Collaborative information sharing in complex and extended organizations

Subtitle: Information sharing failures in complex and extended organizations

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Intellectual Property Statement

I, Paul P. Bata confirm that the work herein presented is my own and that where reference has been made to other works, due credit has been given.

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Dedication

This work is dedicated to the loving memories of my late dad Mr Peter AB Bata and mum Mrs Esther Peter Bata and to my wife and children who are my inspiration and source of encouragement. My parents taught me that hard work pays, that no matter how difficult it is there is light at the end of the tunnel.

Abstract

Organizational forms are changing and developing. The new forms of organizations include networked and hybrid organizations forms which have interdependencies and use technological applications in their operations. These organizations are extended and complex in terms of relationships, operations and boundary crossing. Whilst literatures on information behaviours exist in different work contexts, there is little or no reference to information sharing in these new complex and extended settings, leaving the area under studied. This study, therefore, set out to explore how complexity and extension influence collaborative information sharing and how complex and extended organizations respond to deficiencies in information sharing. The study used a qualitative research methodology on a single case study organization including 46 semi-structured interviews, observations, and document analysis from 4 different sets of participants within the case study organization as well as the extended stakeholder community that it works with. This was a non-probability sample based on convenience. Activity Theory was used as a framing tool and lens in guiding the choice of sample as well as analysis, as the approach allows the consideration of transient and cross boundary multiple relationships. Fourth generation activity theory was used as a complementary approach to third generation activity theory; giving a level of insight in terms of the activity systems, shared object, and tensions and contradictions as drivers of information sharing failures. The findings suggest failures in the sharing of information are linked with, in part at least, the increase in complexity caused by organizational extension. This study reports the use of specialised teams and groups (with a complementary nature) as ways of responding to and managing such information sharing failures. Key among the reactions observed was the formation of knots; among these were some whose characteristics are qualitatively different to those discussed and described in extant literature. These knots mitigate the deficiencies in the setting but behave in a different way from knots in other settings studied in the literature. The knots reported are motivated and shaped by the extended specialised nature of the setting and serve as a way of filling the expertise need which cuts across organizational boundaries. The key differences observed are in the crafting process of developing membership, and the speed of formation of such knots. This study has value for both theory and practice; having implications for the use of tools, rules and roles and policy in decision making and guiding practice in responding to information sharing failures in these new, complex and extended, organizational forms.

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Abbreviations

1GAT: First Generation Activity Theory

2GAT: Second Generation Activity Theory

3GAT: Third Generation Activity Theory

4GAT: Fourth Generation Activity Theory

9/11: September 11

ABSH: Abuja Stakeholder

ANBC: Advanced National Business Certificate

ANTC: Advanced National Technical Certificate

AT: Activity theory

BIM: International Business Machines (the largest computer company)

BNMS: Benin Management staff

BNSS: Benin Senior Staff

CIS: Collaborative information sharing

EDI: Electronic data interchange

IAEA: International Association for Educational Assessment

IOS: Inter-organizational systems

IRM: Institute of Risk Management

IS: Information sharing

ISCM: Information system conceptual model

JAMB: Joint Admission and Matriculations Board

KS: Knowledge sharing

MMS: Multimedia Messaging Service

MP3: File standard technology and format for compressing a sound sequence into a very small file

NABTEB: National Business and Technical Examinations Board

NBC: National Business Certificate

NEC: National Examination Council

NTC: National Technical Certificate

OENU: Organization's End User

OMS: Organizational memory systems

PC: Personal computer

SSL: Secure Sockets Layer

T&C: Tensions and Contradictions

UK: United Kingdom

WAEC: West African Examinations Council

Chapter 1 Introduction

1.1 Introduction/Research motivation

This chapter aims to provide an overview of not just the structure of thesis but also some key themes; driven by the desire to understand issues around complexity and extension which are developed in the literature review chapter. This chapter outlines my reasons for undertaking the research, the research questions, aims and objectives in section 1.2, the research gaps in section 1.3, the significance and contribution of this research in section 1.4, the overview of the rest of the chapters in section 1.5 and conclusion in section 1.6.

This research looked at collaborative information sharing and, information sharing failures which are apparent in complex and extended settings like the case study organization introduced in the next section. The shortcomings in such settings are becoming increasingly difficult to ignore and have been a part of my experience of work in such environments driven in part at least because of complexities instigated by extension. These complexities influence the need for information sharing, which is significant and a growing area of research (Provan et al., 2007, p. 479). Despite the ever-increasing attention around information science and, particularly, information sharing behaviours, there are still no definitive conclusions on many issues regarding organizational extension, the resulting complexities, and how they operate on information behaviours in general, and information sharing specifically (Provan & Lemaire, 2012, p. 368). This lack makes the area understudied and still open to research.

Putting this into context, many organizations today are involved in inter-organizational networks with a consequent shift towards a business environment that is complex both regarding its operation and relationship. The case study organization National Business and Technical Examinations Board (NABTEB) is an example of a complex business organization which goes into both contractual and social types of relationships to satisfy its stakeholders and perform its function in the context of educational provision and certification. The need to collaborate drives organizations like NABTEB to extend connections and links further in search of expertise, thereby going into multiple relationships which are characterised by extension, interdependency, boundary crossing, and requiring the possible use of expertise found in groups and teams. These processes

are complex and can operate to contribute to or underpin information sharing failures in such settings.

1.2 Research questions, aims and objectives

The aim of this research is, therefore, to explore information behaviours in complex and extended settings, which may affect information sharing and the achievement of organizational objectives. The two key areas studied are:

1) How does complexity and extension influence collaborative information sharing?

2) How do complex and extended organizations respond to deficiencies in information sharing?

The original research objectives breaking down and underpinning these questions were to:

a) Explore how complexity and extension influence collaborative information sharing in the complex and extended organization

b) Explore why information is not shared adequately in complex extended settings and how organizations/individuals react or cope.

However, as the research progressed, it became clear that other areas of analysis and theoretical contribution, and especially knot-working, were worthy of inclusion and, as a result, the final set of research objectives was extended to include;

c) Explore the nature and types of knots found in the setting.

d) Explore how, where and why these knots are different from the knots articulated in other literature.

e) Explain the innovations in extended relationships that aid the achievement of organizational goals.

1.3 Research gap

The research gaps identified are based on the literature in information sharing behaviour. However, this study is different from other studies in this area for the following reasons:

1. Complexities associated with extension influences information sharing. While complex and extended settings may be a subject of a growing body of research, there are still no definitive conclusions on many issues regarding organizational extension and how they operate. The literature shows a shortage of research in information sharing behaviour in complex and extended settings, which is a

crucial driver for this study (Provan et al., 2007, p. 479; Provan & Lemaire, 2012, p. 368).

