seen how hard he had to work in order to secure this job. However, you have just found out that this job is dependent on your friend getting a Distinction in his final degree. This means that he has to get a high score in this MATLAB assignment, or he risks losing this job. What will you do?**

a. *Why do you think so?*

- *Follow-up (do you think there is a certain circumstance or experience that influenced your choice?)*
- *Follow up (can you tell me what was or is this experience?).*
- *Follow up (how did this experience shaped your perception?)*

❖ ***Closing***

- ✓ *Would you like to have any closing statement?*
- ✓ *Thank you very much of your time*

Appendix 7

The Survey instrument

Background Information

1. **How old were you at your last birthday? _____**

2. **What is your sex/gender?** *(Tick only one response)*

   Male □ *Female* □ *Other* □

3. **In what country(s) did you attend secondary/high school?** *(Tick relevant box)*

□United Kingdom	□East Asia (Japan, Taiwan, Thailand, Singapore Brunei, Indonesia, Malaysia)	□North America & Canada
□China		□South America
□South Asia (India, Pakistan, Bangladesh, Afghanistan)	□Africa	□Australia
□Europe (Excluding U.K)	□Middle East	□Other (Please specify) _____

4. **Present nationality:**

□United Kingdom	□East Asia (Japan,	□North America &
□China	Taiwan, Thailand,	Canada
□South Asia (India,	Singapore Brunei,	□South America
Pakistan, Bangladesh,	Indonesia, Malaysia)	□Australia
Afghanistan)	□Africa	□Other (Please specify)
□Europe (Excluding U.K)	□Middle East	_____

5. **Do you have any working experience?**

   □ Yes □ No

6. **What study level are you in at the moment?** *(Tick relevant box)*

   Foundation Year□ 1st□ 2nd□ 3rd□ 4th□ 5th□ MEng□ MSc□

   PhD□

7. **What is the name of your Educational Institute (University Name)?**

   _____

1. **What program are you currently registered on? (your Major)** *(Tick relevant box)*

☐Electronic Engineering

☐Audio & Music Technology

☐Communication Engineering

☐Wireless Systems

☐Digital Systems Engineering

☐Engineering Management

☐Civil Engineering

☐Chemical Engineering

☐Mechanical Engineering

☐Other, please specify:

_____

2. **Have you taken any course or workshop on ethics?**

☐ Yes

☐ No

☐ I don't remember

Section 1

How would you rate the importance of the following to the work you are expected to do as an engineer? Rate the importance of each item by ticking a box on a scale of 1 to 5 *(Tick one response for each statement.)*

Where:

(5) Very important.

(4) Important.

(3) Moderately important.

(2) Of little importance.

(1) Not important.

1. Avoid deceptive acts.	5□	4□	3□	2□	1□
2. Take steps to prevent corrupt practices.	5□	4□	3□	2□	1□
3. Take steps to prevent professional misconduct.	5□	4□	3□	2□	1□
4. Take steps to prevent declare conflicts of interest.	5□	4□	3□	2□	1□
5. Reject bribery.	5□	4□	3□	2□	1□
6. Reject improper influence.	5□	4□	3□	2□	1□
7. Act for each employer in a reliable and trustworthy manner.	5□	4□	3□	2□	1□
8. Act for each client in a reliable and trustworthy manner.	5□	4□	3□	2□	1□
9. Ensure that all work is lawful and justified.	5□	4□	3□	2□	1□
10. Minimise any adverse effect on society or on the natural environment for your own and succeeding generations.	5□	4□	3□	2□	1□
11. Justify any adverse effect on society or on the natural environment for your own and succeeding generations.	5□	4□	3□	2□	1□
12. Take due account of the limited availability of natural and human resources.	5□	4□	3□	2□	1□
13. Hold paramount the health and safety of others.	5□	4□	3□	2□	1□
14. Act honourably, responsibly and lawfully.	5□	4□	3□	2□	1□
15. Uphold the reputation, standing and dignity of the profession.	5□	4□	3□	2□	1□
16. Be aware of the issues that engineering and technology raise for society.	5□	4□	3□	2□	1□
17. Listen to the aspirations and concerns of others.	5□	4□	3□	2□	1□
18. Actively promote public awareness.	5□	4□	3□	2□	1□

19. Take steps to prevent professional misconduct.	5□	4□	3□	2□	1□
20. Take steps to prevent declare conflicts of interest.	5□	4□	3□	2□	1□
21. Reject bribery.	5□	4□	3□	2□	1□
22. Reject improper influence.	5□	4□	3□	2□	1□
23. Act for each employer in a reliable and trustworthy manner.	5□	4□	3□	2□	1□
24. Act for each client in a reliable and trustworthy manner.	5□	4□	3□	2□	1□
25. Ensure that all work is lawful and justified.	5□	4□	3□	2□	1□
26. Minimise any adverse effect on society or on the natural environment for your own and succeeding generations.	5□	4□	3□	2□	1□
27. Justify any adverse effect on society or on the natural environment for your own and succeeding generations.	5□	4□	3□	2□	1□
28. Take due account of the limited availability of natural and human resources.	5□	4□	3□	2□	1□
29. Hold paramount the health and safety of others.	5□	4□	3□	2□	1□
30. Act honourably, responsibly and lawfully.	5□	4□	3□	2□	1□
31. Uphold the reputation, standing and dignity of the profession.	5□	4□	3□	2□	1□
32. Be aware of the issues that engineering and technology raise for society.	5□	4□	3□	2□	1□
33. Listen to the aspirations and concerns of others.	5□	4□	3□	2□	1□
34. Actively promote public awareness.	5□	4□	3□	2□	1□
35. Understanding of the impact and benefits of engineering achievements.	5□	4□	3□	2□	1□
36. Be objective and truthful in any statement made in your professional capacity	5□	4□	3□	2□	1□

Section 2

To what extend do you agree with the following being developed by your program? Rate the degree of each item by ticking a box on a scale of 1 to 5 *(Tick one response for each statement.)*

Where:

(5) Strongly agree.

(4) Agree.

(3) Neutral.

(2) Disagree.

(1) Strongly Disagree.

Conduct	Strongly agree (5)				Strongly disagree (1)
1. To act always with care.	5□	4□	3□	2□	1□
2. To act always with competence.	5□	4□	3□	2□	1□
3. Perform services only in areas of current competence.	5□	4□	3□	2□	1□
4. Keep your knowledge up to date.	5□	4□	3□	2□	1□
5. Keep your skills up to date.	5□	4□	3□	2□	1□
6. Assist the development of engineering knowledge in others.	5□	4□	3□	2□	1□
7. Assist the development of engineering skills in others.	5□	4□	3□	2□	1□
8. Not knowingly mislead others about engineering matters	5□	4□	3□	2□	1□
9. Not knowingly allow others to be misled about engineering matters.	5□	4□	3□	2□	1□
10. Present engineering evidence, theory and interpretation honestly accurately and without bias.	5□	4□	3□	2□	1□
11. Review engineering evidence, theory and interpretation honestly, accurately and without bias.	5□	4□	3□	2□	1□
12. Identify risks where possible.	5□	4□	3□	2□	1□
13. Evaluate risks where possible.	5□	4□	3□	2□	1□
14. Quantify risks where possible.	5□	4□	3□	2□	1□
15. Be alert to the ways in which you work might affect others.	5□	4□	3□	2□	1□
16. Duly respect the rights and reputations of other parties.	5□	4□	3□	2□	1□
17. Avoid deceptive acts.	5□	4□	3□	2□	1□
18. Take steps to prevent corrupt practices.	5□	4□	3□	2□	1□

19. Take steps to prevent professional misconduct.	5□	4□	3□	2□	1□
20. Take steps to prevent declare conflicts of interest.	5□	4□	3□	2□	1□
21. Reject bribery.	5□	4□	3□	2□	1□
22. Reject improper influence.	5□	4□	3□	2□	1□
23. Act for each employer in a reliable and trustworthy manner.	5□	4□	3□	2□	1□
24. Act for each client in a reliable and trustworthy manner.	5□	4□	3□	2□	1□
25. Ensure that all work is lawful and justified.	5□	4□	3□	2□	1□
26. Minimise any adverse effect on society or on the natural environment for your own and succeeding generations.	5□	4□	3□	2□	1□
27. Justify any adverse effect on society or on the natural environment for your own and succeeding generations.	5□	4□	3□	2□	1□
28. Take due account of the limited availability of natural and human resources.	5□	4□	3□	2□	1□
29. Hold paramount the health and safety of others.	5□	4□	3□	2□	1□
30. Act honourably, responsibly and lawfully.	5□	4□	3□	2□	1□
31. Uphold the reputation, standing and dignity of the profession.	5□	4□	3□	2□	1□
32. Be aware of the issues that engineering and technology raise for society.	5□	4□	3□	2□	1□
33. Listen to the aspirations and concerns of others.	5□	4□	3□	2□	1□
34. Actively promote public awareness.	5□	4□	3□	2□	1□
35. Understanding of the impact and benefits of engineering achievements.	5□	4□	3□	2□	1□
36. Be objective and truthful in any statement made in your professional capacity.	5□	4□	3□	2□	1□

Appendix 8

Semi-structured interview guide.

The Interview Guide

For the researcher

Introduction

❖ **Introduction & Brief Description of the Research**

A. Introductory conversation (ice-breaking):
    a. Thank you for your time and voluntary interest

B. describing the purpose of the interview
    a. Assuring that the participant is familiar with the interview purpose, and acknowledging the time spent to do the interview and emphasising that anonymity of the interview data will be maintained, managed and kept safe and secure at all times.
    b. Fill and sign the consent form.

Learning & Teaching Engineering Ethics

- **Q1:**
- **Rating the importance of the engineering ethical statements to the future engineering profession**

B. Why did you rank section 1 the way you did?

a. *Follow-up (do you think there is a certain circumstance or experience that influenced your choice?)*
    - *Follow up (can you tell me what was or is this experience?).*
    - *Follow up (how did this experience shaped your perception?)*

b. *Do you think this ranking selection is influenced in any way by:*
    - *Parents views or perceptions?*
    - *Cultural or societal views or perceptions?*
    - *Social circles like peers, friends, role models, etc?*
    - *Educational backgrounds and experiences?*
    - *Working experiences if any?*
    - *Any other past good or bad experiences?*
    - *Other reasons?*

- **Q 2:**
- **Rating the ethical skills that has been developed by the engineering program**

B. Why did you rank section 2 the way you did?

a. *In what ways do you think we are developing accuracy and rigour in you in the programme you are taking?*
    - *If the answer is nothing – follow-up with "What might we do to develop this?"*

b. *In what ways do you think we are developing Honesty and integrity in you in the programme you are taking?*
    - *If the answer is nothing – follow-up with "What might we do to develop this?"*

c. *In what ways do you think we are developing Respect for life, law and the public good in you in the programme you are taking?*
    - *If the answer is nothing – follow-up with "What might we do to develop this?"*

d. *In what ways do you think we are developing Responsible leadership: listening and informing in you in the programme you are taking?*
    - *If the answer is nothing – follow-up with "What might we do to develop this?"*

Appendix 9

The semi-structure interview questions.

Q1. A. How would you rate the importance of the following to the work you are expected to do as an engineer? Rank the importance of each item by inserting a number in the box opposite to each statement on a scale of 1 to 5 *(Tick one response for each statement.)*

Where:

(1) Not Important.

(2) Of Little Importance.

(3) Moderately important.

(4) Important.

(5) Very Important.

Accuracy and rigour □

- always act with care and competence
- perform services only in areas of current competence
- keep their knowledge and skills up to date and assist the development of engineering knowledge and skills in others
- not knowingly mislead or allow others to be misled about engineering matters
- present and review engineering evidence, theory and interpretation honestly, accurately and without bias
- identify and evaluate and, where possible, quantify risks

Honesty and integrity □

- be alert to the ways in which their work might affect others and duly respect the rights and reputations of other parties
- avoid deceptive acts, take steps to prevent corrupt practices or professional misconduct, and declare conflicts of interest
- reject bribery or improper influence
- act for each employer or client in a reliable and trustworthy manner

Respect for life, law and the public good □

- ensure that all work is lawful and justified
- minimise and justify any adverse effect on society or on the natural environment for their own and succeeding generations
- take due account of the limited availability of natural and human resources
- hold paramount the health and safety of others
- act honourably, responsibly and lawfully and uphold the reputation, standing and dignity of the profession

Responsible leadership: listening and informing □

- be aware of the issues that engineering and technology raise for society, and listen to the aspirations and concerns of others
- actively promote public awareness and understanding of the impact and benefits of engineering achievements
- be objective and truthful in any statement made in their professional capacity

Q2. A. To what extent you agree with the following being developed by your program? Rank each item by inserting a number in the box opposite to each statement on a scale of 1 to 5*(Tick one response for each statement.)*

Where:

(1) Strongly Disagree.

(2) Disagree.

(3) Neutral.

(4) Agree.

(5) Strongly Agree.

Accuracy and rigour □

- always act with care and competence
- perform services only in areas of current competence
- keep their knowledge and skills up to date and assist the development of engineering knowledge and skills in others
- not knowingly mislead or allow others to be misled about engineering matters
- present and review engineering evidence, theory and interpretation honestly, accurately and without bias
- identify and evaluate and, where possible, quantify risks

Honesty and integrity □

- be alert to the ways in which their work might affect others and duly respect the rights and reputations of other parties
- avoid deceptive acts, take steps to prevent corrupt practices or professional misconduct, and declare conflicts of interest
- reject bribery or improper influence
- act for each employer or client in a reliable and trustworthy manner

Respect for life, law and the public good □

- ensure that all work is lawful and justified
- minimise and justify any adverse effect on society or on the natural environment for their own and succeeding generations
- take due account of the limited availability of natural and human resources
- hold paramount the health and safety of others
- act honourably, responsibly and lawfully and uphold the reputation, standing and dignity of the profession

Responsible leadership: listening and informing □

- be aware of the issues that engineering and technology raise for society, and listen to the aspirations and concerns of others
- actively promote public awareness and understanding of the impact and benefits of engineering achievements
- be objective and truthful in any statement made in their professional capacity

Q3. A. Who do you think is responsible for teaching ethics as previously defined? Rank each item by inserting a number in the box opposite to each statement on a scale of 1 to 5*(Tick one response for each statement.)*

Where:

(5) Completely responsible.
(4) Responsible.
(3) Don't know.
(2) Not responsible.
(1) Completely not responsible.

Responsible body	**Completely responsible** **(5)**				**Completely not responsible** **(1)**
1. Industry/organization only	5□	4□	3□	2□	1□
2. Academics only	5□	4□	3□	2□	1□
3. Students only	5□	4□	3□	2□	1□
4. 1 & 2 Only	5□	4□	3□	2□	1□
5. 1 & 3 Only	5□	4□	3□	2□	1□
6. 2 & 3 Only	5□	4□	3□	2□	1□
7. All of the previous	5□	4□	3□	2□	1□
8. None of the above	5□	4□	3□	2□	1□

Q1. B. Why did you rank section 1 the way you did?

a. **Do you think that there is a particular circumstance or experience that influenced your choice? Can you tell me, if there is any, what is/are this factor or factors?**
b. **Does this selection choice have to do with:**
    - **Your parents' values and perceptions?**
    - **Your culture or society perceptions?**
    - **Your social circles like peers, friends, peers, lecturers, supervisor, role model etc.?**
    - **Your educational background and or experiences?**
    - **You're working experiences if any?**
    - **Any other past experience good or bad?**

Q2. B. Why did you rank section 2 the way you did?

a. **In what ways do you think we are developing accuracy and rigour in you in the programme you are taking?**
    - **If the answer is nothing – follow-up with "What might we do to develop this?"**
b. **In what ways do you think we are developing Honesty and integrity in you in the programme you are taking?**
    - **If the answer is nothing – follow-up with "What might we do to develop this?"**
c. **In what ways do you think we are developing Respect for life, law and the public good in you in the programme you are taking?**
    - **If the answer is nothing – follow-up with "What might we do to develop this?"**
d. **In what ways do you think we are developing Responsible leadership: listening and informing in you in the programme you are taking?**
    - **If the answer is nothing – follow-up with "What might we do to develop this?"**

Q3. B. Open up a discussion about why the respondent has given each response to try to explore the underlying reasons for each.

Thank you

Appendix 10

RAEng's SEPs 2012's version.

ENGINEERING COUNCIL
ROYAL ACADEMY OF ENGINEERING

STATEMENT OF ETHICAL PRINCIPLES
for the Engineering Profession

Engineering Council

ROYAL ACADEMY OF ENGINEERING

www.eegc.org.uk/professional-ethics

Statement of Ethical Principles

The Engineering Council, in collaboration with the Royal Academy of Engineering and a number of the leading professional engineering institutions, has created a Statement of Ethical Principles to which it believes all professional engineers and technicians, and related bodies should subscribe.

Professional engineers and technicians work to enhance the welfare, health and safety of all, whilst paying due regard to the environment and the sustainability of resources. They have made personal and professional commitments to enhance the wellbeing of society through the exploitation of knowledge and the management of creative teams.

This Statement of Ethical Principles sets a standard to which members of the engineering profession should aspire in their working habits and relationships. It guides them in meeting the UK-SPEC[1] requirement to exercise responsibilities in an ethical manner. The values on which it is based should apply in every situation in which professional engineers and technicians exercise their judgement.

There are four fundamental principles that should guide engineers and technicians in achieving the high ideals of professional life. These express the beliefs and values of the profession and are amplified below.

1 Accuracy and rigour

Professional engineers and technicians have a duty to ensure that they acquire and use wisely and faithfully the knowledge that is relevant to the engineering skills needed in their work in the service of others. They should:

- always act with care and competence
- perform services only in areas of current competence
- keep their knowledge and skills up to date and assist the development of engineering knowledge and skills in others
- not knowingly mislead or allow others to be misled about engineering matters
- present and review engineering evidence, theory and interpretation honestly, accurately and without bias
- identify and evaluate and, where possible, quantify risks

[1]The UK Standard for Professional Engineering Competence - www.engc.org.uk/ukspec

2 Honesty and integrity

Professional engineers and technicians should adopt the highest standards of professional conduct, openness, fairness and honesty. They should:

- be alert to the ways in which their work might affect others and duly respect the rights and reputations of other parties
- avoid deceptive acts, take steps to prevent corrupt practices or professional misconduct, and declare conflicts of interest
- reject bribery or improper influence
- act for each employer or client in a reliable and trustworthy manner

3 Respect for life, law and the public good

Professional engineers and technicians should give due weight to all relevant law, facts and published guidance, and the wider public interest. They should:

- ensure that all work is lawful and justified
- minimise and justify any adverse effect on society or on the natural environment for their own and succeeding generations
- take due account of the limited availability of natural and human resources
- hold paramount the health and safety of others
- act honourably, responsibly and lawfully and uphold the reputation, standing and dignity of the profession

4 Responsible leadership: listening and informing

Professional engineers and technicians should aspire to high standards of leadership in the exploitation and management of technology. They hold a privileged and trusted position in society, and are expected to demonstrate that they are seeking to serve wider society and to be sensitive to public concerns. They should:

- be aware of the issues that engineering and technology raise for society, and listen to the aspirations and concerns of others
- actively promote public awareness and understanding of the impact and benefits of engineering achievements
- be objective and truthful in any statement made in their professional capacity

Engineering Council

Operating under a Royal Charter, the Engineering Council is the UK regulatory body for the engineering profession. It sets and maintains the internationally recognised standards of professional competence and commitment, which are detailed in the UK Standard for Professional Engineering Competence (UK-SPEC).

The Engineering Council also holds the national register of professional Engineering Technicians (EngTech), Incorporated Engineers (IEng), Chartered Engineers (CEng) and ICT Technicians (ICT*Tech*). Holders of these titles must be members of a professional engineering institution licensed by the Engineering Council or in some cases a Professional Affiliate. In order to achieve registered status individuals will have demonstrated to their institution that they possess a range of technical and personal competences and are committed to keeping these up to date, and to acting with integrity in the public interest. The award and retention of these titles ensures that employers, government and wider society - both in the UK and overseas - can have confidence in the knowledge, experience and commitment of engineers and technicians on the register.

Royal Academy of Engineering

As the UK's national academy for engineering, we bring together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering.

We provide analysis and policy support to promote the UK's role as a great place to do business. We take a lead on engineering education and we invest in the UK's world-class research base to underpin innovation. We work to improve public awareness and understanding of engineering. We are a national academy with a global outlook.

We have four strategic challenges: drive faster and more balanced economic growth; foster better education and skills; lead the profession; and promote engineering at the heart of society.

Engineering Council

recognising professional excellence

246 High Holborn
London WC1V 7EX

T +44 (0)20 3206 0500
F +44 (0)20 3206 0501
info@engc.org.uk
www.engc.org.uk

Registered Charity: 286142 Published April 2014

Appendix 11

RAEng's SEPs 2017's version.

Engineering Council

Operating under a Royal Charter, the Engineering Council is the UK regulatory body for the engineering profession. It sets and maintains the internationally recognised standards of professional competence and commitment, which are detailed in the UK Standard for Professional Engineering Competence (UK-SPEC).

The Engineering Council also holds the national register of professional Engineering Technicians (EngTech), Incorporated Engineers (IEng), Chartered Engineers (CEng) and ICT Technicians (ICT*Tech*). Holders of these titles must be members of a professional engineering institution licensed by the Engineering Council or in some cases a Professional Affiliate. In order to achieve registered status individuals will have demonstrated to their institution that they possess a range of technical and personal competences and are committed to keeping these up to date, and to acting with integrity in the public interest. The award and retention of these titles ensures that employers, government and wider society - both in the UK and overseas - can have confidence in the knowledge, experience and commitment of engineers and technicians on the register. The Engineering Council publishes more detailed Guidance on Sustainability, Risk, Security and Whistleblowing.

Royal Academy of Engineering

As the UK's national academy for engineering, the Royal Academy of Engineering brings together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering.

The Academy provides analysis and policy support to promote the UK's role as a great place to do business. It takes a lead on engineering education and invests in the UK's world-class research base to underpin innovation. The Academy works to improve public awareness and understanding of engineering, and is a national academy with a global outlook.

The Royal Academy of Engineering has four strategic challenges:

- Make the UK the leading nation for engineering innovation
- Address the engineering skills crisis
- Position engineering at the heart of society
- Lead the profession

Engineering Council

T +44 (0)20 3206 0500
info@engc.org.uk
www.engc.org.uk
@EngCouncil

ROYAL ACADEMY OF ENGINEERING

T +44 (0)20 7766 0600
www.raeng.org.uk
@RAEngNews

Registered Charity: 286142. First published 2005. Reviewed 2014. Updated and published July 2017. Please refer to the Engineering Council website to ensure that you have the current version.

ENGINEERING COUNCIL
ROYAL ACADEMY OF ENGINEERING

STATEMENT OF ETHICAL PRINCIPLES
for the engineering profession

www.engc.org.uk/professional-ethics

Engineering Council

ROYAL ACADEMY OF ENGINEERING

Statement of Ethical Principles

The Engineering Council and the Royal Academy of Engineering have jointly created a Statement of Ethical Principles for all engineering professionals[1].

Engineering professionals work to enhance the wellbeing of society. In doing so they are required to maintain and promote high ethical standards and challenge unethical behaviour. There are four fundamental principles for ethical behaviour and decision-making. These are set out below, together with examples of how each should be applied.

Engineering professionals should read this Statement in conjunction with their relevant Code of Conduct or Licence to Practise. The Statement by itself is not prescriptive: it is neither a Regulation nor a Standard.

1 Honesty and integrity

Engineering professionals have a duty to uphold the highest standards of professional conduct including openness, fairness, honesty and integrity. They should:

- act in a reliable and trustworthy manner
- be alert to the ways in which their work and behaviour might affect others and respect the privacy, rights and reputations of other parties and individuals
- respect confidentiality
- declare conflicts of interest
- avoid deception and take steps to prevent or report corrupt practices or professional misconduct
- reject bribery and improper influence

2 Respect for life, law, the environment and public good

Engineering professionals have a duty to obey all applicable laws and regulations and give due weight to facts, published standards and guidance and the wider public interest. They should:

- hold paramount the health and safety of others and draw attention to hazards
- ensure their work is lawful and justified
- recognise the importance of physical and cyber security and data protection
- respect and protect personal information and intellectual property
- protect, and where possible improve, the quality of built and natural environments
- maximise the public good and minimise both actual and potential adverse effects for their own and succeeding generations
- take due account of the limited availability of natural resources
- uphold the reputation and standing of the profession

3 Accuracy and rigour

Engineering professionals have a duty to acquire and use wisely the understanding, knowledge and skills needed to perform their role. They should:

- always act with care
- perform services only in areas in which they are currently competent or under competent supervision
- keep their knowledge and skills up to date
- assist the development of engineering knowledge and skills in others
- present and review theory, evidence and interpretation honestly, accurately, objectively and without bias, while respecting reasoned alternative views
- identify, evaluate, quantify, mitigate and manage risks
- not knowingly mislead or allow others to be misled

4 Leadership and communication

Engineering professionals have a duty to abide by and promote high standards of leadership and communication. They should:

- be aware of the issues that engineering and technology raise for society, and listen to the aspirations and concerns of others
- promote equality, diversity and inclusion
- promote public awareness and understanding of the impact and benefits of engineering achievements
- be objective and truthful in any statement made in their professional capacity
- challenge statements or policies that cause them professional concern

[1]In this Statement, "engineering professionals" means "professional engineers and those technicians, tradespeople, students, apprentices and trainees engaged in engineering". Non-engineers managing or teaching engineering professionals should be made aware of this Statement

Glossary

Term	Definition
Ethics	Virtues, morals, norms, duties, concepts, responsibilities, rules, regulations, customs, habits, beliefs, identity, character, set of skills, standards, wisdom, code of ethics, professionalism, and ways of behaviour.
Moral agent	The decision maker, the actor and the person who is held responsible for his/her own behaviours.
Moral development	The principles of how individuals treat and interact with one another, with respect to other's welfare, justice and rights.
Pre-conventional level	The first stage in moral development.
Conventional level	The second stage in moral development.
Post-conventional level	The third stage in moral development.
Ethical schemas	Are the structures of the general knowledge that reside in the long-term memory, where each schema summarizes the individual's expectations, hypothesis, and concepts.
Ethical decision-making	A process that results in producing moral behaviour.
Moral reasoning	The way of thinking about issues of right or wrong.
Moral cognition	The way of making moral judgments and decisions.
Moral awareness	The individual's ability to recognize the moral issue in a situation.
Moral judgement	The process of evaluating and formulating the possible solutions to this ethical issue and develop a moral justification for it.
Moral intention	Prioritising moral issues over other issues.
Moral Behaviour	Acting on moral concerns in the ethical situation.
Rest's model	A tool to explore an individual's internal process of ethical decision making.
Egoism	Self-interests.

Self-efficacy	The individual's perception of the difficulty or ability level that is required to perform the behaviour.
Controllability	The perceptions and beliefs the individual hold about the extent to which s/he can freely perform a behaviour.
Unintentional unethical decisions	Decisions committed either of being unaware or being boundedly ethical.
Boundedly ethical	Unethical behaviours that are perceived unethical by their actors upon further awareness or reflection.
Intentional unethical decisions	Decisions that are committed by individuals who intentionally bend ethical rules, either to serve themselves.
Ethical blind spots	Discriminations and biases.
Moral emotions	Quick feelings and intuitions that trigger moral reasoning.
Culture	Rule systems and control mechanisms that exist in the outside environment and rooted inside the people.
Masculinity	Societies' preference for heroism, achievement, assertiveness and the success rewards system.
Femininity	Societies preference for modesty, cooperation, appreciating life qualities, and caring for the weak.
Collectivism	Societies that are more concerned about maintaining relationships, and prioritize the importance of both, self and group interests.
Individualism	Societies that are more concerned about completing the task.
Uncertainty avoidance	The extent to which individuals in a society can tolerate unexpected, unknown, or unfamiliar events and the extent individuals in these societies will attempt to avoid such situations.
Power distance	The extent to which a society accepts that power in organizations and institutions is distributed unequally.
Ethical issue	A problem that involves a single ethical concern.
Ethical dilemma	A problem that involves two or more ethical conflicts.
Right vs wrong issue	Moral temptations.
Right vs right issue	Ethical Decisions.

Rewards	Expectations of what to receive from others in terms of values and on an exchange of the desired activity or set of activities performed, which can be generated internally and/or externally.
Sanctions	Expectations of punishments of what to receive from others in terms of values and on an exchange of undesired activity or set of activities performed, which can be generated internally or externally.
Moral Intensity	The extent of the issue-related moral features in a situation.
Ethics education	A pedagogical activity that involves analytical tools, critical skills, and techniques of careful reasoning.
Ethical sensitivity	Abilities in metacognition and self-regulated learning, analysing reasons beside developing ethical judgments, leadership and ethical character and having emotional skills.
Self-regulated learning	A cyclical process where the moral agent evaluates his/her learning experience, to optimise their strategic pursuit to learn from mistakes, and master the learning tasks, to improve and attain the levels of the ethical skills.
Leadership	Leading self, leading others and leading performance.
Ethical character	Consistency and match of the individual's perceptions of the "Ideal-Self", the "Ought-Self" and the "Actual-Self".
Emotional skills	Showing empathy, compassion and moral obligation when evaluating ethical issues.
Ethical decision-making model	A conceptual framework that is used by professionals and academics to bring the ethical decision-making principles to the ethics education and ensure that they are followed.
Code of engineering ethics	A document that is put together to guide and help engineers in making decisions while practising the profession.
Accuracy and rigour	Attention to details and accuracy in ensuring and providing better engineering solutions.

Honesty and integrity	Taking steps to prevent professional misconduct.
Respect for life, law and the public good	Professional responsibilities to uphold and protect life, law and public benefits.
Responsible leadership: listening and informing	Responsibilities of engineers due to the trusted and privileged position engineering hold in the society.
Engineering micro-ethics	Engineering profession's internal relations.
Engineering macro-ethics	The collective social responsibility of the profession and to societal decisions about technology.
Ethics Education Effectiveness	The extent to which observable improvements are made on the part of students regarding ethics-related skills, knowledge, or attitudes.
Ethical perception	An indication of ethical sensitivity or rating to relative importance.
Self-reflection	A process of recalling knowledge concerning ones' self and or one's personal experiences.
Paradigm	The set of views and beliefs that constitutes knowledge and truth and guides the way problems are solved.
Pragmatism	Is a problem-oriented philosophy which believes in employing multiple research methods to help answer research questions effectively and practically.
Multi-phase approach	More than two phases or both sequential and concurrent strands that are combined over a period within a 'program' of study addressing an overall program objective.
Mixed method	Combining quantitative and qualitative data collection techniques to generate answers to (a) research question (s).
Multi-method	Combining two or more qualitative or quantitative data collection techniques to generate answers to (a) research question (s).
Triangulating methods	Integrating, mixing and complementing results from different data collection methods that studied the same phenomena and answering one broader research question.

Social Desirability	Respondents tendencies to present themselves in a favourable image to avoid negative judgements or evaluations.
Response errors	Respondents' biased answers which are related to several factors such as respondents' psychological and biological states, and researcher's effect.

References

Abbott, A., Dalton. R and Saegusa. A, 1999. Science comes to terms with the lessons of fraud. *Nature,* 398(6722), p. 13–14.

Acocella, I., 2012. The focus groups in social research: advantages and disadvantages. *Quality & Quantity,* 46(4), p. 1125–1136.

Aiken, L., 1997. *Questionnaires and inventories: Surveying opinions and assessing personality.* 1st ed. Michigan: Wiley.

Ajzen, I., 1985. From intentions to actions: A theory of planned behavior. In: J. K. a. J. Beckmann, ed. *Action Control.* Berlin, Heidelberg: Springer, pp. 11-39.

Ajzen, I., 1991. The theory of planned behavior. *Organizational behavior and human decision process,* 50(2), pp. 179-211.

Ajzen, I., 2002. Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior. *Journal of applied social psychology,* 32(4), pp. 665-683.

Ajzen, I., 2002. Residual effects of past on later behavior: Habituation and reasoned action perspectives. *Personality & Social Psychology Review,* 6(2), pp. 107-122.

Ajzen, I., 2006. *Behavioral Interventions Based on the Theory of Planned Behavior,* Massachusetts: people.umass.edu.

Ajzen, I., 2011. The theory of planned behaviour: reactions and reflections. *Psychology & Health,* 26(9), pp. 1113-1127.

Ajzen, I., and Dasgupta, N., 2015. Explicit and Implicit Beliefs, Attitudes, and Intentions. In: P. H. a. B. Eitam, ed. *The Sense of Agency.* New York: Oxford University Press, pp. 115-144.

Alderfer, C., 1969. An empirical test of a new theory of human needs. *Organizational Behavior and Human Performance,* 4(2), pp. 142-175.

Alexander, L., and Moore, M., 2016. The Stanford Encyclopedia of Philosophy. [Online] Available at: https://plato.stanford.edu/entries/ethics-deontological/ [Accessed 09 April 2019].

Alhemoud, A., 1995. Engineering Ethics is Smart Business. *Professional Safety*, Not Provided October, 40(10), p. 42.

Allan, C., 2000. The hidden organisational costs of using non-standard employment. *Personnel Review,* 29(2), pp. 188-206.

Allen, P., Bennett, K., and Heritage, B., 2014. *SPSS statistics version 22: A practical guide.* 1st ed. South Melbourne, Victoria: Cengage Learning Australia.

Allen, R., Lucero, M., and Van Norman, K., 1997. An Examination of the Individual's Decision to Participate in an Employee Involvement Program. *Group & Organization Management,* 22(1), pp. 117-143.

Alpay, E., 2013. Student-inspired activities for the teaching and learning of engineering ethics. *Science and Engineering Ethics,* 19(4), p. 1455–1468.

Alvarez, K., Salas, E., and Garofano, C., 2004. An Integrated Model of Training Evaluation and Effectiveness. *Human Resource Development Review,* 3(4), pp. 385-416.

American Physical Society, 2009. *Financial Responsibility.* [Online] Available at: http://ethics.iit.edu/eelibrary/biblio/financial-responsibility

[Accessed 06 August 2017].

Angelo T., and Boehrer, J., 2002. *Case Learning: How does it work? Why is it effective?.* [Online] Available at: http://www.soc.ucsb.edu/projects/casemethod/caselearning.pdf

[Accessed 20 June 2016].

Anscombe, G., 1958. Modern Moral Philosophy. *Philosophy,* 33(124), pp. 1-16.

Antes et al., 2007. Personality and Ethical Decision-Making in Research: The Role of Perceptions of Self and others. *Journal of Empirical Research on Human Research Ethics,* 2(4), pp. 15-34.

Antes et al., 2009. A Meta-Analysis of Ethics Instruction Effectiveness in the Sciences. *Ethics & Behaviour,* 19(5), pp. 379-402.

Antes et al., 2012. Applying Cases to Solve Ethical Problems: The Significance of Positive and Process-Oriented Reflection. *Ethics & Behaviour,* 22(2), pp. 113-130.

Arhin, A. and Jones, K., 2009. A multidiscipline exploration of college students' perceptions of academic dishonesty: Are nursing students different from other college students?. *Nurse Education Today,* 29(7), pp. 710-714.

Arlow, P., 1991. Personal characteristics in college students' evaluations of business ethics and corporate social responsibility. *Journal of Business Ethics,* 10(1), p. 63–69.

Armstrong. K, 2011. *Twelve steps to a compassionate life.* 1st ed. London: The Bodley Head.

Aronson, J., 1995. A pragmatic view of thematic analysis. *The Qualitative Report,* 2(1), pp. 1-3.

Ary et al., 2010. *Introduction to Research in Education.* 8th ed. Belmont, CA: WADSWORTH Cengage Learning.

Ashe, C., 2005. Business ethics scenarios: The right and the wrong of it. *Journal of Business Case Studies,* 1(3), pp. 49-52.

Atesh, M., Baruah, B., and Ward, T., 2016. *Analyzing the perception, judgment and understanding of Ethics among engineering students in higher education.* Istanbul, IEEE, pp. 1-8.

Atesh, M., Baruah, B., and Ward, T., 2017. *Analyzing the Factors Influencing the Ethical Decision Making Skills Among Engineering Students.* Valencia, IATED, pp. 1-8.

Atesh, M., Baruah, B., and Ward, T., 2017. *How Do We Measure Ethical Perception and Decision Making Competences Among Higher Education Students?* London, 5th Annual Symposium of the United Kingdom & Ireland Engineering Education Research.

Auger, GA., and Gee, C., 2016. Developing Moral Maturity: An Evaluation of the Media Ethics Course Using the DIT-2. *Journalism & Mass Communication Educator,* 71(2), pp. 146-162.

Avci, E., 2017. Learning from experiences to determine quality in ethics education. *International Journal of Ethics Education,* 2(1), p. 3–16.

Awasthi, V., 2008. Managerial Decision-Making on Moral Issues and the Effects of Teaching Ethics. *Journal of Business Ethics,* 78(1-2), p. 207–223.

Aziz et al., 2005. Understanding the training needs of department chairs. *Studies in Higher Education*, 30(5), pp. 571-593.

Ayres, L., 2012. *Semi-Structured Interview In: The SAGE Encyclopedia of Qualitative Research Methods.* [Online] Available at: https://methods.sagepub.com/base/download/ReferenceEntry/sage-encyc-qualitative-research-methods/n420.xml

[Accessed 19 November 2018].

Babakus, E., and Mangold, W., 1992. Adapting the SERVQUAL scale to hospital services: an empirical investigation. *Health Services Research,* 26(6), p. 767–786.

Bagdasarov et al., 2013. Case-based ethics instruction: the influence of contextual and individual factors in case content on ethical decision-making. *Science and Engineering Ethics,* 19(3), p. 1305–1322.

Bailey et al., 2010. Revitalizing Accounting Ethics Research in the Neo-Kohlbergian Framework: Putting the DIT into Perspective. *Behavioral Research in Accounting,* 22(2), pp. 1-26.

Bairaktarova, D., and Woodcock, A., 2014. *The role of motivation in engineering students': Ethical Decisions.* Chicago, Illinois, IEEE 2014 International Symposium on Ethics in Engineering, Science, and Technology.

Bairaktarova, D., and Woodcock, A.,2017. Engineering Student's Ethical Awareness and Behavior: A New Motivational Model. *Science and Engineering Ethics,* 23(4), p. 1129–1157.

Baker, M., 1996. *Reengineering Ph. D. Programs.* Not provided, ASEE Annual Conference Proceedings.

Baker, S., 1997. Applying Kidder's ethical decision-making checklist to media ethics. *Journal of Mass Media Ethics,* 12(4), pp. 197-210.

Balakrishnan, B., and Tarlochan, F., 2015. *Engineering students' attitude towards engineering ethics education.* Tallinn, Estonia, IEEE Global Engineering Education Conference (EDUCON).

Baldwin et al., 1996. Cheating in medical school: a survey of second-year students at 31 schools. *Academic Medicine,* 71(3), pp. 267-273.

Baldwin, T., and Ford, J., 1988. Transfer of training: A review and directions for future research. *Personnel Psychology,* 41(1), pp. 63-105.

Banerjee et al., 2009. Hypothesis testing, type I and type II errors. *Industrial Psychiatry Journal,* 18(2), p. 127–131.

Banerjee, P., Chatterjee, P., and Sinha, J., 2012. Is it light or dark? Recalling moral behavior changes perception of brightness. *Psychological Science,* 23(4), pp. 407-409.

Banik, G., 2011. *Ethics: Why it is important and how we can teach it for engineering and construction students?.* Vancouver, BC, 2011 ASEE Annual Conference & Exposition.

Bannon, W., 2014. How to Do Perform Multiple Imputation (MI) Using SPSS. *The StatsWhisperer Newsletter,* 4(4), pp. 1-18.