2. There is also a lack of cross-fertilisation of literature on teams and information sharing literature in complex and extended settings.
3. While knots are one of the ways of mitigating complexity in complex and extended settings, and significant research exists in that area, the concept remains an area of research that is still, "undertheorized" regarding its application and knots have mostly been studied in less complicated and extended settings. Thus, the concept is open to different empirical testing and separate use in the different area of study (Bleakley 2013, p.25). The three areas highlighted above are further elaborated in the next sub-section:

1.3.1 Complex and extended setting

This sub-section provides background information about complex and extended organizations involving different interconnected individuals/organizations that interact with one another in trying to achieve a purpose. These interactions may be either direct or indirect forms of networking (Dubini and Aldrich, 1991). The work environment under extended relationship is said to be characterised by modern working practices and the use of technology centred on increasing work effectiveness. Under this arrangement, there are different examples and forms of working, including team working, call centres, knowledge management and the use of e-business in managing work (Holman et al., 2003). To support this, Landy & Conte (2016) state that the 21st-century workplace, which is technological and multi-culturally driven, has changed dramatically from what it had been in the previous 15 years. The work changes, which have been rapid are often accomplished using teamwork rather than a single worker.

The forms of relationships in the case study organization (existing between different arms of the organizations, different structures or different patterns) need to be coordinated and regulated to understand the connection. A recent study by the Institute of Risk Management (IRM, 2014) looked at extended enterprises as complex networking of relationships that support both the public and private sectors in modern economies. They gave the attributes of complex organizations as being unpredictable and adaptive due to unexpected issues which are likely to arise in the event of trying to solve specific problems. Complex and extended organizations may necessitate many disciplines

working together in a new way and managing such interactions utilising innovations through right principles, shared ethics, shared values and acceptable behaviours.

The two concepts of complexity and extension are linked. Extension is defined in this study as the extent to which an organization must collaborate with a set of other organizations to meet the aims it has to achieve. Such extension requires the organization to manage and accommodate relationships with a range of stakeholders and maintain flexibility in these relationships. This type of relationship recognises and attempts to reconcile areas where there may be a lack of congruence between aims, systems and processes. While some extended relationships may be based on and governed by well-articulated and formal contractual arrangements, others (many) may be based on evolved and informal arrangements which, while accepted and accommodated, are subject to far lower levels of formality and governance.

While extension may bring with it uncertainties and the potential for failures in information sharing, this process of partnering and collaboration is necessary for the organization to deliver the business aims and mandate. Complexity in this study is bound up with extension in many cases, in the sense that extension will tend to bring complexity with it, as the organization must accommodate a range of diverse stakeholders and ways of working.

Complexity may, however, also arise, without significant extension or independent of it. This complexity independent of extension may be driven by a range of factors which include the size of the organization, the nature of tasks undertaken or novelty in tasks. In this study, the context discussed is both extended with complexity as a result of that, and complex per se. The complexity in the setting is, in part at least, a product of the extension of the organization and the stakeholders with whom it must collaborate. Therefore, the focus of the research is collaborative information sharing in complex and extended organizations. This has been extended specifically to examine the information sharing failures which hinder collaborative information sharing in complex and extended organizations.

1.3.2 Information sharing behaviour

This section explains the gap in information behaviour and the utilisation of information within complex and extended organizations. Whilst there is significant literature on information behaviours and uses with reference to, among others, the following areas; police (Allen, 2011); public sector, (Yang and Maxwell, 2011), there appears to be a lack of research according to Allen (2011) in the area of uncertain and complex environments. Other areas of research covered are supply chain, (Chengalur-Smith, 2012); discipline, (Pilerot, 2014); emergency services, (Allen et al., 2014). However, there is a shortage of research in information sharing behaviours and uses in complex and extended organizations where we see different sharing behaviours.

The 21st-century work environment is said to have transformed (Landy & Conte, 2016). The work environment is assumed to be characterised by the collection of contemporary working practice and the use of technology which drives different information sharing behaviours and considered according to Hilbert (2016) as the ingredient of growth and a form of knowledge. Thus, information in this context is needed to cope with the transformation in the 21st-century economy and the amount of information acquired has a direct effect on business and extended relationships.

The study of Landy & Conte (2016) associates 21st-century work practice with the use of teams and is also seen as one of the ways extended organizations utilised and searched for efficacy (Holman et al., 2003). However, some qualitatively different approaches of information behaviours were observed in extended organizations which can be attributed to their extension and complexity. Thus, these behaviours require further exploration to theorise and understand in the context of this study.

1.3.2.1 Use of teams in complex and extended settings

The use of teams, especially temporary teams, is a part of the way that organizations and those within them, deal with issues resulting from deficits in information sharing (Camarinha-Matos, 2004; Chae et al., 2015; Maciejovsky et al., 2013 and Mankin et al., 1996). Therefore, work teams which are temporary are considered in this study as vital to understanding such information sharing behaviours.

Cohen & Bailey (1997) looked at what makes teams work and ended up with an explanation based on the complementary nature of its' member's skills. According to

them, a team is made up of a selection of individuals who depend on each other's skills to make a whole. They gave an example of a production team where, when one part of the production is complete, it is passed to another team to continue. The teams have leaders who take decisions on who does what and how, and they are known to have routine (Cohen & Bailey, 1997; Van Der Vegt & Bunderson, 2005), and there exists a form of reliance between members of a team (Belbin, 2012). However, due to different complexities which are said to be attributed by different challenges associated with extended relationships and their type of complexity, this area of information sharing behaviour remains understudied (Provan and Lemaire, 2012).

1.3.3 Knots and knot-working

A dominant driving force for this research is that while extended and complex organizations will have areas where information is shared effectively, there are also areas and instances of failure. Such failures in information sharing will have their roots in many causes, and the elimination of all such failures is an ideal state that is unlikely to be achieved.

Where such failures occur, the impact may be relatively minor or may have significant implications, and this may reduce such organizations' effectiveness, leading to lost productivity and efficiency as stated by Provan & Lemaire (2012). Examples of information sharing failures are manifold. In the UK, numerous reports into major incidents and responses to disasters have identified inadequate exchange of information as a significant weakness in the actions to deal with the issues. According to the Audit Commission report (1996) poor information sharing between public sector organizations can be linked to increased crime.