Batha, K., and Carroll, M., 2007. Metacognitive training aids decision making. *Australian Journal of Psychology,* 59(2), pp. 64-69.

Baumeister et al., 1994. Guilt: an interpersonal approach. *Psychological Bulletin,* 115(2), pp. 243-267.

Barkhordari-Sharifabad, M., Ashktorab, T., and Atashzadeh-Shoorideh, F., 2017. Obstacles and problems of ethical leadership from the perspective of nursing leaders: a qualitative content analysis. *Journal of Medical Ethics and History of Medicine,* 10(1), pp. 1-11.

Barnett, T., and Valentine, S., 2004. Issue contingencies and marketers' recognition of ethical issues, ethical judgments and behavioral intentions. *Journal of Business Research,* 57(4), pp. 338-346.

Bartlett, M., 1954. A note on the multiplying factors for various chi square approximations. *Journal of the Royal Statistical Society,* Volume 16, pp. 296-298.

Barton, A., 1958. Asking the Embarrassing Question. *Public Opinion Quarterly,* Volume 22, pp. 67-68.

Baumeister et al., 1994. Guilt: an interpersonal approach. *Psychological Bulletin,* 115(2), pp. 243-267.

Barkan, R., Ayal, S., and Ariely, D., 2015. Ethical dissonance, justifications, and moral behavior. *Current Opinion in Psychology,* 6(Not provided), pp. 157-161.

Barnett, D., and Dalton, J., 1981. Why College Students Cheat. *Journal of College Student Personnel,* 22(6), pp. 545-551.

Baruah, B., Atesh, M., and Ward, T., 2017. *A new framework for measuring the ethical awareness and perception among engineering students in Higher Education.* Florence, New Perspectives in Science Education: 6th Edition.

BBC British Council, 2018. *Teaching English-Approach.* [Online] Available at: https://www.teachingenglish.org.uk/article/approach

[Accessed 19 August 2018].

Bebeau, M., 2002. The defining issues test and the four component model: Contributions to professional education. *Journal of Moral Education,* 31(3), pp. 271-295.

Beck, L., and Ajzen, I., 1991. Predicting dishonest actions using the theory of planned behavior. *Journal of research in personality*, 25(3), pp. 285-301.

Beder, S., 1999. Beyond Technicalities: Expanding Engineering Thinking. *Journal of Professional Issues in Engineering Education and Practice,* 125(1), pp. 12-18.

Bekhet, A., and Zauszniewski, J., 2012. Methodological triangulation: An approach to understanding data. *Nurse Researcher,* 20(2), pp. 40-43.

Benner, P., 1985. Quality of life: a phenomenological perspective on explanation, prediction, and understanding in nursing science. *Advances in Nursing Science,* 8(1), pp. 1-14.

Bennett, M., 1977. Response Characteristics of Bilingual Managers to Organizational Questionnairs. *Personnel Psychology*, 30(1), pp. 29-36.

Bentham, S., 2002. *Psychology and Education.* 1st ed. London: Routledge.

Bero, B., and Kuhlman, A., 2011. Teaching ethics to engineers: Ethical decision making parallels the engineering design process. *Science and engineering ethics,* 17(3), p. 597–605.

Besterfield-Sacre et al., 2001. Gender and ethnicity differences in freshmen engineering student attitudes: A cross-institutional study. *The Research Journal for Engineering Education,* 90(4), pp. 477-489.

Betz, M., O'Connell, L., and Shepard, J., 1989. Gender differences in proclivity for unethical behavior. *Journal of Business Ethics,* 8(5), p. 321–324.

Bielefeldt, A., 2015. *Ethic of Care and Engineering Ethics Instruction.* Rocky Mountain, American Society for Engineering Education.

Bland, J., 1994. Statistics Notes: One and two sided tests of significance. *BMJ,* 309 (248).

Bielefeldt, A., 2018. *Professional Social Responsibility in Engineering.* [Online] Available at: https://www.intechopen.com/books/social-responsibility/professional-social-responsibility-in-engineering

[Accessed 10 January 2019].

Blankenship, K., and Whitley, B., 2000. Relation of general deviance to academic dishonesty. *Ethics & Behavior,* 10(1), pp. 1-12.

Bless et al., 1992. Asking Difficult Questions: Task Complexity Increases the Impact of Response Alternatives. *European Journal of Social Psychology,* 22(3), pp. 309-312.

Boisjoly, R., 2006. *Telecon Meeting (Ethical Decisions - Morton Thiokol and the Challenger Disaster).* [Online] Available at: https://www.onlineethics.org/Resources/thiokolshuttle/shuttle_telecon.aspx#publicationContent

[Accessed 01 April 2019].

Bollom, W., 1988. Ethics and self-regulation for CPAs in the U.S.A. *Journal of Business Ethics,* 7(1-2), p. 55–61.

Bommer et al., 1987. A behavioral model of ethical and unethical decision making. *Journal of Business Ethics,* 6(4), p. 265–280.

Borkowski, S., and Ugras, Y., 1992. The ethical attitudes of students as a function of age, sex and experience. *Journal of Business Ethics*, 11(12), p. 961–979.

Borman, W., and Motowidlo, S., 1992. Expanding the criterion domain to include elements of contextual performance. In: N. S. a. W. C. Borman, ed. *Personnel Selection in Organizations.* Florida: Wiley, pp. 71-98.

Bowen, R., 2012. Ethics and the Engineer: Professional Codes and the Rule of St. Benedict. *Studies in Christian Ethics*, 25(3), pp. 277-294.

Bowie, N., 1985. Are business ethics and engineering ethics members of the same family?. *Journal of Business Ethics*, 4(1), p. 43–52.

Bowlby, J., 1983. *Attachment: Volume One of the Attachment and Loss Trilogy.* 2nd ed. New York: Basic Books.

Borneman, M., 2012. *Criterion Validity In: Encyclopedia of Research Design.* [Online] Available at: https://methods.sagepub.com/base/download/ReferenceEntry/encyclopedia-of-measurement-and-statistics/n113.xml

[Accessed 09 August 2018].

Borenstein et al., 2010. The engineering and science issues test (ESIT): A discipline-specific approach to assessing moral judgment. *Science and Engineering Ethics*, 16(2), p. 387–407.

Bradfield, N., 2016. *Guidance For Higher Education Institutions How To Handle Alleged Student Misconduct Which May Also Constitute A Criminal* Baber, H., 2018. *The Nature of Morality and Moral Theories.* [Online] Available at: http://home.sandiego.edu/~baber/gender/MoralTheories.html

[Accessed 08 May 2019].

Brahmbhatt, A., 2016. Managing Personal and Professional Ethics: A Step Towards Quality Life. *International Journal of Multidisciplinary Research and Modern Education (IJMRME)*, II(I), pp. 140-146.

Branch, W., 2000. Supporting the moral development of medical students. *Journal of General Internal Medicine*, 15(7), p. 503–508.

Brandimonte, M., Bruno, N., and Collina, S., 2006. Cognition, Trieste, Italy: Psychology Press.

Braun, V., and Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology,* 3(2), pp. 77-101.

Brennan, A., and Lo, Y-Sze., 2015. *The Stanford Encyclopedia of Philosophy.* [Online] Available at: https://plato.stanford.edu/entries/ethics-environmental/ [Accessed 28 April 2019].

Brierley, J., 2017. The role of a pragmatist paradigm when adopting mixed methods in behavioural accounting research. *International Journal of Behavioural Accounting and Finance (IJBAF),* 6(2), pp. 140-154.

Briggs, S., Cheek, J., 1986. The role of factor analysis in the development and evaluation of personality scales. *Journal of Personality,* 54(1), pp. 106-148.

British Psychological Society, 2014. *Code of Human Research Ethics.* Leicester: The British Psychological Society.

Brocato, J., 2007. *Using the Challenger and Columbia Disasters to Discuss Technical Communication and Professional Ethics: A Multifaceted Approach.* Mississippi, Proceedings of the American Society for Engineering.

Brock et al., 2008. Mental Models: An Alternative Evaluation of a Sensemaking Approach to Ethics Instruction. *Science and Engineering Ethics,* 14(3), p. 449–472.

Brown, J., 2000. *Statistics Corner- What is construct validity?* [Online] Available at: http://hosted.jalt.org/test/bro_8.htm

[Accessed 09 August 2018].

Brown, J., 2001. *Using Surveys in Language Programs.* 1st ed. New York: Cambridge University Press.

Bucciarelli, L., 1994. *Designing Engineers.* 1st ed. Woburn, Massachusetts: The MIT Press.

Buch, K., and Rivers, D., 2001. TQM: the role of leadership and culture. *Leadership & Organization Development Journal,* 22(8), pp. 365-371.

Buch, K., and Tolentino, A., 2006. Employee perceptions of the rewards associated with six sigma. *Journal of Organizational Change Management,* 19(3), pp. 356-364.

Burrell, G., and Morgan, G., 1979. *Sociological paradigms and organisational analysis: elements of the sociology of corporate life.* 1st ed. Aldershot, Hants: Routledge, Taylor & Francis.

Butler, R., 2014. *Exploratory vs Confirmatory Research,* s.l.: researchgate.net.

Butterfield, KD., Trevin, LK., and Weaver, GR., 2000. Moral awareness in business organizations: Influences of issue-related and social context factors. *Human Relations,* 53(7), pp. 981-1018.

Byrne, E., and Mullally, G., 2013. *A New Kind of Engineer: Incorporating Complexity, Uncertainty and Ethics as Bases for EESD.* Cambridge, Engineering Education for Sustainable Development.

Cagle, J., and Baucus, M., 2006. Case Studies of Ethics Scandals: Effects on Ethical Perceptions of Finance Students. *Journal of Business Ethics,* 64(3), p. 213–229.

Callegaro, M., 2011. *Social Desirability In: Encyclopedia of Survey Research Methods.* [Online] Available at: https://methods.sagepub.com/base/download/ReferenceEntry/encyclopedia-of-survey-research-methods/n537.xml

[Accessed 04 April 2018].

Campbell, D., and Fiske, D., 1959. Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin,* 56(2), pp. 81-105.

Campion, M., and Campion, J., 1987. Evaluation of an interviewee skills training program in a natural field experiment. *Personnel Psychology,* 40(4), pp. 675-691.

Canary et al., 2014. Engaging Students in Integrated Ethics Education: A Communication in the Disciplines Study of Pedagogy and Students' Roles in Society. *Communication Education,* 63(2), pp. 83-104.

Carpenter et al., 2006. Engineering students' perceptions of and attitudes towards cheating. *The Research Journal for Engineering Education,* 95(3), pp. 181-194.

Carroll, M., and Shaw, E., 2012. Ethical Maturity in the Helping Professions: Making Difficult Life and Work Decisions. M. Carroll and M. Tholstrup ed. London: Jessica Kingsley Publishers.

Carter, D., 2016. Co-Curricular Connections: The Role of Undergraduate Research Experiences in Promoting Engineering Students' Communication, Teamwork, and Leadership Skills. *Research in Higher Education,* 57(3), p. 363–393.

Carter et al., 2016. Co-Curricular Connections: The Role of Undergraduate Research Experiences in Promoting Engineering Students. *Research in Higher Education,* 57(3), p. 363–393.

Carter et al., 2014. *The Use of Triangulation in Qualitative Research*., Oncology Nursing Forum, pp. 545-547.

Casey, D., and Murphy, K., 2009. Issues in using methodological triangulation in research. *Nurse Researcher,* 16(4), pp. 40-55.

Cattell, R., 1966. The Scree Test For The Number Of Factors. *Multivariate Behavioral Research,* 1(2), pp. 245-276.

Center for the Study of Ethics in the Professions, Illinois Institute of Technology, 2019. *Ethics Education Library- Case Study Collection.* [Online] Available at: http://ethics.iit.edu/eelibrary/case-study-collection

[Accessed 10 May 2019].

Chadwick, R., 1998. *Encyclopedia of Applied Ethics.* 1st ed. California: Elsevier.

Chambers, C. and Ransom, H., 2015. Teaching Ethics in Higher Education Using the Values–Issues–Action (VIA) Mode. *Journal for the Study of Postsecondary and Tertiary Education,* 1(Not provided), pp. 13-34.

Chen, L., 2012. *A mixed methods study investigating intangibles in the banking sector,* Glasgow: University of Glasgow.

Chadwick, R., and Schroeder, D., 2002. *Applied ethics: critical concepts in philosophy.* 1st ed. Cornwall: Routledge, Taylor and Francis Group.

Chatterjee, S., Sarker, S., and Valacich, J., 2015. The Behavioral Roots of Information Systems Security: Exploring Key Factors Related to Unethical IT Use. *Journal of Management Information Systems*, 31(4), pp. 49-87.

Cheruvalath, R., 2019. Does Studying 'Ethics' Improve Engineering Students' Meta-Moral Cognitive Skills?. *Science and engineering ethics*, 25(2), p. 583–596.

Chhokar, J., Brodbeck, F., and House, R., 2013. *Culture and leadership across the world: The GLOBE book of in-depth studies of 25 societies.* 1st ed. New York: Lawrence Erlbaum Associates Publishers.

Chilisa, B., and Kawulich, B., 2012. *Selecting a Research Approach: Paradigm, Methodology, and Methods*, West Georgia: researchgate.net.

Christensen, A., Cote, J., and Latham, C., 2016. Insights Regarding the Applicability of the Defining Issues Test to Advance Ethics Research with Accounting Students: A Meta-analytic Review. *Journal of Business Ethics*, 133(1), p. 141–163.

Chugh, D., Bazerman, M., and Banaji, M., 2005. Bounded ethicality as a psychological barrier to recognizing conflicts of interest. In: D. C. G. L. a. M. B. D. Moore, ed. *Conflicts of Interest: Challenges and Solutions in Business, Law, Medicine and Public Policy.* New York: Cambridge University Press, pp. 74-98.

Clarke, I., 2001. Extreme response style in cross-cultural research. *International Marketing Review*, 3(301-324), p. 18.

Clarkeburn, H., 2002. A Test for Ethical Sensitivity in Science. *Journal of Moral Education*, 31(4), pp. 439-453.

Cleary, T., and Sandars, J., 2011. Assessing self-regulatory processes during clinical skill performance: A pilot study. *Medical Teacher*, 33(7), pp. e368-e374.

CNN, 2001. *Enron Fast Facts.* [Online] Available at: https://edition.cnn.com/2013/07/02/us/enron-fast-facts/index.html

[Accessed 13 April 2019].

Cohen, J., 1988. *Statistical Power Analysis for the Behavioral Sciences.* 2nd ed. New York: Routledge.

Cohen, J., 1990. Things I have learned (so far). *American Psychologist*, 45(12), pp. 1304-1312.

Cohen, L., Manion, L., and Morrison, K., 2013. Research Methods in Education. 7th ed. New York: Routledge, Taylor & Francis Group.

Colby, A., and Sullivan, W., 2008. Ethics teaching in undergraduate engineering education. *Journal of Engineering Education*, 97(3), pp. 327-338.

Colnerud, G., and Rosander, M., 2009. Academic dishonesty, ethical norms and learning. *Assessment & Evaluation in Higher Education*, 34(5), pp. 505-517.

Conlon, E., 2011. *Marco, micro, structure, agency: analysing approaches to engineering ethics.* Dublin, SEIFI Conference.

Cook, T., 1985. Post-positivist critical multiplism. In: W. S. a. C. Reichardt, ed. *Reproduced in Evaluation Studies Review Annual.* Beverly Hills, CA: Sage Publications, p. Vol.12.

Coolican, H., and Coolican, H., 2014. *Research Methods and Statistics in Psychology.* 6th ed. London: Psychology Press.

Cooley, M., 1995. The myth of the moral neutrality of technology. *AI & SOCIETY*, 9(1), p. 10–17.

Coventry University, 2009. *ETHICS.* [Online] Available at: https://ethics.coventry.ac.uk/about/cu-ethics.aspx

[Accessed 01 April 2019].

Coventry University, 2019. *Aerospace Technology BEng (Hons).* [Online] Available at: https://www.coventry.ac.uk/ug/h402/

[Accessed 01 April 2019].

Craft, J., 2013. A Review of the Empirical Ethical Decision-Making Literature: 2004–2011. *Journal of Business Ethics*, 117(2), p. 221–259.

Creswell, J., and Clark, V., 2006. Choosing a Mixed Methods Design. In: 2nd, ed. *Designing and Conducting Mixed Methods Research.* Thousand Oaks, CA: Sage Publications, pp. 58-89.

Creswell, J., 2013. *Educational Research: Pearson New International Edition: Planning, Conducting, and Evaluating Quantitative and Qualitative Research.* 4th ed. Essex: Pearson Higher Ed.

Creyer, E., 1997. The influence of firm behavior on purchase intention: do consumers really care about business ethics?. *Journal of Consumer Marketing,* 14(6), pp. 421-432.

Croasmun, J., and Ostrom, L., 2011. Using Likert-Type Scales in the Social Sciences. Journal of Adult Education, 40(1), pp. 19-22.

Cronan, T., and Al-Rafee, S., 2008. Factors that influence the intention to pirate software and media. *Journal of Business Ethics,* 78(4), p. 527–545.

Cronbach, L., 1959. Further Evidence on Response Sets and Test Design. *Educational and psychological measurement,* pp. 3-31.

Crossler et al., 2013. Future directions for behavioural information security research. *Computers & Security,* Volume 32, pp. 90-101.

Crotty, M., 1998. *The foundations of social research: meaning and perspective in the research process.* 1st ed. Michigan: SAGE Publications.

Cubitt, G., 2007. *History and Memory.* 1st ed. Manchester: Manchester University Press.

Cunliffe, A., 2010. Crafting Qualitative Research. *Organisational Research Methods,* 14(4), pp. 647-673.

Curran, A., 2008. *The little book of big stuff about the brain: The true story of your amazing brain.* 1st ed. Wales: Crown House Publishing Company.

Cypress, B., 2017. Rigour or reliability and validity in qualitative research: Perspectives, strategies, reconceptualization, and recommendations. *Dimensions of Critical Care Nursing*, 36(4), p. 253–263.

Dalal, R., 2005. A meta-analysis of the relationship between organizational citizenship behavior and counterproductive work behavior. *Journal of applied psychology,* 90(6), pp. 1241-1255.

Darwall, S., 1999. Why Ethics is Part of Philosophy: A Plea for a Philosophical Ethics. *The Proceedings of the Twentieth World Congress of Philosophy,* 1(5), pp. 19-28.

Davies, H., and Crombie, I., 2009. *What are confidence intervals and p-values*, s.l.: www.whatisseries.co.uk.

Davis, J., and Welton, R., 1991. Professional ethics: Business students' perceptions. Journal of Business Ethics, 10(6), p. 451–463.

Davis, M., 1991. Thinking like an engineer: The place of a code of ethics in the practice of a profession. *Philosophy & Public Affairs,* 20(2), pp. 150-167.

Davis, M., 1993. Ethics across the curriculum: Teaching professional responsibility in technical courses. *Teaching Philosophy,* 16(3), pp. 205-235.

Davis, M., 1998. *Thinking like an engineer: Studies in the ethics of a profession.* 2nd ed. New York: Oxford University Press.

Davis, M., Curtis, M., and Tschetter, J., 2003. Evaluating cognitive training outcomes: Validity and utility of structural knowledge assessment. Journal of Business and Psychology, 18(2), p. 191–206.

Dedeke, A., 2015. A Cognitive–Intuitionist Model of Moral Judgment. *Journal of Business Ethics*, 126(3), p. 437–457.

Degeorge, R., 1997. Competing with integrity in international business. *Journal of Business Ethics,* 16(1), pp. 6-36.

DeLapp, K., 2002. *The internet encyclopedia of philosophy.* [Online] Available at: https://www.iep.utm.edu/metaethi/

[Accessed 27 April 2019].

Denscombe, M., 2008. Communities of Practice: A Research Paradigm for the Mixed Methods Approach. *Journal of mixed methods research,* 2(3), pp. 270-283.