In the case study context of an examinations board, a specific instance demonstrates how failure in information sharing can impact on pupils' examination success. This was when a failure to effectively share official information with schools on changes to the curriculum jeopardised the success of the pupils and the validity of the examination because of teachers using an out-dated curriculum to prepare students for the test. Where such deficiencies become apparent, Activity Theory (AT) analysis often reveals, as in this case, tension and contradiction in the Activity System and, among a range of reactions to the failure knots can be seen to form to resolve the problem and disband.

The formation and use of such knots, reviewed in a range of contexts, suggests that there are definite similarities with literature examining work teams/knots in less complex and extended settings in the way that such knots function. There are also areas of differences which may be, in part at least, a product of that complexity and extension. Knot-working is fast becoming an area of interest to many scholars (Kerosuo et al., 2013: Kerosuo, 2015) and is widely accepted as a way of involving different experts in various inter-organizational studies and collaboration (Kerosuo et al., 2013). However, the concept (knot-working) remains an area of research that is, "under theorized and still under-researched" and this same area is still open to empirical testing and practical application in different areas (Bleakley 2013, p.25).

To understand the complexities and challenges in complex and extended organizational settings as given by Mihm et al. (2010) and IRM (2014). Activity Theory (AT) was used as a framework and tool for understanding the dialogue between different communities, networks of interrelated activities and division of labour (Engeström, 1999). The use of this approach as a framework is becoming increasingly important in information science (Karanasios et al., 2009). The importance is attributed to the theory's capability to outline the different aspects of the investigation in a study. It also helps in determining the methodology as it defines the subjects (Activity theory term referring to individuals in the research context), communities (Activity theory term referring to the environment), tools in use and types of division of labour, as in this research.

The reason for the use of AT in this investigation is because AT is a theory and a framework that considers information sharing as a human activity undertaken as a purposeful activity. It is also a way of looking at and trying to understand this phenomenon and particularly suits the area of the research -being complex and extended settings. The theory also allows the management of different expectations and motivations and provides an explanatory framework for understanding complexities caused by extension. AT, and especially third generation activity theory (3GAT), helps in demonstrating where and how contradictions and tensions have led to failures in information sharing, the collapse of exchange of information processes and the needed improvements perceived in the system. Fourth generation activity theory (4GAT) is an approach used for better understanding complexities and has been introduced in this study mainly as a way of complementing 3GAT in understanding such extension related

complexities. The theory was chosen due to its ability to allow the combination of other approaches as lenses, in further helping to understand innovations in the setting and the magnitude of complications and extension the research is dealing with to avoid failure in information sharing.

Based on the literature gap as discussed above, the research focuses on the two main aspects of studies which are complexity and extension as seen in the case study organization, which need to be understood in the light of information sharing failures. Therefore, two research questions were asked which are of interest to the study and are different from the research objectives. The research objectives reflect themes the study will explore, and the research questions are areas the study is looking to answer.

1.4 Significance and contribution of research

This section addresses the significance of study in the context examined - which is both complex and extended and with a high potential for information failures caused by the type of complexities in the setting, as shown by the sub-sections.

1.4.1 The context

The context of this investigation highlights the concept of complex organizations and their characteristics as discussed by IRM (2014) and why information sharing is necessary for the setting, especially in extended organizations that are complex (Provan & Lemaire, 2012). The context used for this study, as introduced in section 1.1, is an examination body NABTEB which is an excellent example of a complex extended organization because of its inter-dependency on other organizations for its survival; cross-border relationships and the use of information technology tools in relating to its extended members. The context is explained further in the methodology section in chapter three.

1.4.2 The need

Exchange of information here serves as a driver to organizational effectiveness and efficiency and thence increased performance (Yang & Maxwell, 2011, p. 164). Thus, failures in information sharing occur not only in complex and extended organization like the case study organization NABTEB but also in all forms of organization, leading to less productivity and efficiency. This, therefore, demonstrates the need for collaborative information sharing by way of exchange and use, for addressing issues of policies and

practice both in government and the private sector. An example of information sharing failure in the context of the case study organization is the cancellation of post-examination school placement meeting which usually takes place after common entrance examination and is chaired by the supervising ministry to select qualified students for placement into technical schools. The information for the cancellation was sent out by the examination organization at the last minutes due to the inability of the supervising ministry to confirm their attendance at the meeting 24 hours before the meeting date and time. This action necessitated the cancellation of the meeting and created the need to share that information with stakeholders attending the session using the fastest means available (national television) which is not the official channel of communication. As a different communication channel was used from the formal means of communication, not all stakeholders access that information (due to the unusual practice of using national television as against putting a call through). Another example is where the need to share information exists amongst stakeholders, but cultural difference hinders the ability to share that information due to different ways of interpretation or ways of responding to the situation.

1.4.3 The use of information sharing

The importance of sharing information from the example in 1.4.2 applies to all sectors, especially in complex and extended organizations which are not left out. It is vital as it helps to enlighten organizations of important decision and actions. Other important aspects of information sharing, and their use can be justified in collaborative arrangements, which have been a focus of study in the past and are still receiving attention due to the importance attached to dependencies in organizations (Provan & Lemaire, 2012). Information, in this case, needs to be shared between independent entities that see the importance of coming together to address how problems within and across sectors can be resolved. This same information can be used to provide essential services which are too costly and complex for only one establishment to provide. An example is sharing information of stakeholders' scheduled examination periods and using that information to determine off-peak for different stakeholders to allow the use of their resources such as vehicles for distribution of examination materials, staff in form of human labour for monitoring of examination and other aspects that can be shared.

1.4.4 The ability

Although there seems to be a good number of studies done on network collaboration (Foster, 2003; Newman & Dale, 2005; Kukkonen et al., 2010), there are still no definitive

conclusions on how they work according to Provan & Lemaire (2012). It, therefore, becomes essential and justifiable for different organizations to collaborate in contributing towards the delivery of their goals. Thus, understanding the types of network, what they provide and how these networks function in organizations to enhance efficiency and increase performance, is essential when sharing correctly.

Having highlighted the research relevance, the contribution of this research is in the area of information science and information sharing behaviours, in that it reinforces some of the on-going debates and makes a contribution to what already exists by increasing our understanding of issues of extended organizations that are complex. More specifically, the contributions are to;

1. Information sharing behaviour in complex and extended organizations; by developing an understanding of the nature of inter-dependency observed in the complex and extended organization seen as a way of getting things done, especially in areas where the central agency lacks that expertise. At the same time, the relationship is a way of sharing information needed for such collaborative operation. The understanding of these behaviours especially that of specialised teams and groups with a complementary nature and the setting therein, makes this a work of value.

2. This study adds to an existing body of literature by way of cross-fertilising information sharing behaviour literature with that of temporary teams in a setting that is both complex and extended.

3. This study aimed at increasing our understanding of knots and how they form and operate. The study observed and discussed knots as a way of responding to information sharing deficiencies (among other problems/critical incidents) in complex and extended organizations. The study identified the phenomenon of "crafted knots" in the setting as a different form of knot; sharing characteristics with those described and examined in literature to date ("literature knots"), but also having differentiating factors in that the speed of formation and operation is different from what is already discussed in the literature. The crafted knot discussed, which becomes one of the contributions in this thesis, is an umbrella concept, of which there are several different variants. These exist alongside, rather than as a replacement for, literature knots and have implications for theory.

The contributions in this study will help to generate discussion on why such relationships are considered complex. This is in line with Beekun & Glick (2001); Bienkowska & Zablocka-Kluczka (2014); Camarinha-Matos & Afsarmanesh (2005); Karhula (2012); Kazlauskas (2014); Kerosuo (2015); Kerosuo et al. (2013); Miles & Snow (1986); Robins et al. (2011); Saiz et al. (2005) and Weick (1990). It will also help in highlighting factors responsible for information sharing failures as discussed in related studies Bovens (1998); Holbeche (2006); IRM (2014); Provan & Lemaire (2012). This understanding is because of combining different theories which serve to complement each other in identifying factors responsible for failures in complex and extended organizations.

The research also contributes to policy and practice through the case study which provides further insight into how things are done in a sector considered to be complex while highlighting information sharing needs in general. Some more specific areas of contribution to policy and practice are;

1. Understanding the types of tools available, namely, physical tools, informational tools and representational tools which must be congruent across collaborating partners if meaningful progress is to be achieved with a positive impact on the overall collaboration.

2. Understanding the needs for standardisation to guide the conduct of collaborative relationships and reduce the associated problem of rules and norms affecting different partners in the extended collaboration.

3. Understanding and acknowledging the transient nature of extended relationships and the need to be pro-active, by identifying the various problems in the different activity systems to make plans and avoid time wasting.

Finally, the research contributes to our understanding of the way AT is used as a framework and as a tool for the understanding of the dialogue between different communities, networks of interrelated activities and the division of labour, as in studies like that of Engeström (1999) and others.

1.5 Overview of the rest of the chapters

The remaining thesis structure is organised into chapters, with each chapter providing an overview as a guide to its contents. There are an additional five chapters, which include: literature review in chapter two; methodology in chapter three, a detailed presentation of

theoretical findings and discussions in chapter four, which discusses collaborative information sharing behaviours in complex and extended organizations; chapter five outlines how complex and extended organizations respond to deficiencies using AT and the flexibility in the fourth-generation approach (4GAT) which aid the understanding of information-sharing failure and innovations in the context used (complex and extended organizations). While AT is considered as a tool that fits the study context, 4GAT, as discussed in in chapter five offers further understanding of these different contexts. The final chapter - six- is a conclusion summarising the contributions and implications of this study.

1.6 Conclusion

This introductory chapter provides the background and framework within which this research was conducted, with an overview of the research area. It also provides the motive and the gaps upon which complex and extended organizations were chosen in helping to give an understanding of the complexities and challenges in a complex and extended organization at the organizational level. The research has also been extended to examine the role of the teams and knots that are a part of the ways multiple and extended organizations function, with a bid to mitigate and deal with issues resulting from deficits in information sharing. The chapter has also highlighted the uses of AT, adopted as the research central framework and tool for understanding the dialogue between different communities, networks of interrelated activities and division of labour. Fourth generation activity theory (4GAT) which is an approach used for better understanding complexities has been introduced mainly as a way of complementing 3GAT in understanding the extension related complexities. The theory was chosen due to its ability to allow the combination of other approaches as lenses, in further helping to understand innovations in the setting and the magnitude of complications and extension the research is dealing with to avoid failure in information sharing. The justification of the study is discussed as well as the research contribution. Thus, the research is based on the literature gaps as reviewed in the next chapter which forms the basis of the study.

Chapter 2 Literature Review

2.1 Introduction

This chapter reviews literature providing a background for the research, to placing the study in a context of the setting and to illustrate the gap in the literature that exists in respect to the research context - which is information sharing failures in complex and extended organizations. The study seeks to examine the implications of extension in multiple-relationships on an organization's ability to achieve its' objectives and aims ('mandate' in public sector terms in the context studied) and to examine ways organizations, and the individuals and groups within them, in this complex and extended setting, share information with other actors (individual and organizational). The study also reviews the way extended organizations mitigate the deficiencies and complications associated with multiple-relationships and the research setting thus reducing the extended divide among members.

2.1.1 Chapter outline

The literature reviewed during this study search different information science databases by performing key word search and elimination headings and articles. The word search also included main areas covered by information behaviour models and activity theory concepts. The search process produced seven different headings representing the main area of focus which are:

1) The nature of today's organizations. Different subsections addressing issues of complexity and extension and explaining why organizations need to avoid operating separately or in isolation, but rather should network to be successful. This has been considered first, after the introduction and before information sharing behaviour so that the right understanding of the setting is emphasised. In this section, complex and extended organizations and extended enterprises are considered.
2) The discussions drive an investigation of information sharing and information behaviours in general and within complex organizations, linking the two to complexity and extension. In doing so, the information sharing behaviours of collaborative organizations and the utilisation of information within complex and extended organizations are examined against the backdrop of the objectives of this study, namely, to investigate the phenomena associated with failures of information sharing within such complex and extended organizational settings.

3) In this section the importance of organizational culture is considered. It discusses ways in which organizational members relate to their work, co-workers and their environment. An information sharing culture assumes a prominent position in this debate owing to it being critical to information management and decision making as it determines the value attached to information handling and utilisation.
4) The next section considers different lenses for understanding complexity and managing them; the section considers networking, coupling and knot-working and describes the importance of inter-organizational networks which look at relationships between the organization, its suppliers, competitors, other organizations and their customers and stakeholders. It also gives an idea of how much each organization retain a form of control over resources while agreeing on joint usage. Also discussed in this section is how complex organizations use teams and knot in mitigating extension related deficiencies.
5) This section of the review makes explicit the research context and research gaps and summarise the main arguments presented in this chapter, setting the scene for the methodology chapter.