Denzin, N., 2017. *The research act: A theoretical introduction to sociological methods.* 1st ed. New York: Routledge.

Deshpande, S., 2009. A Study of Ethical Decision Making by Physicians and Nurses in Hospitals. *Journal of Business Ethics*, 90(Not provided), p. 387–397.

Dewey, J., 1909. *Moral Principles in Education.* 3rd ed. Massachusetts: The Riverside Press Cambridge.

Di Tella, R., and Savedoff, W., 2001. *Diagnosis corruption: fraud in Latin America's public hospitals.* 1st ed. Washington, D.C: Inter American Development Bank.

Dörnyei, Z., 2003. *Questionnaires in Second Language Research: Constructing, Administration and Processing.* 1st ed. Mahwah, New Jersey: Lawrance Erlbaum Associates Publishers.

Driver, J., 2014. *The Stanford Encyclopedia of Philosophy.* [Online] Available at: https://seop.illc.uva.nl/entries/utilitarianism-history/

[Accessed 05 March 2019].

Driver, J., 2014. *The Stanford Encyclopedia of Philosophy.* [Online] Available at: https://plato.stanford.edu/entries/utilitarianism-history/

[Accessed 27 April 2019].

Dole, W., and Hurych, J., 2009. Using Kidder's dilemma paradigm to resolve conflicts in library core values. *New Library World,* 110(9/10), pp. 449-456.

Downie, R., and Clarkeburn, H., 2005. Approaches to the teaching of bioethics and professional ethics in undergraduate courses. *Bioscience Education,* 5(1), pp. 1-9.

Doyle, S., 1985. *GCSE computer studies for you.* 2nd ed. Cheltenham: Stanley Thornes Ltd.

Duffour et al., 2010. *Reflection of UCL Civil and Environmental Engineering experience in integrating ethics in engineering education,* London: researchgate.net.

Dugan, J., 2011. Pervasive myths in leadership development: Unpacking constraints on leadership learning. *Journal of Leadership Studies,* 5(2), pp. 79-84.

Duke, C., 2002. Learning Outcomes: Comparing Student Perceptions of Skill Level and Importance. *Journal of Marketing Education,* 24(3), pp. 203-217.

Duke, C., and Reese, R., 1995. A Case Study in Curriculum Evaluation Using Strategic and Tactical Assessments. *Journal of Education for Business,* 70(6), pp. 344-347.

Dymond, R., 1949. A scale for the measurement of empathic ability. *Journal of Consulting Psychology,* 13(2), pp. 127-133.

Dyrud, M., 2004. *Cases for teaching engineering ethics.* Savannah, GA, 34th Annual Frontiers in Education.

Dyrud, M., 2017. *Ethics and Whistleblowing: Moral Quandaries.* [Online] Available at: http://www.indiana.edu/~ciec/Proceedings_2017/ETD/ETD535_Dyrud.pdf

[Accessed 23 July 2018].

Eckensberger, L., 2009. *Morality From a Cultural Psychology Perspective.* Grand Valley State University, International Association for Cross-Cultural Psychology Conferences, pp. 25-35.

Eekhout et al., 2014. Missing data in a multi-item instrument were best handled by multiple imputations at the item score level. *Journal of Clinical Epidemiology,* 67(3), pp. 335-342.

Eisenberg, N., 2000. Emotion, regulation, and moral development. *Annual Review of Psychology,* 51(1), p. 665–697.

Eisenhardt, K., 1989. Building Theories from Case Study Research. *Academy of Management Review,* 14(4), pp. 532-550.

Eisenberg, N., and Miller, P., 1987. The relation of empathy to prosocial and related behaviors. *Psychological Bulletin,* 101(1), pp. 91-119.

Ekanayake, S., Ahmad, F., and McKenzie, K., 2012. Qualitative cross-sectional study of the perceived causes of depression in South Asian origin women in Toronto. *BMJ,* 2(1).

Ellard, H., and Rogers, T., 1993. Teaching questionnaire construction effectively: The Ten Commandments of question writing. Contemporary Social Psychology, 17(1), pp. 17-20.

Elliott, K., 1997. *Corruption and the global economy.* 1st ed. Washington, D.C: Institute for International Economics.

Elliott, K., and Shin, D., 1999. *Assessing student satisfaction: an approach to help in the development of marketing strategy for a.* s.l., Management Association.

Elliott, K., and Shin, D., 2002. Student Satisfaction: An alternative approach to assessing this important concept. *Journal of Higher Education Policy and Management,* 24(2), pp. 197-209.

Emison, G., 2004. American pragmatism as a guide for professional ethical conduct for engineers. *Science and Engineering Ethics,* 10(2), p. 225–233.

encyclopedia.com, 2019. *Ethics Assessments Rubrics.* [Online] Available at: https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/ethics-assessment-rubrics

[Accessed 09 May 2019].

Enders, C., 2010. *Applied missing data analysis.* 1st ed. New York: The Guilford Press.

Engineering Council, 2018. *Statement of Ethical Principles.* [Online] Available at: https://www.engc.org.uk/standards-guidance/guidance/statement-of-ethical-principles/

[Accessed 06 June 2016].

Engineering Council, 2014. *The Accreditation of Higher Education Programmes UK Standard for Professional Engineering Competence.* 3rd ed. : The Engineering Council.

Eyisi, D., 2016. The Usefulness of Qualitative and Quantitative Approaches and Methods in Researching Problem-Solving Ability in Science Education Curriculum. *Journal of Education and Practice,* 7(15), p. 100 2016.

Fass, R., 1990. Cheating and plagiarism. In: W. M. May, ed. *Ethics and Higher Education.* New York: Macmillan, pp. 170-183.

Fayard, J., Bassi, A., and Bernstein, D., 2009. Is cleanliness next to godliness? Dispelling old wives' tales: Failure to replicate Zhong and Liljenquist (2006). *Journal of Articles in Support of the Null Hypothesis,* 6(2), pp. 21-30.

Fazio et al., 1986. On the automatic activation of attitudes. *Journal of Personality and Social Psychology,* 50(2), pp. 229-238.

Ferrell, O., and Gresham, L., 1985. A contingency framework for understanding ethical decision making in marketing. Journal of marketing, 49(3), pp. 87-96.

Ferrell, O., Gresham, L., and Fraedrich, J., 1989. A synthesis of ethical decision models for marketing. Journal of Macromarketing, 9(2), pp. 55-64.

Field, A., 2013. *Discovering Statistics using IBM SPSS Statistics.* 4th ed. London: SAGE Publications.

Finch, A., and McAfee, O., 2012. Determining the Importance of Ethics Education in Business Programs. *Review of Management Innovation & Creativity,* 5(17), pp. 43-49.

Finelli et al., 2012. An Assessment of Engineering Students' Curricular and Co-Curricular Experiences and Their Ethical Development. *The Research Journal for Engineering Education,* 101(3), pp. 469-494.

Fishbach et al., 2014. Motivation resulting from completed and missing actions. *Advances in experimental social psychology,* 50(Not provided), pp. 257-307.

Fishbach, M., and Ajzan, I., 2011. Predicting and changing behavior: The reasoned action approach. 2nd ed. New York: Taylor & Francis Group.

Fisher, C., Fried, F., and Feldman, L., 2009. Graduate Socialization in the Responsible Conduct of Research: A National Survey on the Research Ethics Training Experiences of Psychology Doctoral Students. *Ethics & Behaviour,* 19(6), pp. 496-518.

Fiske, S., and Taylor, S., 1991. *Social Cognition.* 2nd ed. New York: Mcgraw-Hill Book Company.

Fleming, J., 2006. *Piaget, Kohlberg, Gilligan, and Others on Moral Development- University of Warwick.* [Online] Available at: https://warwick.ac.uk/fac/cross_fac/iatl/study/ugmodules/ethicalbeings/theoretical_approach_intro_reading.pdf

[Accessed 1-13 July 2018].

Flexner, A., 2002. *Medical Education in the United States and Canada Bulletin Number Four (1910),* New York: The MerryMount Press.

Fontana, A., and Frey, J., 2000. *The interview: From structured questions to negotiated text.* 2nd ed. Thousand Oaks, CA: SAGE Publications.

Ford, R., and Richardson, W., 1994. Ethical decision making: A review of the empirical literature. *Journal of Business Ethics,* 13(3), p. 205–221.

Frank, M., and Gilovich, T., 1988. The dark side of self-and social perception: black uniforms and aggression in professional sports. Journal of Personality and Social Psychology, 54(1), pp. 74-85.

Frede, D., 2003. *The Stanford Encyclopedia of Philosophy.* [Online] Available at: https://plato.stanford.edu/entries/plato-ethics/

[Accessed 05 March 2019].

Freitas et al., 1998. *The Focus Group: A Qualitative Research Method,* Baltimore: Merrick School of Business, University of Baltimore.

Frey, R., and Wellman, C., 2003. *A companion to applied ethics.* 1st ed. Cornwall: Blackwell Publishing.

Frey, W., and O'Neill-Carrillo, E., 2008. Engineering ethics in Puerto Rico: Issues and narratives. *Science and Engineering Ethics,* 14(3), p. 417–431.

Fullan, M., 2005. Turnaround Leadership. *The Educational Forum,* 69(2), pp. 174-181.

Fulmer, R., 2014. *Normative Ethics: An Exercise to Facilitate Awareness,* Virginia: VISTAS project sponsored by the American Counseling Association.

Fitzsimons, G., and Fishbach, A., 2010. Shifting closeness: interpersonal effects of personal goal progress. *Journal of personality and social psychology,* 98(4), pp. 535-549.

Friedman, G., and Sage, A., 2004. Case studies of systems engineering and management in systems acquisition. *Systems Engineering,* 7(1), pp. 84-97.

Gaberson, K., 1997. Academic dishonesty among nursing students. *Nursing Forum,* 32(3), pp. 14-20.

Galanina, E., Dulzon, A., and Schwab, A., 2015. *Forming engineers' sociocultural competence: Engineering ethics at Tomsk polytechnic university.* Not provided, IOP Publishing Ltd.

Gianakis, G., 2005. Decision making and managerial capacity in the public sector. In: M. H. a. S. Lee, ed. *Public Productivity Handbook.* New York: Taylor & Francis Group, pp. 45-67.

Gillham, B., 2008. *Developing a questionnaire.* 2nd ed. London: Continum International Publishing Group.

Gilligan, C., 1977. In a Different Voice: Women's Conceptions of Self and of Morality. *Harvard Educational Review,* 47(4), pp. 481-517.

Gilman, S. C., 2005. *Ethics Codes and Codes of Conduct as Tools for Promoting an Ethical and Professional Public Service: Comparative Successes and Lessons,* Washington, D.C: PREM, the World Bank.

Garrigan et al., 2018. Moral decision-making and moral development: Toward an integrative framework. *Developmental Review,* 49(1), pp. 80-100.

Gauthier, L., 2013. How learning works: 7 research-based principles for smart teaching. *Journal of the Scholarship of Teaching and Learning,* 14(1), pp. 126-129.

Geertz, C., 1973. *The Interpretation of Cultures: Selected Essays.* 1st ed. New York: Basic Books.

Geistauts, G., Baker, E., and Eschenbach, T., 2008. Engineering Ethics: A System Dynamics Approach. Engineering Management Journal, 20(3), pp. 21-28.

Gert, B., and Gert, J., 2016. *The Stanford Encyclopedia of Philosophy.* [Online] Available at: https://plato.stanford.edu/entries/morality-definition/

[Accessed 05 March 2019].

Gino, F., 2015. Understanding Ordinary Behavior: why people who value morality act immorally. *Current Opinion in Behavioral Sciences,* 3(1), pp. 107-111.

Gino, F., and Bazerman, M., 2007. *Slippery slopes and misconduct: The effect of gradual degradation on the failure to notice others,* Unpublished manuscript. Working paper. Harvard University #06-007.

Gino, F., Ayal, S., and Ariely, D., 2009. Contagion and Differentiation in Unethical Behavior: The Effect of One Bad Apple on the Barrel. *Psychological Science,* 20(3), pp. 393-398.

Gino, F., and Ayal, S., 2011. Honest rationales for dishonest behavior. In: M. M. a. P. Shaver, ed. *The Social Psychology of Morality: Exploring the Causes of Good and Evil.* Washington, D.C: Research Gate, p. 149–166.

Gino, F., and Galinsky, A., 2012. Vicarious dishonesty: When psychological closeness creates distance from one's moral compass. *Organizational Behavior and Human Decision Processes,* 119(1), pp. 15-26.

Gläser, J., and Laudel, G., 2013. Life with and without coding: Two methods for early-stage data analysis in qualitative research aiming at causal explanations. *Forum: Qualitative Social Research,* 14(2).

Glynn, K., Rajendran, K., and Corbin, S., 1993. Perceptual-Based Student Outcomes Assessment Process in the Marketing Curriculum. *Journal of Education for Business,* 69(1), pp. 11-17.

Goldstein, I., and Ford, J., 2002. *Training in organizations: Needs assessment, development, and evaluation.* 4th ed. Belmont, CA: Wadsworth.

Gong, Q., 2010. Virtue ethics and modern society—A response to the thesis of the modern predicament of virtue ethics. *Frontiers of Philosophy in China.* 5 (2), pp 255–265.

Goodwin, J., and Goodwin, K., 2016. *Research in psychology: Methods and design.* 8th ed. Massachusetts: WILEY.

Goolaup, S., and Ismayilov, T., 2012. *The influence of power distance on leadership behaviours and styles: Case studies of Japanese and French companies operating in Sweden,* Umea, Sweden: Umea School of Business.

Graduate Prospects, 2019. *Electronics engineer.* [Online] Available at: https://www.prospects.ac.uk/job-profiles/electronics-engineer

[Accessed 01 April 2019].

Gray, C., Exter, M., and Krause, T., 2016. *Instructional Strategies for Incorporating Empathy in Transdisciplinary Technology Education.* New Orleans, ASEE's 123rd Annual Conference & Exposition.

Greene, J., Caracelli, V., and Graham, W., 1989. Toward a Conceptual Framework for Mixed-Method Evaluation Designs. Educational Evaluation and Policy Analysis, 11(3), pp. 255-274.

Greene et al., 2001. *An fMRI investigation of emotional engagement in moral judgment,* Washington DC: American Association for the Advancement of Science.

Greene, J. D., 2015. Beyond point-and-shoot morality: Why cognitive (neuro) science matters for ethics?. *The Law & Ethics of Human Rights,* 9(2), p. 141–172.

Greenlaw, C., and Brown-Welty, C., 2009. A Comparison of Web-Based and Paper-Based Survey Methods. *Evaluation Review,* 33(5), pp. 464-480.

Greenwald, A., Nosek, B., and Banaji, M., 2003. Understanding and using the Implicit Association Test: I. An improved scoring algorithm. *Journal of Personality and Social Psychology,* 85(2), pp. 197-216.

Grosch, K., and Rau, H., 2017. Gender differences in honesty: The role of social value orientation. *Journal of Economic Psychology,* Volume 26, pp. 258-267.

Gruys, M., and Sackett, P., 2003. Investigating the Dimensionality of Counterproductive Work Behavior. International journal of selection and Assessment, 11(1), pp. 30-42.

Guardian, 2017. *Light at the end of the tunnel: sun shines for Brunel's birthday.* [Online] Available at: https://www.theguardian.com/technology/2017/apr/10/isambard-kingdom-brunel-birthday-box-tunnel-bath-sun

[Accessed 07 March 2019].

Guba, E., 1990. *The Paradigm dialogue.* 1st ed. Thousand Oaks, CA: Sage Publications.

Guest, G., Bunce, A., and Johnson, L., 2006. How Many Interviews Are Enough? An Experiment with Data Saturation and Variability. *Field Methods,* 18(1), pp. 59-82.

Guest, G., 2013. Describing mixed methods research: An alternative to typologies. *Journal of Mixed Methods Research,* 7(2), pp. 141-151.

Guise et al., 2010. A mixed-mode approach to data collection: combining web and paper questionnaires to examine nurses. *Journal of Advanced Nursing,* 66(7), pp. 1623-1632.

Guion, L., Diehl, D., and McDonald, D., 2002. Triangulation: Establishing the validity of qualitative studies, Florida: Department of Family, Youth and Community Sciences, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.

Gülcan, N. Y., 2015. *Discussing the Importance of Teaching Ethics in Education.* Karaoglanoglu, Turkey, ELSEVIER, pp. 2622-2625.

Gump, L., Baker, R., and Roll, S., 2000. Cultural and Gender Differences in Moral Judgment: A Study of Mexican Americans and Anglo-Americans. Hispanic Journal of Behavioral Sciences, 22(1), pp. 78-93.

Haidt, J., 2003. The moral emotions. In: K. R. S. &. H. H. G. R. J. Davidson, ed. *Handbook of affective sciences.* New York: Oxford University Press, pp. 851-870.

Haidt, J., and Joseph, C., 2004. Intuitive ethics: How innately prepared intuitions generate culturally variable virtues?. The MIT Press Journals, 133(4), pp. 55-66.

Haidt, J., 2007. The new synthesis in moral psychology. *American Association for the Advancement of Science,* 316(5827), pp. 998-1002.

Haidt, J., and Graham, J., 2007. When Morality Opposes Justice: Conservatives Have Moral Intuitions that Liberals may not Recognize. Social Justice Research, 20(1), p. 98–116.

Haidt, J., 2008. Morality. *Perspectives on Psychological Science,* 3(1), pp. 65-72.

Haidt, J., and Bjorklund, F., 2008. Social intuitionists answer six questions about morality. In: S. a. Walter, ed. Moral Psychology, Vol. 2. New York: MIT Press, pp. 181 - 217.

Hair et al., 2010. *Multivariate Data Analysis.* 7th ed. Cornell University: Prentice Hall.

Hall et al., 1995. A comparison of student and employer expectations with regard to business internships. *Marketing Education Review,* 5(3), pp. 41-49.

Hall, H., Ely, E., and Grossman, J., 2005. *The Supreme Court of the United States.* 2nd ed. New York: Oxford University Press.

Hamilton, D., 1968. Personality attributes associated with extreme response style. *Psychological Bulletin,* 69(3), pp. 192-203.

Hanna, M., 2014. *The Role of Code of Engineering Ethics in Projects.* Not provided: SELEM DMCC.

Hanson, W., and Moore, J., 2013. Ethical decision-making by business students: Factors of influence. *Electronic Journal of Business Ethics and Organization Studies,* 18(1), pp. 15-26.

Harding et al., 2004. *The influence of academic dishonesty on ethical decision making in the workplace: A study of engineering students.* Not Provided, American Society for Engineering Education Annual Conference & Exposition.

Harding et al., 2007. The Theory of Planned Behavior as a Model of Academic Dishonesty in Engineering and Humanities Undergraduates. *Ethics & Behaviour,* 17(3), pp. 255-279.

Harkrider et al., 2013. Structuring Case-Based Ethics Training: How Comparing Cases and Structured Prompts Influence Training Effectiveness. *Ethics & Behaviour,* 23(3), pp. 179-198.

Harris, A., 2013. *A model of key characteristics affecting consumer attitudes toward the usage of free legitimate ad-supported music download services,* Aberdeen: Robert Gordon University.

Harré, R., 1985. Personal being: a theory for individual psychology. *Ethics,* 95(4), pp. 947-949.

Harris et al., 1992. Engineering Ethics: What? Why? How? And When? *The Research Journal for Engineering Education,* 85(2), pp. 93-96.

Harsh, M., 2015. Ethical Engineering: Definitions, Theories and Techniques. In: M. Harsh, ed. Engineering for International Development and Environmental Sustainability. London: Springer, pp. 15-62.

Harun et al., 2016. *A survey on engineering ethics and technological advancement among Malaysian public university students.* Kuala Lumpur, 2016 IEEE 8th International Conference on Engineering Education (ICEED).

Hasnas, J., 2009. The Mirage of Product Safety. In: G. G. Brenkert, ed. *The Oxford Handbook of Business Ethics.* Georgetown: Oxford University Press, pp. 3-24.