2.2 Complexities and extension in organizations

Organizational forms are changing and developing. It is argued that there are a paradigm shift and ways in which organizations are changing which are on the increase (Landy & Conte, 2016). The changes taking place in businesses (both big and small) and the application of technology has a far-reaching consequence for all forms of companies both small and big (Tapscott & Caston, 1993). The modifications witnessed are in part, at least, due to the increase in complexities and extension which also drives information sharing failures and a key driver for this research.

Linking the changes discussed, Mihm et al. (2010) argue that complexity evolves in the use of multiple technologies, multiple interrelated business processes and team collaboration involving other partners. They further say that the failure of information sharing is commonly seen in complex and extended organizations than in those with less extension and complexity. However, a combination of new science and the complex nature of today's business drives the creative impulses that bring about innovation and allow organizations to find solutions as a way of gaining competitive advantage.

Two reasons have been outlined in respect as to why innovations that see the transformation take place are hampered; according to Kotter (1995), these are because organizations don't learn from change process which goes through different phases and, they don't learn from mistakes. Thus, organizations that embrace innovations gain a competitive advantage which drives the needed transformation in organizations. The change witnessed is compelling evidence of the shift from individual working to team-based working and the need for diverse skills and different forms of expertise (Kozlowski & Bell, 2003). Similarly, Landy & Conte (2016) give reasons for the use of teams as 1) It saves time when compared with what an individual can achieve, 2) The different ideas from individuals are cross-fertilised in groups to give some form of innovation and creativity. Others are, 3) there is the tendency of information integration as compared to an individual; 4) The use of teams is a way of effective delivery of service and 5) teams enhance learning in an organization more effectively.

In trying to understand the nature of today's organizations, this research focuses on organizational forms, looking at complex and extended organizations which also cover extended enterprises in their attempt to find flexibility. The reason for these two choices is because of the on-going trend of collaborative inter-organizational networks which extend organizational interactions outside organizational boundaries in search of flexibility which is often complex and comes at a high cost (Landy & Conte, 2016). This collaboration has a consequent shift towards a business environment that is complex both regarding its operation and the extended relationships involved.

2.2.1 Complex and extended organizations

A key driver for this study is that while complex and extended organizations will have areas where information is shared effectively and potentially more than in more straightforward settings, there are also areas and instances of failure. Such failures in information sharing have their roots in many causes, and the elimination of all such failures is an ideal state that is unlikely to be achieved without a good understanding of them. Where such failures occur, the impacts of them may be relatively minor or may have significant impacts, and this may reduce such organizations' effectiveness, leading to lost productivity and efficiency as stated by Provan & Lemaire (2012).

2.2.1.1 Definition of complex and extended organization

The emergent definitions of complexity and extension used in this research were reviewed based the literature; it was found that the two concepts are linked. Extension refers to the extent to which the organization must collaborate with a set of other organizations to meet the aims it has to achieve. According to Zhang et al. (2012), such a relationship found in extended organizations is an effort aimed at gaining competitive advantage. Such extension, according to Cuenca et al. (2011), is a process of integrating different groups. This extension requires the organization to manage and accommodate relationships with a range of stakeholders and to maintain flexibility in these relationships, which recognise and attempt to reconcile areas where there may be a lack of congruence between aims, systems and processes. Some relationships may be based on and governed by, well-articulated and formal contractual arrangements, while others may be based on evolved and informal arrangements which, while accepted and accommodated, are subject to far lower levels of formality and governance.

While the extension may bring with it uncertainties and the potential for failures in information sharing, this process of partnering and collaboration is necessary for the organization to deliver the business's aims and mandate. Complexity is bound up with extension in many cases, in the sense that extension will tend to bring complexity with it as the organization has to accommodate a range of disparate stakeholders and ways of working. Complexity may, however, also arise without significant extension or independent of it. This complexity, independent of extension, may be driven by a range of factors which may include the size of the organization, the nature of tasks undertaken or novelty in tasks. However, a recent study by the Institute of Risk Management (IRM) (2014) considered extended organization as a complex organization involved in a network of relationships that support both the public and private sectors in the modern economies. They went further to give attributes of complex organization as:

1) Hard to control
2) Unpredictable
3) A need to adapt since unexpected issues are likely to arise in the event of trying to solve one problem.
4) Require many specialisations working together in a new way
5) Management of such must be by creativity through principles, shared ethics, shared values and behaviours.

2.2.2 Extended enterprises

In this section, extended enterprises are used to refer to extended organizations. Three key aspects of global extension required are capital, people and information (Kanter, 1999). The section highlights the importance of information sharing by different extended groups and areas they stand to benefit. Different definitions of extended enterprises are used to categorise three groups as identified which represent different complexity. One of the groups that emerges fits the description of the organization considered in this study and its stakeholders, which are complex and extended.

Rouse (2012) defines extended enterprises as organizations whose success depends on networks of relationships, meaning that they cannot function in isolation. Similarly, Farrel (2008) sees it as a representation of relationships that cut across entities having direct or indirect things in common and whose relations affect each other. This type of organization operates independently but has a shared relationship because of markets, contracts or agreements. The need for information sharing in inter-organizational networks highlighted by Humphrey & Schmitz (1998), also demonstrates that trust is an essential aspect of building networks for better economic growth.

Table 2.1 below provides different definitions of extended enterprises to categorising them according to types and purpose

Table 2. 1 Definitions of extended enterprises

Author/s	**Year of Publication**	**Definition of term extended enterprises**	**Purpose of extended enterprises**
Brown et al.	**1995**	Sees it as a Co-makership which involves a long-term relationship with limited suppliers based on mutual understanding.	Working together with a view to improving quality and reducing cost in a defined market.
Lin et al.	**2000**	Organizations that are intertwined and interdependent on one another in their operation, with a view to keeping costs low and profits high	Reduction in cost and increase in profit.
Ericksen and Suri	**2001**	"Extending business relationships by providing process management consultation and workshops to suppliers and supplier tiers in order to reduce cycle time, to minimize system cost, and to improve the quality of the goods or services provided by the suppliers"	Reduction of cycle time, system cost and improved quality of both goods and services.
Martinez et al./ Kochhar and Zhang	**2001/2002**	Member organizations which combine core competencies and capabilities strategically to build a distinctive market competence through networking.	Taking advantage of an individual market that best fit the physical characteristics of core competence. It also involves globalisation of exchanges and subcontracting production and partnership. Example of virtual enterprise.
Sachs et al.	**2002**	The interdependencies that exist between different firms, their customers, employees and employers, including the communities and their constituencies which are not essentially contractual but based on social interactions.	To operate a network of relationships, especially with key stakeholders, through creating and sustaining by means of enhanced capacity.

Author/s	Year of Publication	Definition of term extended enterprises	Purpose of extended enterprises
Saiz et al.	**2005**	A body where the dominant organization achieves its vision in full using other members for key features. This is done through collaboration and partnering with others with the understanding of using specializations otherwise not available to them. Examples are extended enterprises and virtual enterprises.	Achieving full vision based on others through flexible changes, collaborating, outsourcing and networking. Strengthening their weaknesses by means of common objectives.
Chen et al.	**2008**	Virtual enterprises are more concerned with interoperability of vibrant networked enterprises having a dynamic and less stable nature than the extended enterprise.	Virtual networking through interoperability of different enterprises.
Cuenca et al.	**2011**	Sees extended enterprises as a long-term coming together of suppliers and their customers.	Process of integrating suppliers and its customers.
Zhang et al.	**2012**	Extended enterprises seen as an attempt by manufacturers to build recognised partnerships with a view to gaining a competitive advantage.	Integration of organizational competencies and available resources to compete in the whole product life cycle from manufacturing to production, distribution and customer service satisfaction.
Arduin et al.	**2014**	Seen as a network of different firms collaborating within a project to accomplish a common goal.	Knowledge sharing in accomplishing common goals.

2.2.3 Categorisation of definitions into different groups

Having considered a variety of definitions of extended enterprises and the themes that emerged from the various descriptions in the table above, it is possible to identify different ideas from the table. These became the basis for the literature review in this research. Although the characteristics found suggest some overlapping functions and similarities, groups can be distinguished regarding types and functioning.

Three different groups emerged, based on similarities in themes from definition and function. These are; those that support the manufacturing/production function of enterprises (Brown et al., 1995; Cuenca et al., 2011; Ericksen & Suri, 2001; Lin et al., 2000), those that support virtual enterprises through computer networking (Chen et al., 2008; Kochhar & Zhang, 2002; Martinez et al., 2001) and those that support general service provision (Arduin et al. 2014; Sachs, 2002; Saiz et al., 2005).

This section, therefore, examines the standard definitions to derive a new meaning for this research.

2.2.3.1 Group 1

The first group mostly found in the supply chain and manufacturing industries. E.g. the motor vehicle industry. Inter-organizational communication characterises this group with the flexibility of relationships and control; others are mass customization, manufacturing strategy, outsourcing, inventory management, cost reduction and improved quality of goods and services (Nakornsri & Lee, 2008). The main benefit of such alliances is to maximise competitiveness among members and increase profitability for the member companies (Nakornsri & Lee, 2008, p.2).

2.2.3.2 Group 2

The second group constitutes organizations that support virtual enterprises characterised by short-term alliances, created to explore the fast-changing opportunities presented by a changing environment. This group is associated with a specialisation that is geographically distributed and has organizational independence and is supported by computer networking. Good examples of this group are the virtual enterprises seen in the entertainment industry concerned with converting movies, some textbooks, and software into digital formats (Trapp et al., 2015). Some of the best practices employed by this

group are short-term cooperation, dependence and empowerment; each contributing partner identifying a strength which will go into the alliance and use of teamwork.

This category requires time for team development, and the technology must be compatible and reliable, with flexibility. One advantage of this type of enterprise is that it can have leverage in production or service which may include product design to marketing and communication through brand experience (Romero & Molina, 2011).

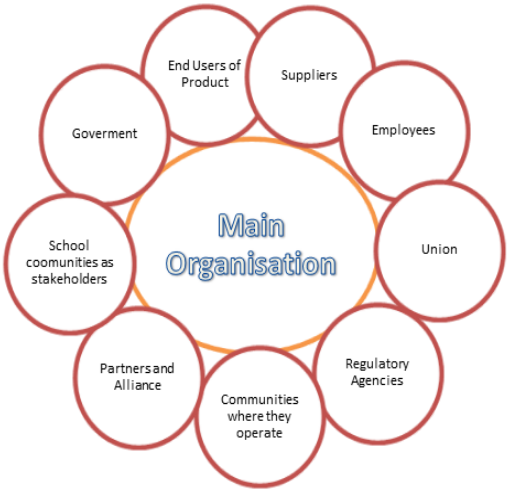

Figure 2. 1 An example of a multiple type of relationship showing organization partnering with stakeholders: *Source: Author, 2017*

2.2.3.3 Group 3

The third group comprises more general service providers and also covers the functions of the first two groups. This group partners with all stakeholders, communities and constituencies with proper use of teams in achieving the outcome. Examples can be seen in the educational sector, health and financial industries, i.e. schools, hospitals, banks. The type of relationship here is characterised by business relationships, networking with stakeholders, the use of both tight and loose relationships, using teams and specialisation and collaborating with teams to achieve stated results. A diagrammatic representation of the concept of this group is shown in Figure 2.1. This group aims at motivating members and getting loyalty from of its members by showing that they need each other to stay in business (as the output of one becomes the input of another). Table 2.2 shows the characteristics of the three different groups explained above with a justification why a particular group is chosen in the section that follows.

Table 2. 2 Characteristics of different groupings

Operations	Group 1 Supply chain and manufacturing industries Could be considered private for –profit sector.	Group 2 Virtual enterprises Could be considered private for –profit sector.	Group 3 General service providers could be considered public non-profit.
	Inter and intra organizational communication.	Short term alliance.	Partners with all their stakeholders, communities and constituencies (inter/intra communication) Both long term and short time type of relationships.
Purpose	Cost reduction and improved quality of goods and services.	Created to explore the fast-changing opportunities presented by a changing environment.	Covers all the functions of the first two groups. Aims to motivate members and promote loyalty through a better understanding that they need each other to stay in business.
Relationships	Flexibility of relationships and control, outsourcing and inventory management.	Specialisation.	Relationship here is characterised by business relationships, flexibility, control and specialisation.
Markets	Defined market. Mass customization. Loose control.	Defined market. Geographically distributed. Tight control.	Public, private and non-profit. Use both tight and loose coupling to maintain relationships.
Collaboration	Manufacturing collaborative strategy.	Organizational independence and empowerment.	Networking with stakeholders and using specialisation, collaboration within teams to achieve stated results.
Information sharing	Supported by computer networking and technology.	Supported by computer networking and technology must also be compatible and reliable with flexibility.	Use both face-to-face and computer networking,
Examples	Manufacturing industries and supply chains.	Entertainment industry, converting movies, textbooks, and software into digital formats.	Education, health and financial industries, i.e. schools, hospitals, banks.