Haws, D., 2001. Ethics Instruction in Engineering Education: A (Mini) Meta-Analysis. *Journal of Engineering Education,* 90(2), pp. 223-229.

Hauenstein, N., Findlay, R., and McDonald, D., 2011. Using Situational Judgment Tests to Assess Training Effectiveness: Lessons Learned Evaluating Military Equal Opportunity Advisor Trainees. *Military Psychology,* 22(3), pp. 262-281.

Heale, R., and Twycross, A., 2015. Validity and reliability in quantitative studies. *Evidence-based nursing,* 18(3), pp. 66-67.

Hébert et al., 1990. Evaluating ethical sensitivity in medical students: using vignettes as an instrument. *Journal of Medical Ethics,* 16(3), pp. 141-154.

Hellman, D., 2008. *When is discrimination wrong?* 1st ed. U.S.A: Harvard University Press.

Helyer, R., 2015. Learning through reflection: the critical role of reflection in work-based learning (WBL). *Journal of Work-Applied Management,* 7(1), pp. 15-27.

Henle, C., 2006. Bad Apples or Bad Barrels' A Former CEO Discusses the Interplay of Person and Situation with Implications for Business Education. *Academy of Management Learning & Education,* 5(3), pp. 346-355.

Henson et al., 2001. *Reporting Practice and Use of Exploratory Factor Analysis in Educational Research Journals,* Little Rock, AR: Paper presented at the Annual Meeting of the Mid-South.

Herkert, J., 1999. *ABET's Engineering Criteria 2000 and Engineering Ethics: Where Do We Go From Here?* National Academy of Engineering, Online Ethics Center.

Herkert, J., 2001. Future directions in engineering ethics research: Microethics, macroethics and the role of professional societies. *Science and Engineering Ethics,* 7(3), p. 403–414.

Herkert, J., 2005. Ways of thinking about and teaching ethical problem solving: Microethics and macroethics in engineering. *Science and Engineering Ethics,* 11(3), p. 373–385.

Harré, R., 1985. Personal being: a theory for individual psychology. Ethics, 95(4), pp. 947-949.

Hersh, M., 2016. Engineers and the other: the role of narrative ethics. *AI & SOCIETY,* 31(3), p. 327–345.

Heymans, M., 2015. *Handling missing data-Amsterdam Public Health Quality Handbook.* [Online] Available at: http://www.emgo.nl/kc/handling-missing-data/

[Accessed 19 July 2018].

Hicks, L., 1997. How Do Academic Motivation and Peer Relationships Mix in an Adolescent's World? *Middle School Journal,* 28(4), pp. 18-22.

Higgins, E., 1987. Self-discrepancy: a theory relating self and effect. *Psychological Review,* 94(3), pp. 319-340.

Higgins, E., and Conwell, J., 2016. Securing foundations and advancing frontiers: Prevention and promotion effects on judgment & decision making. *Organizational Behavior and Human Decision Process,* 136(Not provided), pp. 56-67.

Hilburn, T., Towhidnijad, M., and Salamah, S., 2014. *A Life-Cycle Engineering Case Study,* Daytona Beach, FL: Department of Electrical, Computer, Software, and Systems Engineering.

Hirschi, T., 1969. *Causes of delinquency.* 1st ed. California: University of California Press.

Ho, J., 2010. Ethical perception: are differences between ethnic groups situation dependent? *Business Ethics: A European Review,* 19(2), pp. 154-182.

Hofstede, G., 1980. Motivation, leadership, and organization: Do American theories apply abroad? *Organizational Dynamics,* 9(1), pp. 42-63.

Hofstede. G., and Bond, M., 1988. The Confucius connection: From cultural roots to economic growth. *Organizational Dynamics,* 16(4), pp. 5-21.

Hofstede, G., 1983. The cultural relativity of organizational practices and theories. *Journal of international business studies,* 14(2), p. 75–89.

Hofstede, G., 1998. Think locally, act globally: Cultural constraints in personnel management. In: M. F. a. P. D. W. Weber, ed. *Management and International Review.* Gabler Verlag, Wiesbaden: mir Special Issue, pp. 7-26.

Hofstede, G., 2001. *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations.* 2nd ed. California: SAGE publications.

Hofstede, G., 2011. Dimensionalizing Cultures: Th Hofstede Model. *Online readings in psychology and culture,* 2(1), pp. 3-26.

Holbrook, A., and Krosnick, J., 2009. Social desirability bias in voter turnout reports: Tests using the item count technique. *Public Opinion Quarterly,* 74(1), p. 37–67.

Holmes, R., 2019. *Introduction to applied ethics.* [Online] Available at: https://www.bloomsbury.com/cw/introduction-to-applied-ethics/what-is-applied-ethics/

[Accessed 28 April 2019].

Honan et al., 2013. Ethical issues in cross-cultural research. *International Journal of Research & Method in Education,* 36(4), pp. 386-399.

Houts, A., Cook, T., and Shadish Jr, W., 1986. The person-situation debate: A critical plist perspective. *Journal of Personality,* 54(1), pp. 52-105.

Howard, M., 2016. A Review of Exploratory Factor Analysis Decisions and Overview of Current Practices: What We Are Doing and How Can We Improve? *International Journal of Human-Computer Interaction,* 31(1), pp. 51-62.

Hoyningen-Huene, P., 1990. Kuhn's conception of incommensurability. *Studies in History and Philosophy of Science Part A,* 21(3), pp. 481-492.

Huang, H., and Hung, Y., 2013. Gender differences and behavioral integrity: From a social contract perspective. Journal of Management & Organization, 19(1), pp. 86-100.

Hughes, C., 2010. *The assessment of ethics.* New South Wales, the Asia Pacific Conference on Educational Integrity (4APCEI).

Hughes, K., and Scott-Clayton, J., 2011. Assessing Developmental Assessment in Community Colleges. *Community College Review,* 39(4), pp. 327-351.

Hunt, G., 2007. *Teaching Ethics to Engineering Students,* Surrey: University of Surrey.

Hunt, S., and Vitell, S., 1986. A general theory of marketing ethics. *Journal of Macromarketing,* 6(1), pp. 5-16.

Hunt, S., and Vitell, S., 2006. The General Theory of Marketing Ethics: A Revision and Three Questions. *Journal of Macromarketing,* 26(2), pp. 143-153.

Hursthouse, R., and Pettigrove, G., 2016. *The Stanford Encyclopedia of Philosophy.* [Online] Available at: https://plato.stanford.edu/entries/ethics-virtue/

[Accessed 9 April 2019].

Husted, B., and Allen, D., 2008. Toward a model of cross-cultural business ethics: The impact of individualism and collectivism on the ethical decision-making process. *Journal of Business Ethics*, 82(2), p. 293–305.

Hursthouse, R., 1999. *On Virtue Ethics.* 1st ed. Oxford: Clarenton Press.

Illingworth, S., 2004. Approaches to Ethics in Higher Education Teaching Ethics across the Curriculum. 1st ed. Leeds: The Philosophical and Religious Studies Subject Centre, University of Leeds.

Izzo, G., 2000. Compulsory ethics education and the cognitive moral development of salespeople: A quasi-experimental assessment. *Journal of Business Ethics*, 28(3), p. 223–241.

Jackson, N., and Carter, P., 1991. In Defence of Paradigm Incommensurability. *Organization Studies*, 12(1), pp. 109-127.

Jarratt, D., 1996. A comparison of two alternative interviewing techniques used within an integrated research design: a case study in outshopping using semi-structured and non-directed interviewing techniques. *Marketing Intelligence & Planning*, 14(6), pp. 6-15.

Jasuja et al., 2019. *"Ethics vs Morals" Diffen.com.* [Online] Available at: https://www.diffen.com/difference/Ethics_vs_Morals

[Accessed 03 May 2019].

Jenkins, G., and Taber, T., 1977. A Monte Carlo study of factors affecting three indices of composite scale reliability. *Journal of Applied Psychology*, 62(4), pp. 392-398.

Jones et al., 2003. Auditors' Ethical Reasoning: Insights from Past Research and Implications for the Future. Journal of Accounting Literature, 22(Not Provided), pp. 45-103.

Jones, T., 1991. Ethical Decision Making by Individuals in Organizations: An issue-contingent model. *Academy of Management Review*, 16(2), pp. 366-395.

Jensen, J., 2017. *Development of student leadership skills and identity: a case study at a Finnish university*, Jyväskylä, Finland: University of Jyväskylä.

Jonsen, A., and Toulmin, T., 1988. *The Abuse of Casuistry: A History of Moral Reasoning.* 1st ed. California: University of California Press.

Johnson et al., 2013. The Effects of Note-Taking and Review on Sensemaking and Ethical Decision Making. Ethics & Behaviour, 23(4), pp. 299-323.

Johnson, R., and Onwuegbuzie, A., 2004. Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational Researcher,* 33(7), pp. 14-26.

Jordan, J., Mullen, E., and Murnighan, J., 2011. Striving for the Moral Self: The Effects of Recalling Past Moral Actions on Future Moral Behavior. *Personality and Social Psychology Bulletin,* 37(5), pp. 701-713.

JUSTIA US Law, 1993. *JUSTIA US Law.* [Online] Available at: https://law.justia.com/cases/nevada/supreme-court/1993/22397-1.html

[Accessed 20 02 2019].

Kaiser, H., 1970. A second-generation little jiffy. *Psychometrika,* 35(4), p. 401–415.

Kalichman, M., 2007. Responding to challenges in educating for the responsible conduct of research. *Academic Medicine,* 82(9), pp. 870-875.

Kalichman, M., and Plemmons, D., 2007. Reported goals for responsible conduct of research courses. Academic Medicine, 82(9), pp. 846-852.

Kaminska, O., and Foulsham, T., 2013. *Understanding Sources of Social Desirability Bias in Different Modes: Evidence from Eye-tracking Olena Kaminska, ISER Working Paper Series,* Essex: ISER Working Paper Series, Institute for Social and Economic Research (ISER), University of Essex.

Kansas State University, 2009. *Offer from Another Engineer, Engineering Ethics Skit.* [Online] Available at: http://ethics.iit.edu/eelibrary/node/3727

[Accessed 06 August 2017].

Karafillis, G., 2012. Some Thoughts on John Dewey's Ethics and Education. *US-China Education Review,* pp. 445-452.

Karande et al., 2000. Perceived moral intensity, ethical perception, and ethical intention of American and Malaysian managers: a comparative study. *International Business Review,* 9(1), pp. 37-59.

Kaufmann, D., and Vicente, P., 2011. Legal Corruption. *Economics & Politics*, 23(2), pp. 195-219.

Kegan, R., 1994. *In over our heads: The mental demands of modern life.* 1st ed. New York: Harvard University Press.

Kelley, P., and Elm, D., 2003. The Effect of Context on Moral Intensity of Ethical Issues: Revising Jones's Issue-Contingent Model. *Journal of Business Ethics*, 48(2), p. 139–154.

Kerkvliet, J., 1994. Cheating by economics students: A comparison of survey results. *The Journal of Economic Education*, 25(2), pp. 121-133.

Kidder, R., 1995. *How good people make tough choices: resolving the dilemmas of ethical living.* 1st ed. New York: Harper Collins.

Kidder, R., 1996. *Tough choices, why it's getting harder to be ethical? - The Futurist Magazine.* [Online] Available at: https://www.questia.com/read/1G1-17449511/tough-choices-why-it-s-getting-harder-to-be-ethical

[Accessed 24 03 2018].

Kidwell, J., Stevens, R., and Bethke, A., 1978. Differences in Ethical Perceptions Between Male and Female Managers: Myth or Reality?. *Journal of Business Ethics*, 6(6), p. 489–493.

Kim, R., 2016. Ethical Decision Making in International Business: A Study of Challenge in Teaching to Future Global Talents. *Business and Management Studies*, 2(2), pp. 1-13.

Kirkpatrick, D., 1996. Great Ideas Revisited. Techniques for Evaluating Training Programs. Revisiting Kirkpatrick's Four-Level Model. *Training and Development*, 50(January), pp. 54-59.

Kirkpatrick, D., and Kirkpatrick, J., 2009. *Implementing the Four Levels: A Practical Guide for Effective Evaluation of Training Programs: Easyread Super Large 24pt Edition.* 1st ed. San Francisco, CA: Berrett-Koehler Publishers.

Kitzinger, J., 1995. Qualitative Research: Introducing focus groups. *The BMJ*, Volume 311, pp. 299-311.

Kivunja, C., and Kuyini, A.,2017. Understanding and Applying Research Paradigms in Educational Contexts. International Journal of Higher Education, 6(5), pp. 26-41.

Knight, P., and Page, A., 2007. *The assessment of 'wicked' competences be undecided about them,* s.l.: The Practice-based Professional Learning Centre for excellence in teaching and learning in the Open University.

Kohlberg, L., 1969. Stage and sequence: The cognitive development approach to socialization. In: D. A. Goslin, ed. *Handbook of socialization theory.* Chicago, IL: Rand McNally, pp. 347-480.

Kohlberg, L., 1971. How to Commit the Naturalistic Fallacy and Get Away with It in the Study of Moral Development. In: P. R. S. C. Cafagna A.C., ed. *Philosophy, Children, and the Family.* Boston: Springer, pp. 261-270.

Kohlberg, L., 1976. Moral stages and moralization: The cognitive-development approach. In: T. Lickona, ed. *In Moral development and behavior: Theory, research and social issues.* New York: Holt, Rinehart and Winston, pp. 31-53.

Kohlberg, L., and Hersh, R., 1977. Moral development: A review of the theory. Theory into practice, 16(2), pp. 53-59.

Kohlberg, L., 1978. Revisions in the theory and practice of moral development. *New directions for child and adolescent development,* 1978(2), pp. 83-88.

Kohlberg, L., 1984. *The psychology of moral development: the nature and validity of moral stages.* 1st ed. Michigan: Harper & Row.

Koiranen, M., 2002. Over 100 Years of Age But Still Entrepreneurially Active in Business: Exploring the Values and Family Characteristics of Old Finnish Family Firms. *Family Business Review,* 15(3), pp. 175-187.

Kolodner, J., 2014. *Case-based reasoning.* 1st ed. San Mateo, CA: Morgan Kaufmann Publishers.

Kouchaki, M., and Gino, F., 2015. Dirty deeds unwanted: The use of biased memory processes in the context of ethics. Current Opinion in Psychology, Volume 6, pp. 82-86.

Kouchaki, M., and F. Gino, F., 2016. Memories of unethical actions become obfuscated over time. Proceedings of the National Academy of Sciences of the United States of America, 113(22), pp. 6166-6171.

Kraiger, K., 2002. Decision based evaluation. In: K. Kraiger, ed. *Creating, Implementing and Managing Effective Training and Development.* Jossey-Bass San Francisco, CA: Wiley, pp. 331-375.

Krosnick, J., 1991. Response strategies for coping with the cognitive demands of attitude measures in surveys. *Applied cognitive psychology,* 5(3), pp. 213-236.

Kocanjer, D., and Kadoić, N., 2017. *Raising students' awareness about ethical behavior.* Žilina, Slovačka, Publishing Institution of the University of Zilina.

Kulju et al., 2015. Ethical competence: A concept analysis. Nursing Ethics, 23(4), pp. 401-412.

Krueger, R., and Casey, MA., 2015. *Focus Group Interviewing.* 5th ed. Minnesota: University of Minnesota.

Kuyini, A., 2017. Understanding and Applying Research Paradigms in Educational Contexts. International Journal of Higher Education, 6(5), pp. 26-29.

LaDuke, R., 3015. Academic dishonesty today, unethical practices tomorrow?. *Journal of Professional Nursing,* 29(6), pp. 402-406.

LaFollette, H., 2014. Ethics in practice : an anthology. 4th ed. : WILEY Blackwell.

Lancaster University, 2019. Nuclear Engineering BEng Hons. [Online] Available at: https://www.lancaster.ac.uk/study/undergraduate/courses/nuclear-engineering-beng-hons-h820/#course-structure

[Accessed 01 May 2019].

Larson, A., 2003. Demystifying Six Sigma: a company-wide approach to continuous improvement. 1st ed. New York: AMACOM.

Lathem, S., Neumann, M., and Hayden, N., 2011. The socially responsible engineer: Assessing student attitudes of roles and responsibilities. *The Research Journal for Engineering Education,* 100(3), pp. 444-474.

Lau, C., 2010. A Step Forward: Ethics Education Matters!. Journal of Business Ethics, 92(4), p. 565–584.

Laughlin, R., 1995. Empirical research in accounting: alternative approaches and a case for 'middle-range' thinking. Accounting, Auditing & Accountability Journal, 8(1), pp. 63-87.

Lavrakas, P., 2008. Encyclopedia of survey research methods. 1st ed. Thousand Oaks, CA: SAGE publications.

Leake, D., 1994. Case-Based Reasoning: Experiences, lessons and future directions. 1st ed. Massachusetts: MIT Press Cambridge.

Lee, S., and Schwarz, N., 2010. Washing away postdecisional dissonance. *Science*, 328(5979), p. 709.

Lee, WS., and Guven, C., 2013. Engaging in corruption: The influence of cultural values and contagion effects at the microlevel. *Journal of Economic Psychology*, 39(Not provided), pp. 287-300.

Leeuw, E., 2005. To mix or not to mix data collection modes in surveys. Journal of Official Statistics, 21(2), p. 233–255.

Lehnert, K., Park, Y., and Singh, N., 2015. Research note and review of the empirical ethical decision-making literature: Boundary conditions and extensions. *Journal of Business Ethics*, 129(1), p. 195–219.

Lehrer, J., 2009. The decisive moment: How the brain makes up its mind. 1st ed. Edinburgh: Canongate Books Ltd.

Leitsch, D., 2009. Using dimensions of moral intensity to predict ethical decision-making in accounting. Accounting Education: an international journal, 15(2), pp. 135-149.

Lenk, H., 1983. Notes on Extended Responsibility and Increased Technological Power. In: P. D. a. F. Rapp, ed. *Philosophy and Technology*. Dordrecht, Netherlands: Springer, pp. 195-210.

Lenzner, T., Kaczmirek, L., and Lenzner, A., 2010. Cognitive burden of survey questions and response times: A psycholinguistic experiment. *Applied Cognitive Psychology*, 24(7), pp. 1003-1020.

Leung, F-H., and Savithiri, R., 2009. Spotlight on focus groups. *Canadian Family Physician*, 55(2), pp. 218-219.

Leung, S., 2011. A Comparison of Psychometric Properties and Normality in 4-, 5-, 6-, and 11-Point Likert Scales. Journal of Social Service Research, 37(4), pp. 412-421.

Leveson, N., and Cutcher-Gershenfeld, J., 2004. What System Safety Engineering Can Learn from the Columbia Accident. Massachusetts, International conference of the system safety.

Levenson, R., and Ruef, A., 1992. Empathy: A physiological substrate. *Journal of Personality and Social Psychology*, 63(2), pp. 234-246.

Lewis, T., Amini, F., and Lannon, R., 2001. *A General Theory of Love.* 1st ed. San Francisco: Vintage Books.

Limayem, M., Khalifa, M., and Chin, W., 2004. Factors motivating software piracy: a longitudinal study. IEEE, 51(4), pp. 414-425.

Lincoln, S., and Holmes, E., 2011. Ethical decision making: A process influenced by moral intensity. *Journal of Healthcare, Science and the Humanities,* 1(1), pp. 55-69.

Lissitz, R., and Green, S., 1975. Effect of the number of scale points on reliability: A Monte Carlo approach. *Journal of Applied Psychology*, 60(1), pp. 10-13.

Little, R., 1992. Regression with Missing X 's: A Review. *Journal of the American Statistical Association,* 87(420), pp. 1227-1237.

Loe, T., Ferrell, L., and Mansfield, P., 2000. A Review of Empirical Studies Assessing Ethical Decision Making in Business. *Journal of business ethics*, 25(3), p. 185–204.