2.2.4 Choice and justification of the chosen group

In this research, the third group is considered as an example of extension with some form of complex relationships. The characteristics of the group are also consistent with a recent study by IRM (2014) that cites attributes of complexity as including unpredictability and difficulties in exercising control. Some additional characteristics of complex organizations are also seen from the leadership style of operation. These characteristics of leadership, according to IRM (2014), are suitable for handling complex organizations as proposed in this third group which include interest in making new connections and possession of an open mindset, which is not constrained by difficulties. Others are; positive attitudes about change; embracement of uncertainties; believing in diversity and being open to as many perspectives as possible; operating open and distributed leadership and decision-making styles; creating a vision shared by all associates, promoting participation and believing in ethics and values with an emphasis on good relationships. These attributes are arguably visible in group 3 based on the literature definitions and characteristics found in the group in Table 2.2.

2.2.4.1 Limitations of the chosen group

Weaknesses which may be found in this group can be attributed to complexity as highlighted by IRM (2014) and Provan & Lemaire (2012). The highlight above could also be in accordance to Gamoran & Dreeben (1986), who state that organizations in formal control will apply many rules, observe complete obedience to orders and have a need for constant supervision of work done by the other partner, which may affect relationships with others. This action could be attributed to their expertise, and the expectation is that the people they partner must work to their standard. Such thing of relationship also requires the continuous monitoring of the partners and evaluations of the outcome of such partnerships. Thus, the action described by Gamoran & Dreeben (1986) suggest the inter-relationship between extension and complexity of rules, obedience to order and the ability of collaborators to deliver the expected outcome where communication may be a problem due to the different stakeholders involved. Other constraints such as time of delivery may be affected and become a problem considering that output in one network could be an input for another.

2.3 Information sharing and information behaviours

2.3.1 Introduction

This research identifies information-sharing failure as a product of complexity and extension and the resulting relationships and dependencies. These complexities and extensions bring about tensions and contradictions in activity systems which are seen in the failures of formal systems and emergent behaviours addressing and resolving them. Among behaviours under research are temporary teams and groups, and knots which form and behave in specific ways which have some differences from other settings where such knots have been studied.

Information sharing involving inter and intra organizational boundaries is considered significant in any organization, especially in complex and extended organizations. Some positive aspect of information sharing according to Lee et al. (2000) is a meaningful strategy in the achievement of organizational success. For organizations that want to increase both efficiencies and performance, information must be shared (Yang & Maxwell, 2011). The act of sharing information is nowadays easier due to technological advances, but it can still be a complicated task (Chengalur-Smith et al., 2012). Similarly, Pilerot (2014) describes information as an essential aspect of work settings (organizations) as people need it for making decisions and completing tasks. The above statement is in line with Yang & Maxwell (2011) who argue that information is crucial because it is linked to increases in efficiency and performance. Wilson (1999) and Fidel (2012) both claimed that information sharing is a form of information use which is also part of information behaviour, this point is being echoed by Mishra (2012) who looks at the uses of information more generally.

2.3.2 Information sharing in complex and extended settings

Information sharing, according to Savolainen (2007 p.1), is “a two-way activity in which information is given and received in the same context.” The statement above then implies that the need for such information must exist before sharing can take place. Similarly, an earlier study by Belkin et al. (1982) defines information need as the gap between the knowledge the worker has of the task and the knowledge required to perform that task. In filling the identified gap, several factors demand the giving and receiving of information about the subject matter, including personality factors which also serve as drivers (Utz et al., 2014).

Liu et al. (2015) explain that partners who are involved in information sharing can gain a better understanding of each other's capabilities, which will result in benefits for both partners. Sharing information also improves the quality of the information being shared and the skills of the organizations who share the information. Other benefits attached to information sharing include a reduction in the time wasted in supply chain management (Ward & Zhou, 2006). Helping to cope with the environmental uncertainties of partners, as information about their operation and the external environment is made available, (Wong et al., 2015), has also been cited as a potential benefit. Information sharing is therefore considered very important for inter-organizational communication as the process provides a platform for the exchange of ideas between partners (Huo et al., 2013). However, the need for such information may vary according to different needs in line with the studies of Mervyn et al. (2014) show the diverse information needs based on a range of relative reasons.

A general model of information behaviour is described by Wilson (1997) which demonstrates how people need, seek, exchange and make use of information, as presented in Figure 2.2.

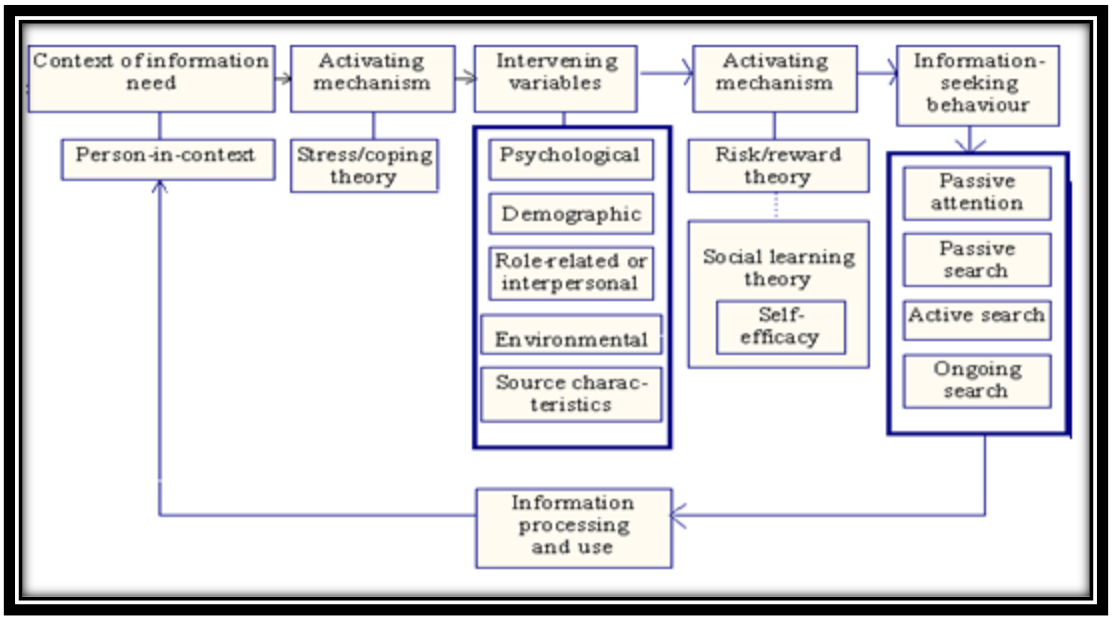

Figure 2. 2 Wilson information behaviour model 1997: Sources: Adapted from Wilson 1995

According to Wilson (1997), the main part that gives rise to information sharing behaviour is the situation that gives rise to the need. This, according to him, varies from discipline to discipline.