Leonard, L., Cronan, T., and Kreie, J., 2004. What influences IT ethical behavior intentions—planned behavior, reasoned action, perceived importance, or individual characteristics?. Information & Management, 42(1), pp. 143-158.

Looij-Jansen P., and Wilde, E., 2008. Comparison of Web-Based versus Paper-and-Pencil Self-Administered Questionnaire: Effects on Health Indicators in Dutch Adolescents. *Health Services Research,* 43(5), pp. 1708-1721.

Loui, M., 2005. Ethics and the Development of Professional Identities of Engineering Students. Journal of Engineering Education, 94(4), pp. 383-390.

Lynch, W., and Kline, R., 2000. Engineering Practice and Engineering Ethics. *Science, Technology, & Human Values*, 25(2), pp. 195-225.

MacCleave, A., 2006. Incommensurability in Cross-Disciplinary Research: A Call for Cultural Negotiation. International Journal of Qualitative Methods, 5(2), pp. 40-54.

MacDougall et al., 2014. Examining the Effects of Incremental Case Presentation and Forecasting Outcomes on Case-Based Ethics Instruction. Ethics & Behaviour, 24(2), pp. 126-150.

Macfarlane, B., Zhang, J., and Pun, A., 2014. Academic integrity: a review of the literature. Studies in Higher Education, 39(2), pp. 339-358.

Macklin, R., 1980. Problems in the Teaching of Ethics: Pluralism and Indoctrination. In: C. a. a. S. Bok, ed. Ethics Teaching in Higher Education. Boston, MA: Springer, pp. 81-101.

Maclagan, P., 2003. Varieties of Moral Issue and Dilemma: A Framework for the Analysis of Case Material in Business Ethics Education. Journal of Business Ethics, 48(1), p. 21–32.

Macnish, K., and Lawlor, R., 2014. *Engineering in Society Suggestions for Teaching Suggestions for Teaching.* [Online] Available at: https://www.raeng.org.uk/publications/reports/engineering-in-society-suggestions-for-teaching

[Accessed 13 July 2016].

Maguire, M., and Delahunt, B., 2017. Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. AISHE-J: The All Ireland Journal of Teaching and Learning in Higher Education, 9(3), pp. 3351-33514.

Malek, J., 2010. To Tell or Not to Tell? The Ethical Dilemma of the Would-Be Whistleblower. Accountability in Research, Policies and Quality Assurance, 26(1), pp. 115-129.

Mandal, J., Ponnambath, D., and Parija, C., 2016. Utilitarian and deontological ethics in medicine. *Tropical Parasitology,* 6(1), pp. 1-6.

Manfreda et al., 2008. Web Surveys versus other Survey Modes: A Meta-Analysis Comparing Response Rates. International Journal of Market Research, 50(1), pp. 79-104.

Mann, S., 1996. What should training evaluations evaluate?. Journal of European Industrial Training, 20(9), pp. 14-20.

Mansell et al., 2004. The learning curve: the advantages and disadvantages in the use of focus groups as a method of data collection. NURSE RESEARCHER, 11(4), pp. 79-89.

Markus, K., and Smith, K., 2012. *Content Validity In: Encyclopedia of Research Design.* [Online] Available at: https://methods.sagepub.com/base/download/ReferenceEntry/encyc-of-research-design/n74.xml

[Accessed 09 August 2018].

Marques, P., and Azevedo-Pereira, J., 2009. Ethical Ideology and Ethical Judgments in the Portuguese Accounting Profession. *Journal of Business Ethics,* 86(2), p. 227–242.

Martin, D., Conlon, E., and Bowe, B., 2017. A Constructivist Approach to the use of Case Studies in teaching Engineering Ethics. In: D. G. a. I. S. M. Auer, ed. *Teaching and Learning in a Digital World.* Cham: Springer, pp. 193-201.

Martin, D., Conlon, E., and Bowe, B., 2018. *A Case for Case Instruction of Engineering Ethics.* Copenhagen, SEFI Annual Conference.

Martin, T., 1982. Do Courses in Ethics Improve the Ethical Judgment of Students?. Business & Society, 21(1), pp. 17-26.

Martin, P., and Bateson, P., 1993. *Measuring Behaviour: An Introductory Guide.* 2nd ed. Cambridge: Cambridge University Press.

Martinson, B., Anderson, M., and de Vries, R., 2005. Scientists behaving badly. Nature, 435(7043), p. 737–738.

Maruyama, Y., and Ueno, T., 2010. Ethics Education for Professionals in Japan: A critical review. *Educational Philosophy and Theory*, 42(4), pp. 438-447.

Mason, M., 2010. Sample size and saturation in PhD studies using qualitative interviews. Forum qualitative, 11(3).

Mason, R., 2017. Four Ethical Issues of the Information Age, Dallas, Texas: researchgate.net.

Massachusetts Institute of Technology, Department of Electrical Engineering and Computer Science, National Academy of Engineering, OEC, 2002. Software Protection & Intellectual Property - Role Play Material from MIT's EECS Department. [Online] Available at: http://ethics.iit.edu/eelibrary/node/7637

[Accessed 07 August 2017].

Mathers, N., Fox, N., and Hunn, A., 1998 (Updated 2002). Using interviews in a research project. 2nd ed. Sheffield: Institute of General Practice, Northern General Hospital, Sheffield.

Mathes, M., 2004. Ethical Decision Making and Nursing. Medsurg Nursing, 13(6), pp. 429-431.

Mathieson, K., 2003. Elements of Moral Maturity. Journal of College Character, 4(5), pp. 1-10.

Mauro, P., 1995. Corruption and growth. The quarterly journal of economics, 11(3), p. 681–712.

May, D., and Luth, M., 2013. The Effectiveness of Ethics Education: A Quasi-Experimental Field Study. *Science and Engineering Ethics*, 19(2), p. 545–568.

Marin, G., Gamba, R., and Marin, B., 1992. Extreme Response Style and Acquiescence among Hispanics: The Role of Acculturation and Education. *Journal of Cross-cultural Psychology*, 23(4), pp. 498-509.

Mayhew, B., and Murphy, P., 2009. The impact of ethics education on reporting behavior. *Journal of Business Ethics*, 86(3), p. 397–416.

Mazar, N., Amir, O., and Ariely, D., 2008. The dishonesty of honest people: A theory of self-concept maintenance. Journal of Marketing Research, 45(6), pp. 633-644.

McCabe, D., Trevino, L., and Butterfield, K., 2001. Heating in Academic Institutions: A Decade of Research. Ethics & Behavior, 11(3), pp. 219-232.

McCabe et al., 1996. The influence of collegiate and corporate codes of conduct on ethics-related behavior in the workplace. Business Ethics Quarterly, 6(4), pp. 461-476.

McCarthy, J., 2003. Principlism or narrative ethics: must we choose between them? Medical Humanities, Volume 29, pp. 65-71.

McCloskey, H., 2013. Meta-Ethics and Normative Ethics. 4th ed. Dordrecht, Netherlands: Springer.

McCombs School of Business – The University of Texas at Austin, 2019. Ethics Unwrapped. [Online] Available at: https://ethicsunwrapped.utexas.edu/case-studies

[Accessed 10 May 2019].

McCombs School of Business – The University of Texas at Austin, 2019. Utilitarianism - Ethics Unwrapped. [Online] Available at: https://ethicsunwrapped.utexas.edu/glossary/utilitarianism

[Accessed 27 April 2019].

McCombs School of Business – The University of Texas at Austin, 2019. Utilitarianism-Ethics Unwrapped. [Online] Available at: https://ethicsunwrapped.utexas.edu/glossary/deontology

[Accessed 27 April 2019].

McDonald, G., and Donleavy, G., 1995. Objections to the teaching of business ethics. Journal of Business Ethics, 14(10), p. 839–853.

McKinney, J., Emerson, T., and Neubert, M., 2010. The Effects of Ethical Codes on Ethical Perceptions of Actions Toward Stakeholders. *Journal of Business Ethics,* 97(4), p. 505–516.

McKay et al., 2007. Faculty ethics from the perspective of college of business administrators. Journal of Legal, Ethical and Regulatory Issues, 10(1), pp. 105-124.

McLean, B., and Elkind, P., 2003. *The smartest guys in the room: the amazing rise and scandalous fall of Enron.* 1st ed. New York: Penguin Group.

McMahon, J., and Harvey, R., 2006. An Analysis of the Factor Structure of Jones' Moral Intensity Construct. *Journal of Business Ethics,* 64(4), p. 381–404.

McTighe, J., 2016. *How will we evaluate student performance on tasks? (Part 6).* [Online] Available at: https://blog.performancetask.com/how-will-we-evaluate-student-performance-on-tasks-part-6-946c82deee02?gi=dc04e37cb959

[Accessed 09 May 2019].

McSweeney, B., 2002. Hofstede's model of national cultural differences and their consequences: A triumph of faith-a failure of analysis. Human Relations, 55(1), pp. 89-118.

Mead et al., 2009. Too tired to tell the truth: Self-control resource depletion and dishonesty. Journal of Experimental Social Psychology, 45(3), pp. 594-597.

Mecca et al., 2015. Researcher perspectives on conflicts of interest: A qualitative analysis of views from academia. Science and Engineering Ethics, 21(4), p. 843–855.

Menzel, D., 2010. Teaching and learning ethical reasoning with cases. Public Integrity, 11(3), pp. 239-250.

Mercer-Mapstone, L., and Kuchel, L., 2015. Teaching Scientists to Communicate: Evidence-based assessment for undergraduate science education. *International Journal of Science Education*, 37(10), pp. 1613-1638.

Mercer-Mapstone, L., and Matthews, K., 2017. Student perceptions of communication skills in undergraduate science at an Australian research-intensive university. *Assessment & Evaluation in Higher Education,* 42(1), pp. 98-114.

Messick, D., and Bazerman, M., 2001. Ethical leadership and the psychology of decision making. In: D. M. R. D. John Dienhart, ed. *The Next Phase of Business Ethics: Integrating Psychology and Ethics (Research in Ethical Issues in Organizations, Volume 3).* Not provided: Emerald Group Publishing Limited, pp. 213 - 238.

Messick, S., 1989. Meaning and Values in Test Validation: The Science and Ethics of Assessment. *Educational Researcher*, 8(2), pp. 5-11.

Michalos, A., and Poff, D., 2012. *Citation Classics from the Journal of Business Ethics: Celebrating the First Thirty Years of Publication.* 1st ed. Brandon, Canada: Springer.

MICHELSON Institute. *Anti-Corruption Resource Centre.* [Online] Available at: https://www.u4.no/terms#

[Accessed 03 May 2019].

Milewski, S., 2015. *Managing technological open process innovation: an empirical lifecycle perspective on the management of external contributions to process development and implementation in large manufacturing companies,* York: University of York.

Molander, E., 1987. A paradigm for design, promulgation and enforcement of ethical codes. *Journal of Business Ethics,* 6(8), p. 619–631.

Monash Business School, 2017. *The Contagion Effect: How Bribery and Corruption Spreads.* [Online]
Available at: https://www2.monash.edu/impact/articles/the-contagion-effect-how-bribery-and-corruption-spreads/

[Accessed 03 May 2019].

Monteiro, F., 2017. The Students' Perspective Contribution: Rethink the Ethical Education of Engineering Students. *International Journal of Engineering Pedagogy,* 7(2), pp. 22-35.

Moore, C., and Gino, F., 2013. Ethically adrift: How others pull our moral compass from true North, and how we can fix it. *Research in Organizational Behavior,* 33(Not Provided), pp. 53-77.

Moore et al., 2005. *Conflicts of interest: Challenges and solutions in business, law, medicine, and public policy.* 1st ed. New York: Cambridge University Press.

Moors, G., 2012. The effect of response style bias on the measurement of transformational, transactional, and laissez-faire leadership. *European Journal of Work and Organizational Psychology*, 21(2), pp. 271-298.

Moores, T., and Chang, J., 2006. Ethical decision making in software piracy: Initial development and test of a four-component model. *MIS Quarterly,* 30(1), pp. 167-181.

Morgan, G., and Smircich, L., 1980. The Case for Qualitative Research. *Academy of Management Review*, 5(4), p. 491–500.

Morgan, R., and Casper, W., 2000. Examining the factor structure of participant reactions to training: A multidimensional approach. *Human Resource Development Quarterly*, 11(3), pp. 301-317.

Moriarty, J., 2016. *The Stanford Encyclopedia of Philosophy.* [Online] Available at: https://plato.stanford.edu/entries/ethics-business/

[Accessed 28 April 2019].

Morris, D., 2001. Narrative, ethics, and pain: Thinking with stories. *Narrative*, 9(1), pp. 55-77.

Morse, J., 2002. Principles of mixed methods and multimethod research design. In: A. T. a. C. Teddlie, ed. *Handbook of Mixed Methods in Social & Behavioral Research.* Thousand Oaks, CA: SAGE Publications, pp. 189-208.

Mulder, L., 2018. When sanctions convey moral norms. *European Journal of Law and Economics*, 46(3), p. 331–342.

Mumford et al., 2006. Validation of ethical decision making measures: Evidence for a new set of measures. *Ethics & Behaviour*, 16(4), pp. 319-345.

Mumford et al., 2007. Field and Experience Influences on Ethical Decision Making in the Sciences. *Ethics & Behaviour*, 19(4), pp. 263-289.

Mumford et al., 2008. A Sensemaking Approach to Ethics Training for Scientists: Preliminary Evidence of Training Effectiveness. *Ethics & Behaviour*, 18(4), pp. 315-339.

Mumford, M., Steele, L., and Watts, L., 2015. Evaluating Ethics Education Programs: A Multilevel Approach. *Ethics & Behavior*, 25(1), pp. 37-60.

Mumford, M., 2017. *Assessing the Effectiveness of Responsible Conduct of Research Training: Key Findings and Viable Procedures.* [Online]
Available at: https://www.ncbi.nlm.nih.gov/books/NBK475950/

[Accessed 21 August 2017].

Muramatsu et al. 2019. The development and validation of the Ethical Sensitivity Questionnaire for Nursing Students. *BMC Medical Education.* 19 (215)

Naagarazan, R., 2007. *A Textbook on Professional Ethics And Human Values.* 1st ed. Tamil Nadu, India: New Age International Publishers.

Nair, S., 2014. Ethics in Higher Education. In: N. Provided, ed. *Handbook of Research on Higher Education in the MENA Region: Policy and Practice.* Not Provided: IGI Global, pp. 230-260.

Narvaez, D., 2009. *Assessing Ethical Skills,* Notre Dame, in: Moral Psychology Laboratory, University of Notre Dame.

NASA, n.d. *IMPLEMENTATION of the RECOMMENDATIONS of the Presidential Commission on the Space Shuttle Challenger Accident.* [Online] Available at: https://history.nasa.gov/rogersrep/v6ch7.htm

[Accessed 02 April 2019].

National Academy of Engineering, 2016. *Infusing Ethics into the Development of Engineers: Exemplary Education Activities and Programs.* Washington, D.C: National Academies Press.

National Society of Professional Engineers, 2019. *Codes of Ethics.* [Online] Available at: https://www.nspe.org/resources/ethics/code-ethics

[Accessed 11 January 2019].

Neier, S., and Zayer, L., 2015. Students' Perceptions and Experiences of Social Media in Higher Education. *Journal of Marketing Education,* 37(3), pp. 133-143.

Neuendorf, K., 2011. *Internal Consistency Reliability: Can Cronbach's alpha be Too High ?.* [Online]
Available at: https://academic.csuohio.edu/kneuendorf/c63111/hand5a.pdf

[Accessed 19 July 2018].

New Jersey Society of Professional Engineers, 2019. *Why Are Ethics Important for Professional Engineers?.* [Online]
Available at: https://njspe.org/2018/05/17/ethics-professional-engineers/

[Accessed 02 March 2019].

New World Encyclopedia writers and editors, 2016. *Applied ethics- New World Encyclopedia.* [Online] Available at: https://www.newworldencyclopedia.org/entry/Applied_ethics

[Accessed April 2019, 2019].

New World Encyclopedia writers and editors, 2018. *Normative Ethics-New World Encyclopedia.* [Online] Available at: http://www.newworldencyclopedia.org/p/index.php?title=Normative_ethics

[Accessed 27 April 2019].

Newberry, B., 2004. The dilemma of ethics in engineering education. *Science and Engineering Ethics,* 10(2), p. 343–351.

Nikoomaram et al., 2013. The Effects of age, gender, education level and work experience of accountant on ethical decision making by using fuzzy logic. *International Research Journal of Applied and Basic Sciences,* 4(6), pp. 1559-1571.

Noble, H., and Smith, J., 2015. Issues of validity and reliability in qualitative research. *Evidence-based nursing,* 18(2), pp. 34-35.

Nowell et al., 2017. Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods,* 16(1), pp. 1-13.

Oliver-Hoyo, M., and Allen, DD., 2006. The Use of Triangulation Methods in Qualitative Educational Research. *Journal of College Science Teaching,* Issue January/February, pp. 42-47.

Osborne, J., Costello, A., and Kellow, J., 2008. *Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis,* Thousand Oaks, CA: SAGE Publications.

Ostroff, C., 1991. Training Effectiveness Measures and Scoring Schemes: A comparison. *Personnel Psychology*, 44(2), pp. 353-374.

Ozolins, J., 2005. *Teaching Ethics in Higher Education,* Australian Catholic University, Australia: researchgate.net.

Oyserman, D., Coon, HM., and Kemmelmeier, M., 2002. Rethinking individualism and collectivism: Evaluation of theoretical assumptions and meta-analyses. *Psychological Bulletin,* 128(1), pp. 3-72.

O'Clock, P., and Okleshen, M., 1993. A comparison of ethical perceptions of business and engineering majors. *Journal of Business Ethics,* 12(9), p. 677–687.

O'Fallon, M., and Butterfield, K., 2005. A Review of The Empirical Ethical Decision-Making Literature: 1996–2003. *Journal of Business Ethics,* 59(4), p. 375–413.

O'Leary, C., and Stewart, J., 2007. Governance factors affecting internal auditors' ethical decision-making. *Managerial Auditing Journal,* 22(8), pp. 787-808.

Pallant, J., 2013. *A step by step guide to data analysis using IBM SPSS Survival Manual.* 5th ed. Glasgow: McGraw Hill.

Pandikow, A., Ruhe, L., and Herzog, E., 2007. *Cultural Differences - and how they affect Systems Engineering.* San Diego, CA, INCOSE International Symposium, pp. 24-28.

Panasiti, M., and Ponsi, G., 2017. Commentary: Investigating the Effects of Anger and Guilt on Unethical Behaviour: A Dual-Process Approach. *Frontiers in psychology,* 8(Article 159), pp. 1-3.

Park, C., 2003. In other (people's) words: Plagiarism by university students--literature and lessons. Assessment & Evaluation in Higher Education, 28(5), pp. 471-488.

Parry et al., 2018. Qualitative and historiometric methods in leadership research: A review of the first 25 years of The Leadership Quarterly. *Leadership Quarterly 25th Anniversary Issue,* 25(1), pp. 132-151.

Passmore, C., and Parchman, M., 2002. *Guidelines for constructing a survey.* Orlando, Fla, The Society of Teachers of Family Medicine 2000 Annual Spring Conference, pp. 281-286.

Passow, H., 2012. Which ABET competencies do engineering graduates find most important in their work?. *Journal of Engineering Education,* 101(1), pp. 95-118.

Patterson, D., 2001. Causal effects of regulatory, organizational and personal factors on ethical sensitivity. *Journal of Business Ethics,* 30(2), p. 123–159.

Penn State Univesity, 2008. *Professional Responsibility-Confluence.* [Online] Available at: https://wikispaces.psu.edu/display/STS245/Professional+Responsibility.

[Accessed 01 May 2019].

Penn, W., 1990. Teaching Ethics -A Direct Approach. *Journal of Moral Education,* 19(2), pp. 124-138.

Perlman, B., and Varma, R., 2001. *Teaching engineering ethics.* University of New Mexico, Albuquerque, American Society for Engineering Education Annual Conference & Exposition.

Pflugrath, G., Martinov-Bennie, N., and Chen, L., 2007. The impact of codes of ethics and experience on auditor judgments. *Managerial Auditing Journal,* 22(6), pp. 566-589.

Phau et al., 2014. Engaging in digital piracy of movies: a theory of planned behaviour approach. *Internet Research,* 24(2), pp. 246-266.

Pics-about-space.com, n.d. *Pics about space.* [Online] Available at: https://pics-about-space.com/srb-space-shuttle-engines?p=3#

[Accessed 11 July 2018].

Pillemer, D., 1991. One- Versus Two-Tailed Hypothesis Tests in Contemporary Educational Research. *Educational Researcher,* 20(9), pp. 13-17.

Pintrich, P., 2002. The Role of Metacognitive Knowledge in Learning, Teaching, and Assessing. *Theory into practice,* 41(1), pp. 219-225.

Pitchard, M., 1992. *Teaching engineering ethics: A case study approach.* 1st ed. Kalamazoo: Western Michigan University. Center for the Study of Ethics in Society.

Podsakoff et al., 1999. Transformational leader behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors. *The Leadership Quarterly,* 1(2), pp. 107-142.

Poland, B., 2003. Transcription quality. In: J. H. a. J. Gubrium, ed. *Inside Interviewing: New Lenses, New Concerns.* Thousand Oaks, CA: SAGE Publications, pp. 267-287.

Posner, B., 2012. Effectively measuring student leadership. *Administrative Sciences,* 2(4), pp. 221-234.

Pritchard, M., 1992. *Gifts from a Supplier- Ethics Education Library.* [Online] Available at: http://ethics.iit.edu/eelibrary/biblio/gifts-supplier

[Accessed 09 August 2017].

Rabins, M., 1998. Teaching engineering ethics to undergraduates: Why? What? How?. *Science and Engineering Ethics*, 4(3), p. 291–302.

Race, K., Hotch, D., and Packer, T., 1994. Rehabilitation Program Evaluation: Use of Focus Groups to Empower Clients. *Evaluation Review,* 18(6), pp. 730-740.

Randall, D., and Fernandes, F., 1991. The social desirability response bias in ethics research. *Journal of Business Ethics,* 10(11), p. 805–817.

Rajeev, P., and Bhattacharyya, S., 2007. Regret and disappointment: A conceptualization of their role in ethical decision-making. *Vikalpa: The Journal for Decision Makers,* 32(4), pp. 75-86.

Rajeev, P., 2011. Exploring moral action: A critical review of integrative models and suggestions for future research. *Journal of International Business Ethics,* 4(2), pp. 53-65.

Ralston et al., 2014. Societal-level versus individual-level predictions of ethical behavior: A 48-society study of collectivism and individualism. *Journal of Business Ethics,* 122(2), p. 283–306.

Randall, D., Huo, Y., and Pawelk, P., 1993. Social desirability bias in cross-cultural ethics research. *The International Journal of Organizational Analysis,* 1(2), pp. 185-202.

Rawls, J., 2001. The Independence of Moral Theory. *The American Philosophical Association Centennial Series,* 5(1), pp. 161-182.

Reidenbach, R., and Robin, D., 1990. Toward the development of a multidimensional scale for improving evaluations of business ethics. *Journal of Business Ethics*, 9(8), p. 639–653.

Resnik, D., 2003. From Baltimore to Bell Labs: Reflections on Two Decades of Debate about Scientific Misconduct. *Accountability in Research, Policies and Quality Assurance,* 10(2), pp. 123-135.

Resnik, D., 2015. *What is ethics in research & why is it important.* [Online] Available at: https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm

[Accessed 07 January 2016].

Rest, J., 1984. Research on Moral Development: Implications for Training Counseling Psychologists. *The Counseling Psychologist,* 12(3), pp. 19-29.

Rest, J., 1988. Can Ethics Be Taught in Professional Schools? The Psychological Research. *ETHICS EASIER SAID THAN DONE,* 1(1), pp. 22-26.

Rest, J., 1989. *Development in judging moral issues.* 1st ed. Minnesota: University of Minnesota Press.

Rest, J., 1994. *Moral development in the professions: Psychology and applied ethics.* 1st ed. Minnesota: Lawrence Erlbaum Associates Publishers.

Rest, J., Thoma, S., and Bebeau, M.,1999. *Postconventional moral thinking: A neo-Kohlbergian approach.* 1st ed. New York: Psychology Press.

Rest et al., 1986. *Moral development: Advances in research and theory.* 1st ed. New York: Praeger.

Rest et al., 1999. A Neo-Kohlbergian Approach: The DIT and Schema Theory. *Educational Psychology Review,* 11(4), p. 291–324.

Rest et al., 2000. A neo-Kohlbergian approach to morality research. *Journal of Moral Education,* 29(4), pp. 381-395.

Reynolds, S., 2006. Moral awareness and ethical predispositions: Investigating the role of individual differences in the recognition of moral issues. *Moral awareness and ethical predispositions: Investigating the role of individual differences in the recognition of moral issues,* 91(1), pp. 233-243.

Rezaee, Z., Elmore, R., and Szendi, J., 2001. Ethical behavior in higher educational institutions: The role of the code of conduct. *Journal of Business Ethics,* 30(2), p. 171–183.

Rieder, H., and Lauritsen, L., 2011. Quality assurance of data: ensuring that numbers reflect operational definitions and contain real measurements [State of the art series.

Operational research. Number. *International Union Against Tuberculosis and Lung Disease,* 15(3), pp. 296-304.

Richards, L., and Gorman, L., 2004. *Using case studies to teach engineering design and ethics.* Virginia, peer.asee.org.

Riper et al., 1993. *Can ethics be taught?. perspectives, challenges, and approaches at Harvard Business School.* 1st ed. Massatuchestts: Harvard Business School.

Robichaux, C., 2012. Developing ethical skills: from sensitivity to action. *Critical care nurse,* 32(2), pp. 65-72.

Robinson et al., 2007. *Engineering, Business & Professional Ethics.* 1st ed. London: Routledge.

Robinson, K., Saldanha, I., and Mckoy, N., 2011. *Frameworks for determining research gaps during systematic reviews,* Rockville: Johns Hopkins University Evidence-based Practice Center.

Roddis, W., 1993. Structural failures and engineering ethics. *Journal of Structural Engineering,* 119(5), pp. 1539-1555.

Rodrigo, 2012. *How moral intensity and ethical decision making differs between UK business students and accounting professionals?.* [Online] Available at: https://writepass.com/journal/2012/12/how-moral-intensity-and-ethical-decision-making-differs-between-uk-business-students-and-accounting-professionals/

[Accessed 03 March 2019].

Rodzalan, S., and Saat, M., 2016. Ethics of Undergraduate Students: A Study in Malaysian Public Universities. *International Journal of Information and Education Technology,* 6(9), pp. 672-678.

Rohatyn, F., 1987. *Ethics in America's money culture- The New York Times.* [Online] Available at: https://www.nytimes.com/1987/06/03/opinion/ethics-in-america-s-money-culture.html

[Accessed 19 January 2019].

Rosenberg, M., 1973. Which Significant Others?. *American Behavioral Scientist,* Not provided (Not provided), pp. 829-860.

Rosenthal, S., and Buchholz, R., 1999. *Rethinking business ethics: A pragmatic approach.* 1st ed. New York: Oxford University Press.

Rossman, G., and Wilson, B., 1985. Numbers and words: Combining quantitative and qualitative methods in a single large-scale evaluation study. *Evaluation Review*, 9(5), pp. 627-643.

Rottig, D., Koufteros, X., and Umphress, E., 2011. Formal Infrastructure and Ethical Decision Making: An Empirical Investigation and Implications for Supply Management. *Decision Sciences*, 42(1), pp. 163-204.

Royal Academy of Engineering, 2011. *Engineering ethics in practice: a guide for engineers.* [Online] Available at: https://www.raeng.org.uk/publications/other/engineering-ethics-in-practice-full

[Accessed 08 November 2016].

Royal Academy of Engineering, 2012. *Statement of Ethical Principles.* [Online] Available at: https://www.fsb.unizg.hr/brodogradnja/7-UZIR-Ethics-Statement-of_Ethical-Principles-in-Royal-Academy-of-Enginering.pdf

[Accessed 13 December 2015].

Royal Academy of Engineering, 2003. *Engineering ethics.* [Online] Available at: https://www.raeng.org.uk/policy/engineering-ethics/ethics

[Accessed 13 January 2016].

Royal Academy of Engineering, An engineering ethics curriculum map. *An engineering ethics curriculum map-The Royal Academy An engineering.* [Online] Available at: https://www.raeng.org.uk/RAE/media/.../Ethics-Curriculum-Map.pdf

[Accessed 10 March 2017].

Royal Academy of Engineering, 2017. *Engineering Ethics.* [Online] Available at: https://www.raeng.org.uk/publications/reports/statement-of-ethical-principles

[Accessed 04 January 2018].

Ruspini, E., 2002. *Introduction to Longitudinal Research.* 1st ed. New York: Routledge, Taylor & Francis.

Sachdeva, S., Iliev, R., and Medin, D., 2009. Sinning saints and saintly sinners the paradox of moral self-regulation. *Psychological Science,* 20(4), pp. 523-528.

Sachdeva, S., Iliev, R., and Medin, D., 2009. The dark side of self-and social perception: black uniforms and aggression in professional sports. *Psychological Science,* 20(4), pp. 523-528.

Salas, E., Milham, L., and Bowers, C., 20003. Training Evaluation in the Military: Misconceptions, Opportunities, and Challenges. *Journal of Public Administration Research and Theory,* 2(4), p. 443–462.

Saldana, J., 2015. *The coding manual for qualitative researchers.* 9th ed. Ashford: SAGE Publications.

Salmansaug, S., 1987. *Suddenly business schools tackle ethics.* [Online] Available at: https://www.nytimes.com/1987/08/02/education/suddenly-business-schools-tackle-ethics.html

[Accessed 12 June 2018].

Samuels, P., 2016. *Advice on exploratory factor analysis,* s.l.: Centre for Academic Success, Birmingham City University.

Sanders, M., Gugiu, P., and Enciso, P., 2015. How good are our measures? Investigating the appropriate use of factor analysis for survey instruments. *Journal of Multidisciplinary Evaluation,* 11(25), pp. 25-35.

Saunders, M., Lewis, P., and Thornhill, A., 2009. *Research Methods for Business Students.* 5th ed. Harlow, Essex: Pearson Education.

Sandelowski, M., 1995. Qualitative analysis: What it is and how to begin. *Research in nursing & health,* 18(4), pp. 371-375.

Sandusky, G., Sporkin, F., and Sullivan, L., 2012. *Report of the Special Investigative Counsel Regarding the Actions of The Pennsylvania State University Related to the Child Sexual Abuse Committed by Gerald A. Sandusky,* Not Provided: assets.sbnation.com.

Sang-Hun, C., 2009. *Disgraced Cloning Expert Convicted in South Korea- The New York Times.* [Online] Available at: https://www.nytimes.com/2009/10/27/world/asia/27clone.html

[Accessed 16 April 2019].

Santi, P., 2013. Ethics Exercises for Civil, Environmental, and Geological Engineers. *Journal of Engineering Education*, 89(2), pp. 151-160.

Sayre-McCord, G., 2012. *The Stanford Encyclopedia of Philosophy.* [Online] Available at: https://plato.stanford.edu/entries/metaethics/

[Accessed 27 April 2019].

Schepers, D., 2003. Machiavellianism, profit, and the dimensions of ethical judgment: A study of impact. *Journal of Business Ethics*, 42(4), p. 339–352.

Schoonenboom, J., and Johnson, R., 2017. How to Construct a Mixed Methods Research Design. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 69(2), p. 107–131.

Schrag, B., 1998. *New Technology - Who is the Designer?.* [Online] Available at: http://ethics.iit.edu/eelibrary/node/2112

[Accessed 06 August 2017].

Schraw, G., Crippen, K., and Hartley, K., 2006. Promoting self-regulation in science education: Metacognition as part of a broader perspective on learning. *Research in science education*, 36(1-2), p. 111–139.

Scotland, J., 2012. Exploring the Philosophical Underpinnings of Research: Relating Ontology and Epistemology to the Methodology and Methods of the Scientific, Interpretive, and Critical Research Paradigms. *English language teaching*, 5(9), pp. 9-16.

Schuh et al., 2014. Gender Differences in Leadership Role Occupancy: The Mediating Role of Power Motivation. *Journal of Business Ethics*, 120(3), p. 363–379.

Schwartz, M., 2016. Ethical decision-making theory: An integrated approach. *Journal of Business Ethics*, 139(4), p. 755–776.

Schwartz, S., and Tessler, R., 1972. A test of a model for reducing measured attitude-behavior discrepancies. *Journal of Personality and Social Psychology*, 24(2), pp. 225-236.

Schwandt, T., 2014. *The Sage dictionary of qualitative inquiry.* 4th ed. Urbana-Champaign, Illinois: SAGE.

Seager, T., Selinger, E., and Wiek, A., 2012. Sustainable Engineering Science for Resolving Wicked Problems. *Journal of Agricultural and Environmental Ethics*, 25(4), p. 467–484.

Segal, E., 2000. *From the Sources, Thou Shalt Not Murder.* [Online] Available at: https://people.ucalgary.ca/~elsegal/Shokel/001102_ThouShaltNotMurder.html

[Accessed 27 April 2019].

Segal, E., 2011. Social empathy: A model built on empathy, contextual understanding, and social responsibility that promotes social justice. *Journal of Social Service Research*, 37(3), pp. 266-277.

Seleim, A., and Bontis, N., 2009. The relationship between culture and corruption: a cross-national study. *Journal of Intellectual Capital*, 10(1), pp. 165-184.

Serra, J., 2010. What Is and What Should Pragmatic Ethics Be?. Some Remarks on Recent Scholarship. *European journal of pragmatism and American Philosophy*, 11(2), pp. 1-15.

Sezer, O., Gino, F., and Bazerman, M., 2015. Ethical blind spots: explaining unintentional unethical behavior. *Current Opinion in Psychology*, 6(Not Provided), pp. 77-81.

Shah, S., and Amjad, S., 2016. Ethical Decision Making in Business: linking rational and non-rational theories. *International Journal of Information, Business and Management*, 8(3), pp. 56-80.

Shalvi, S., Gino, F., and Barkan, R., 2015. Self-Serving Justifications: Doing Wrong and Feeling Moral. *Current Directions in Psychological Science*, 24(2), pp. 125-130.

Shapiro, B., 1988. *An introduction to cases.* 1st ed. Massachusetts: Harvard Business School.

Shaub, M., 1989. *An empirical examination of the determinants of auditors' ethical sensitivity*, Texas: Texas Tech University.

Shaver, R., 2019. *The Stanford Encyclopedia of Philosophy.* [Online] Available at: https://plato.stanford.edu/entries/egoism/

[Accessed 03 May 2019].

Sherman, N., 1989. *The Fabric of Character: Aristotle's Theory of Virtue.* 1st ed. Oxford: Clarendon Press.

Shields, C., 2008. *Stanford Encyclopedia of Philosophy.* [Online] Available at: https://plato.stanford.edu/entries/aristotle/

[Accessed 05 March 2019].

Shreeve et al., 2002. Student perceptions of rewards and sanctions. *Pedagogy, Culture & Society,* 10(2), pp. 239-256.

Sieber, S., 1973. The Integration of Fieldwork and Survey Methods. *American Journal of Sociology*, 78(6), pp. 1335-1359.

Sims, R., 1993. The relationship between academic dishonesty and unethical business practices. *Journal of Education for Business,* 68(4), pp. 207-211.

Simpson, P., Banerjee, D., and Simpson Jr, C., 1994. Softlifting: A model of motivating factors. *Journal of Business Ethics,* 13(6), p. 431–438.

Singh, D., and Stückelberger, C., 2017. *Ethics in Higher Education, Values-driven Leaders for the Future.* 1st ed. Geneva: Globethics.net Library.

Singhapakdi, A., Vitell, S., and Franke, G., 1999. Antecedents, consequences, and mediating effects of perceived moral intensity and personal moral philosophies. *Journal of the Academy of Marketing Science,* 27(1), pp. 19-36.

Singhapakdi, A., Vitell, S., and Kraft, K., 1996. Moral intensity and ethical decision-making of marketing professionals. *Journal of Business Research,* 36(3), pp. 245-255.

Smith, N., 2016. Right-Makers and the Targets of Virtue. *The Journal of Value Inquiry,* 51(2), p. 311–326.

Smith, T., 2011. Refining the total survey error perspective. *International Journal of Public Opinion Research*, 23(4), p. 464–484.

Snarey, J., 1985. Cross-cultural universality of social-moral development: A critical review of Kohlbergian research. *Psychological Bulletin,* 79(2), pp. 202-232.

Society of Environmental Engineers, 2016. *The Society of Environmental Engineers.* [Online] Available at: http://www.environmental.org.uk/content.php?p_id=50

[Accessed 09 June 2016].

Soley-Bori, M., 2013. *Dealing with missing data: Key assumptions and methods for applied analysis,* Boston: Boston University, School of Public Health, Department of Health Policy & Management.

Sparks, J., and Hunt, S., 1998. Marketing researcher ethical sensitivity: Conceptualization, measurement, and exploratory investigation. *Journal of Marketing,* 62(2), pp. 92-109.

Spielthenner, G., 2004. Moral Emotions. *Disputatio,* 1(17), pp. 3-15.

Sreenivasan, G., 2002. Errors about errors: Virtue theory and trait attribution. *Mind,* 111(441), p. 47–68.

Srivastava, R., 2012. Effect of cross culture on ethical behavior of Y generation-MBA students-Is it changing? A three nation study (emerging and developed). *Research Journal of Business Management,* 6(2), pp. 52-60.

Stark, A., 1993. *Harvard Business Review.* [Online] Available at: https://hbr.org/1993/05/whats-the-matter-with-business-ethics

[Accessed 02 May 2019].

Statistics Solutions, 2018. *Handling Missing Data: Listwise Versus Pairwise Deletion.* [Online] Available at: https://www.statisticssolutions.com/handling-missing-data-listwise-versus-pairwise-deletion/

[Accessed 05 June 2018].

Status net, 2019. *Ethical Decision Making Models and 6 Steps of Ethical Decision Making Process.* [Online] Available at: https://status.net/articles/ethical-decision-making-process-model-framework/

[Accessed 02 May 2019].

Stead, W., Worrell, D., and Stead, J., 1990. An Integrative Model for Understanding and Managing Ethical Behavior in Business Organizations. *Journal of Business Ethics,* 9(3), p. 233–242.

Steele et al., 2016. How do we know what works? A review and critique of current practices in ethics training evaluation. *Accountability in Research, Policies & Quality Assurance,* 23(6), pp. 319-350.

Steele et al., 2016. A Comparison of the Effects of Ethics Training on International and US Students. *Science and Engineering Ethics,* 22(4), p. 1217–1244.

Stegge, T., 1998. Measuring guilt in children: A rose by any other name still has thorns. In: J. Bybee, ed. *Guilt and Children.* California: Academic Press, pp. 19-74.

Steneck, N., and Bulger, R., 2007. The history, purpose, and future of instruction in the responsible conduct of research. *Academic Medicine,* 82(9), pp. 829-834.

Stenmark, C., Antes, A., and Thiel, C., 2011. Consequences Identification in Forecasting and Ethical Decision-Making. *Journal of Empirical Research on Human Research Ethics,* 6(1), pp. 25-32.

Sternberg, R., 2012. Teaching for Ethical Reasoning. *International Journal of Educational Psychology,* 1(1), pp. 35-50.

Stevens, G., 1984. Business Ethics and Social-Responsibility-The Responses Of Present And Future Managers. *Akron Business and Economic Review,* 15(3), pp. 6-11.

Stewart, D., Shamdasani, P., and Rook, D., 2007. Applied Social Research Methods: Focus groups. In: P. S. a. D. R. D. Stewart, ed. *Group dynamics and focus group research.* Thousand Oaks, CA: SAGE Publications, pp. 19-36.

Stodel, M., 2015. But What Will People Think? Getting beyond Social Desirability Bias by Increasing Cognitive Load. *International Journal of Market Research,* 57(2), pp. 313-322.

Street, M., and Street, V., 2006. The Effects of Escalating Commitment on Ethical Decision-Making. *Journal of Business Ethics,* 64(4), p. 343–356.

Streiner, D., 2003. Being inconsistent about consistency: When coefficient alpha does and doesn't matter. *Journal of Personality Assessment,* 80(3), pp. 217-222.

study.com, 2003. *Electrical Engineer Vs. Mechanical Engineer.* [Online] Available at: https://study.com/articles/electrical_engineer_vs_mechanical_engineer.html

[Accessed 01 April 2019].

Study.com, 2019. *What are the advantages and disadvantages of Kohlberg's moral reasoning theory?.* [Online] Available at: https://study.com/academy/answer/what-are-the-advantages-and-disadvantages-of-kohlberg-s-moral-reasoning-theory.html

[Accessed 03 May 2019].

Subedi, D., 2016. Explanatory sequential mixed method design as the third research community of knowledge claim. *American Journal of Educational Research,* 4(7), pp. 570-577.

Sudman, S., and Bradburn, N., 1973. Effects of Time and Memory Factors on Response in Surveys. *Journal of the American Statistical Association,* 68(344), pp. 805-815.

Sullivan, G., and Artino Jr, A., 2013. Analyzing and interpreting data from Likert-type scales. *Journal of Graduate Medical Education,* 5(4), pp. 541-542.

Susewind, M., and Hoelzl, E., 2014. A matter of perspective: Why past moral behavior can sometimes encourage and other times discourage future moral striving. *Journal of Applied Social Psychology,* 44 (Not provided), p. 201–209.

Sweeney, B., Arnold, D., and Pierce, B., 2010. The Impact of Perceived Ethical Culture of the Firm and Demographic Variables on Auditors' Ethical Evaluation and Intention to Act Decisions. *Journal of Business Ethics,* 93(4), p. 531–551.

Swingler, J., 2008. *Peer assessment and developing students' professional ethics,* Southampton: The Higher Education Academy Engineering Subject Centre and the UK Centre for Materials Education.

Taper Hall of Humanities, University of Southern California, 2019. *Cases and Case Studies.* [Online] Available at: https://dornsife.usc.edu/levan-institute/dilemmas-and-case-studies/

[Accessed 10 May 2019].

Tashakkori, A., Teddlie, C., and Teddlie, C., 1998. Mixed methodology: Combining qualitative and quantitative approaches. 1st ed. Thousand Oaks, CA: SAGE Publications.

Tashakkori, A., and Teddlie, C., 2002. *Handbook of Mixed Methods in Social & Behavioral Research.* 1st ed. Thousand Oaks, CA: SAGE Publications.

Tashakkori, A., and Teddlie, C., 2010. SAGE Handbook of Mixed Methods in Social & Behavioral Research. 2nd ed. Thousand Oaks, CA: SAGE Publications.

Tawil, S., and Cougoureux, M., 2013. *Revisiting Learning: The Treasure Within–N 4–Assessing the influence of the 1996 Delors report.* Paris: united nations educational, scientific and cultural organization.

Taylor, S., Bogdan, R., and DeVault, M., 2015. *Introduction to qualitative research methods: A guidebook and resource.* 1st ed. New Jersey: John Wiley & Sons.

Teclaw, R., Price, M., and Osatuke, K., 2012. Demographic question placement: Effect on item response rates and means of a veteran's health administration survey. *Journal of Business and Psychology*, 27(3), p. 281–290.

Tenbrunsel et al., 2010. The ethical mirage: A temporal explanation as to why we are not as ethical as we think we are. *Research in Organizational Behavior,* 30(Not Provided), pp. 153-173.

Tetlock et al., 2000. The psychology of the unthinkable: taboo trade-offs, forbidden base rates, and heretical counterfactuals. *Journal of Personality and Social Psychology,* 78(5), pp. 853-870.

Thiel, C., Connelly, S., and Griffith, J., 2011. The Influence of Anger on Ethical Decision Making: Comparison of a Primary and Secondary Appraisal. *Ethics & Behaviour,* 21(5), pp. 380-403.

Thiel et al., 2013. Leader ethical decision-making in organizations: Strategies for sensemaking. *Journal of Business Ethics,* 107(1), p. 49–64.

Thoma, S., 2002. An Overview of the Minnesota Approach to Research in Moral Development. *Journal of Moral Education,* 31(3), pp. 225-245.

Tomkinson, B., Tomkinson, R., and Dobson, H., 2008. Education for sustainable development – an inter-disciplinary pilot module for undergraduate engineers and scientists. *International Journal of Sustainable Engineering,* 1(1), pp. 69-76.

Tomkinson et al., 2008. Education for sustainable development – an inter-disciplinary pilot module for undergraduate engineers and scientists. *International Journal of Sustainable Engineering,* 1(1), pp. 69-76.

Thompson, C., 2009. Descriptive Data Analysis. *Air Medical Journal,* 28(2), pp. 56-59.

Torrance, H., 2012. Triangulation, Respondent Validation, and Democratic Participation in Mixed Methods Research. *Journal of Mixed Methods Research,* 6(2), pp. 111-123.

Torres, M., 1998. *Ethical Decision-Making Models,* Barcelona: University of Navarra.

Tourangeau, R., Rips, L., and Rasinski, K., 2000. *The psychology of survey response.* 1st ed. New York: Cambridge University Press.

Trevino, L., 1986. Ethical Decision Making in Organizations: A Person-Situation Interactionist Model. *Academy of Management Review,* 11(3), pp. 601-618.

Trevino, L., 1992. Moral reasoning and business ethics: Implications for research, education, and management. *Journal of Business Ethics,* 11(5-6), p. 445–459.

Treviño, L., Weaver, G., and Reynolds, S., 2006. Behavioral Ethics in Organizations: A Review. *Journal of Management,* 32(6), pp. 951-990.

Treviño, L., Nieuwenboer, N., and Kish-Gephart, J., 2013. (Un)ethical behavior in organizations. *Annual Review of Psychology,* 65(1), pp. 635-660.

Triandis, H., 1979. *Values, attitudes, and interpersonal behavior.* Nebraska, Nebraska Symposium on Motivation.

Tsalikis, J., and Fritzsche, D., 1989. Business ethics: A literature review with a focus on marketing ethics. *Journal of Business Ethics,* 8(9), p. 695–743.

Tudor, J., Penlington, R., and McDowell, L., 2010. Perceptions and their influences on approaches to learning. *Engineering Education a Journal of the Higher Education Academy,* 5(2), pp. 69-79.

Turiel, E., 1983. *The development of social knowledge: Morality and convention.* 1st ed. California: Cambridge University Press.

Turiel, E., Killen, M., and Helwig, C., 1987. Morality: Its structure, functions, and vagaries. In: J. K. a. S. Lamb, ed. *The Emergence of Morality in Young Children.* Chicago: University of Chicago Press, pp. 155-243.

Turner et al., 2018. How Did You Like This Course? The Advantages and Limitations of Reaction Criteria in Ethics Education. *Ethics & Behaviour,* 28(6), pp. 483-496.

Turner, J., and Stets, J., 2006. Moral Emotions. In: J. Turner, ed. *Handbook of the Sociology of Emotions.* Boston, MA: Springer, pp. 544-566.

tutorialspoint.com, 2019. *Engineering Ethics - Kohlberg's Theory.* [Online] Available at:

https://www.tutorialspoint.com/engineering_ethics/engineering_ethics_kohlbergs_theory.ht

[Accessed 28 April 2019].

Tzafestas, S., 2016. Roboethics. In: N. Jacobs, ed. *Intelligent Systems, Control and Automation: Science and Engineering.* Athens, Greece: SpringerLink, pp. 65-79.

Ulman, Y., 2015. Social Ethics. *Encyclopedia of Global Bioethics,* 395(I), pp. 1-11.

United Nations Office on Drugs and Crime, 2018. *Fostering ethical learning environments.* [Online] Available at: https://www.unodc.org/e4j/en/integrity-ethics/teaching-guide/ethical-learning-environments.html

[Accessed 01 May 2019].

University of Birmingham, 2016-2017. *Code of Ethics.* [Online] Available at: https://www.birmingham.ac.uk/Documents/university/legal/code-of-ethics.pdf

[Accessed 11 December 2018].

University of Birmingham, 2019. *Guidance on plagiarism for students.* [Online] Available at: https://intranet.birmingham.ac.uk/as/registry/policy/conduct/plagiarism/guidance-students.aspx

[Accessed 07 April 2019].

University of Central London, 2019. *UCL Institute for Environmental Design and Engineering.* [Online] Available at:

https://www.ucl.ac.uk/bartlett/environmental-design/programmes/health-wellbeing-and-sustainable-buildings-msc/course-structure-and-content

[Accessed 01 April 2019].

University of Dundee, 2019. *Academic misconduct.* [Online] Available at: https://www.dundee.ac.uk/qf/quality-and-academic-standards/assessment/academic misconduct/

[Accessed 07 April 2019].

University of Illinois, 2018. *Data Analysis.* [Online] Available at: https://ori.hhs.gov/education/products/n_illinois_u/datamanagement/datopic.html.

[Accessed 04 August 2018].

University of Leeds, 2019. *Engineering ethics.* [Online] Available at: https://engineering.leeds.ac.uk/info/201363/undergraduate/28/engineering_ethics.

[Accessed 06 April 2019].

University of Manchester, 2019. *BSc Materials Science and Engineering.* [Online] Available at: https://www.manchester.ac.uk/study/undergraduate/courses/2019/09894/bsc-materials-science-and-engineering/course-details/MATS24102#course-unit-details

[Accessed 01 April 2019].

University of Sheffield, 2019. *Postgraduate study.* [Online] Available at: https://www.sheffield.ac.uk/postgraduate/taught/courses/2019/process-safety-and-loss-prevention-msceng-pg-diploma

[Accessed 01 April 2019].

University of Southern California, 2018. *Organizing Your Social Sciences Research Paper: Quantitative Methods.* [Online] Available at: http://libguides.usc.edu/writingguide/quantitative

[Accessed 11 July 2018].

University of Surrey, 1997. *Social Research Update.* [Online] Available at: http://sru.soc.surrey.ac.uk/SRU19.html

[Accessed 24 March 2017].

University of York, Academic Integrity, 2019. *Academic Integrity.* [Online] Available at: https://www.york.ac.uk/integrity/regulations.html

[Accessed 06 May 2018].

University of York, Ethics Committee, 2017. *Ethics Committee.* [Online] Available at: https://www.york.ac.uk/about/organisation/governance/sub-committees/ethics/#tab-1

[Accessed 06 May 2018].

University of York, Law for Engineering Management for MSc, 2019. *Module Catalogue.* [Online] Available at: https://www.york.ac.uk/students/studying/manage/programmes/modulecatalogue/module/ELE00040H/latest

[Accessed 06 May 2018].

University of York, MSc Engineering Management, 2019. *MSc Engineering Management.* [Online] Available at: https://www.york.ac.uk/study/postgraduate-taught/courses/msc-engineering-management/

[Accessed 06 May 2018].

University of York, 2018. *Online Integrity Tutorials.* [Online] Available at: https://www.york.ac.uk/students/studying/develop-your-skills/study skills/study/integrity/onlinetutorials/

[Accessed 06 May 2018].

Vakulchuk, R., 2014. *Kazakhstan's Emerging Economy: Between State and Market.* 1st ed. Wissenschaften, Frankfurt: PL Academic Research.

Van Grinsven, L., and Tillema, H., 2006. Learning opportunities to support student self-regulation: comparing different instructional formats. *Educational Research,* 48(1), pp. 77-91.

Van Vaerenbergh, Y., and Thomas, T., 2012. Response Styles in Survey Research: A Literature Review of Antecedents, Consequences, and Remedies. *International Journal of Public Opinion Research,* 25(2), p. 195–217.

Varsavsky, C., Matthews, K., and Hodgson, Y., 2014. Perceptions of Science Graduating Students on their Learning Gains. *International Journal of Science Education,* 36(6), pp. 929-951.

Vaughan, D., 1996. *The Challenger launch decision: Risky technology, culture, and deviance at NASA.* 1st ed. Chicago: The University of Chicago Press.

Vavra, T., 1997. *Improving your measurement of customer satisfaction: a guide to creating, conducting, analyzing, and reporting customer satisfaction measurement programs.* 1st ed. Milwaukee, Wisconsin: ASQ Quality Press.

Velicer, W., and Fava, J., 1998. Affects of variable and subject sampling on factor pattern recovery. *Psychological Methods,* 3(2), pp. 231-251.

Vesilind, P., 1996. Using Academic Integrity to Teach Engineering Ethics. *Journal of Engineering Education,* 85(1), pp. 41-44.

Vieth, A., and Quante, M., 2010. The structure of perception in particularist ethics. *Ethical Perspectives,* 17(1), pp. 5-39.

Vitell, S., Nwachukwu, S., and Barnes, J., 1993. The effects of culture on ethical decision-making: An application of Hofstede's typology. *Journal of Business Ethics,* 12(10), p. 753–760.

Wahi et al., 2008. Reducing errors from the electronic transcription of data collected on paper forms: a research data case study. *Journal of the American Medical Informatics Association,* 15(3), pp. 386-389.

Wahyuni, D., 2012. The research design maze: Understanding paradigms, cases, methods and methodologies. *Journal of Applied Management Accounting Research,* 10(1), pp. 69-80.

Wang et al., 2008. Cultural differences: Why do Asians avoid extreme responses. *Survey Practice,* 1(3), pp. 1-7.

Ward, A., Jasenek, J., and Thiriet, J., 2008. *The application of the Tuning methodology to the electrical and information engineering disciplines across Europe.* Tallinn, Estonia, 19th EAEEIE Annual Conference.

Ward, T., 2013. *How well are we meeting the educational expectations of EIE students?* Ho Chi Min City, Vietnam, IETEC'1.

Watts et al., 2017. Modeling the Instructional Effectiveness of Responsible Conduct of Research Education: A Meta-Analytic Path-Analysis. *Ethics & Behaviour,* 27(8), pp. 632-650.

Watts et al., 2017. Qualitative Evaluation Methods in Ethics Education: A Systematic Review and Analysis of Best Practices. *Accountability in Research, Policies and Quality Assurance,* 24(4), pp. 225-242.

Weaver, K., and Mitcham, C., 2016. Prospects for Developing Ethical Sensitivity in Nursing, Engineering, and Other Technical Professions Education. *British Journal of Education, Society & Behavioural Science,* 18(2), pp. 1-18.

Weber, J., 1990. Measuring the impact of teaching ethics to future managers: A review, assessment, and recommendations. *Journal of Business Ethics,* 9(3), p. 183–190.

Weiss, J., 2014. *A Stakeholder and Issues Management Approach.* 5th ed. Boston: Berrett-Koehler Publishers.

Wells, D., and Schminke, M., 2001. Ethical development and human resources training: An integrative framework. *Human Resource Management Review,* 11(1-2), pp. 135-158.

Welsh et al., 2015. The slippery slope: How small ethical transgressions pave the way for larger future transgressions. *Journal of Applied Psychology,* 100(1), pp. 114-127.

Westerman et al., 2007. Peers versus national culture: An analysis of antecedents to ethical decision-making. *Journal of Business Ethics,* 75(3), p. 239–252.

Whitley, B., 1998. Factors Associated with Cheating Among College Students: A Review. *Research in Higher Education,* 39(3), p. 235–274.

Wiliams, C., 2007. Research Methods. Journal of Business & Economic Research, 5(3), pp. 65-72.

Williams, B., Onsman, A., and Brown, T., 2010. Exploratory factor analysis: A five-step guide for novices, *Australasian Journal of Paramedicine,* 8(3), pp. 1-13.

Willigenburg, T., 2003. *Shaping the arrow of the will: Skorupski on moral feeling and rationality.* Rotterdam, Edinburgh University Press, pp. 353-368.

Wilson, E., 1998. The biological basis of morality. *The Atlantic Monthly,* Monthly (April), pp. 53-70.

Wilson, J. Q., 1993. The moral sense. *American Political Science Review,* 87(1), pp. 1-11.

Wilson, T., Meyers, J., and D., Gilbert, 2001. Lessons from the Past: Do People Learn from Experience that Emotional Reactions Are Short-Lived. *1648-1661,* 27(12), pp. 1648-1661.

Wilson, W., 2013. Using the Chernobyl Incident to Teach Engineering Ethics. *Science and Engineering Ethics,* 16(2), p. 625–640.

Wittmer, D., 1992. Ethical sensitivity and managerial decisionmaking: An experiment. *Journal of Public Administration Research and Theory,* 2(4), p. 443–462.

Wolf, F., 2010. Enlightened Eclecticism or Hazardous Hotchpotch? Mixed Methods and Triangulation Strategies in Comparative Public Policy Research. *Journal of Mixed Methods Research,* 4(2), pp. 144-167.

Wood, G., and Rimmer, M., 2003. Codes of ethics: what are they really and what should they be?. *International Journal of Value-Based Management,* 16(2), p. 181–195.

Woodyatt, C., Finneran, C., and Stephenson, R., 2016. In-Person Versus Online Focus Group Discussions. *Qualitative Health Research,* 26(6), pp. 741-749.

Woźniak, W., 2014. *Homogeneity of Focus Groups as a Pathway to Successful Research Findings?.* Lodz, Poland: Department of General Sociology Faculty of Economics and Sociology University of Lodz, Poland.

Wright, M., 1995. Can moral judgement and ethical behaviour be learned?: A review of the literature. *Management Decision,* 33(10), pp. 17-28.

Yahr, M., Bryan, L., and Schimmel, K., 2009. *Perceptions of college and university codes of ethics,* Pennsylvania: researchgate.net,

Yong, A., and Pearce, S., 2013. A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, 9(2), pp. 79-94.

You, D., 2014. The Impact of Internship on Undergraduate Psychology Students' Ethical Sensitivity and Reasoning. *Psychology Journal,* 11(2), pp. 108-117.

Youngs, H., and Piggot-Irvine, E., 2012. The Application of a Multiphase Triangulation Approach to Mixed Methods. *Journal of Mixed Methods Research,* 6(3), pp. 184-198.

Yukl, G., 2013. *Leadership in organizations.* 8th ed. New York: Pearson.

Zapalska, A., Jackson, H., and Zelmanowitz, S., 2016. Framework for Leadership Skills Development with Experiential Learning: an Example of an Undergraduate Engineering Program. *International Journal of Science and Engineering Investigations,* 5(27), pp. 38-44.

Zeelenberg et al., 1989. The Experience of Regret and Disappointment. *Journal of Cognition and Emotions,* 12(2), pp. 221-230.

Zeelenberg, M., Van Dijk, W., and Manstead, A., 1998. Reconsidering the relation between regret and responsibility. *Organizational Behavior and Human Decision Processes,* 78(3), pp. 254-272.

Zey-Ferrell, M., and Ferrell, O., 1982. Role-set configuration and opportunity as predictors of unethical behavior in organizations. *Human Relations,* 35(7), pp. 587-604.

Zhong, C., and Liljenquist, J.,2006. Washing away your sins: Threatened morality and physical cleansing. *Science,* 313(5792), pp. 1451-1452.

Zhong, C., Liljenquist, K., and Cain, D., 2009. Moral self-regulation: Licensing and compensation. In: D. Cremer, ed. *Psychological perspectives on ethical behavior and decision making.* Charlotte, NC: Information Age Publishing, pp. 75-89.

Zhu et al., 2011. The effect of authentic transformational leadership on follower and group ethics. *The Leadership Quarterly*, 25(5), pp. 801-817.

Zhu, Q., and Jesiek, B.,2017. A Pragmatic Approach to Ethical Decision-Making in Engineering Practice: Characteristics, Evaluation Criteria, and Implications for Instruction and Assessment. *Science and engineering ethics,* 23(3), p. 663–679.