Information behaviour research, therefore, is concerned with different disciplines other than information science. Wilson general model in Figure 2.2 serves as a learning process and is adapted by different disciplines for their use, bearing in mind that each discipline has different reasons and factors that drive the need to explore what they consider and call information behaviour. The 1997 model by Wilson has however been criticized for its logical and sequential procedure as it is argued that in real life the process should be back and forth rather than sequential (Foster, 2004; Godbold, 2006).

Another model proposed by Robson & Robinson (2013), which is the information system conceptual model (ISCM) as shown in Figure 2.3 combines the information seeking and communication aspects and incorporates most of the factors given in other models, i.e. work role, task and information needs, demographic, environmental, and both the activating and intervening variables from Wilson's model. The advantage of the ISCM model is that both the user and provider are considered, which offers the best understanding of information seeking, information use and the communication of information, stating the factors affecting them.

The definition put forward by Wilson (2000) on information behaviour represents the entirety of human information behaviour when dealing with sources and different information channels, from information seeking to information use. This research, however, is concerned with information sharing and uses, while acknowledging that the whole process of information behaviour goes hand-in-hand with collaboration between the stages. Cho & Lee (2008) defines information seeking as a process of knowledge change by way of collecting information, analyse it, and synthesise and disseminate it through working together.

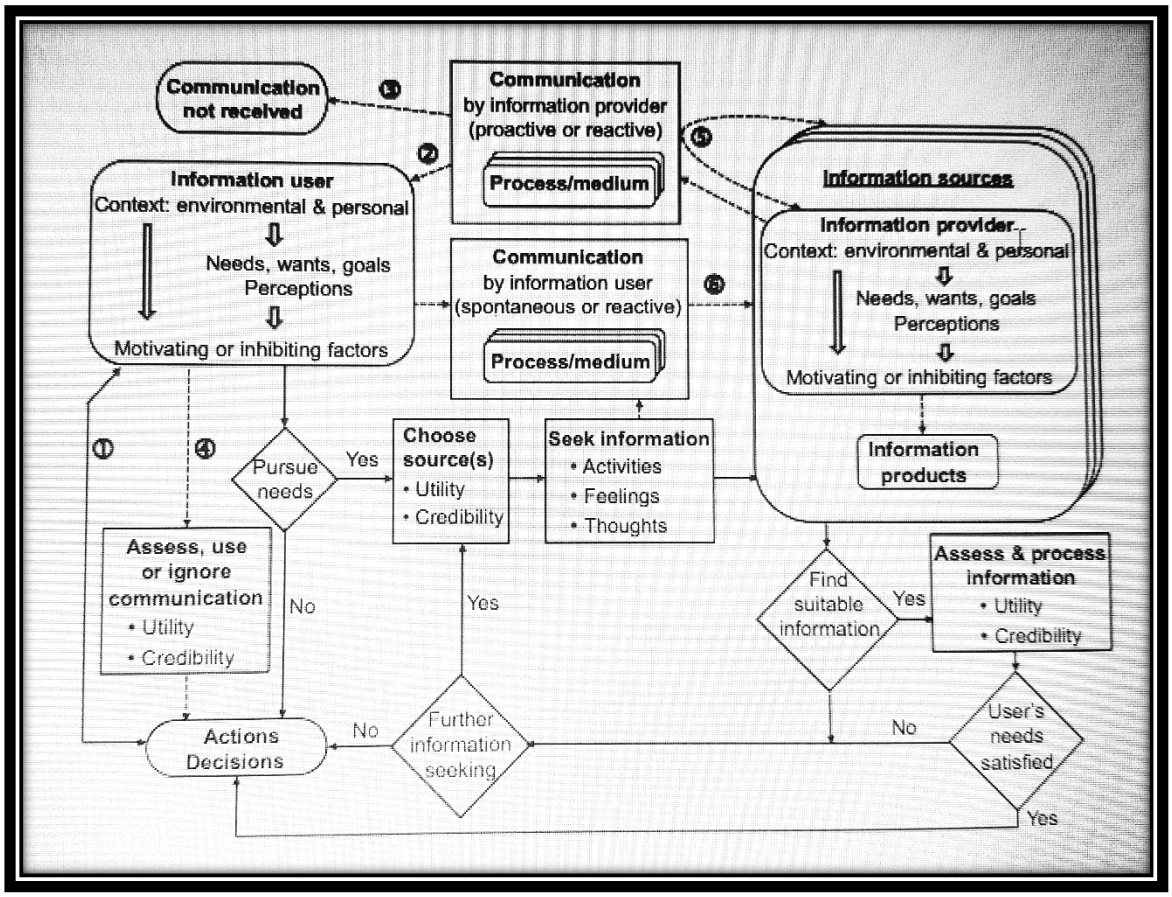

Figure 2. 3 Robson and Robinson Information Sharing Behaviour model: Source: Adapted from Robson and Robinson (2013)

To understand the concept of collaboration, Borghoff & Schlichter (2000) describe collaboration as communication-based on joint and coordinated individual action. Similarly, Talja (2002) states that collaborative information sharing, and use can only be complete if collaborative information seeking takes place in such a way that sharing patterns become stable. Moreover, he went on to say, for sharing to take place, collaborators must know the purpose of the collaboration and must be committed towards this target but have an emphasis on understanding and common ground.

The concept of collaborative information seeking will result in information sharing and use but this, however, is dependent on a certain level of understanding between the collaborators. For a better understanding of what brings about sharing. Lozano (2008) stressed that collaboration with stakeholders' results in the improvement of production and profitability of the organization. Similarly, Ferratt et al. (1996) explain that collaborative advantage can be a driver for groups of collaborators to establish an

outcome of cooperation rather than competition. Accordingly, the issue of trust was discussed by many as driving the need for collaboration, for building good networks for better economic growth, networks for competitive advantage, networking as a way of negotiating and networks for organizational productivity (Dunkerley et al., 1981; Eom, 2005; Humphrey & Schmitz, 1998; Shin 2000).

The next section, therefore, considers collaborative information sharing (CIS) in organizations. These organizations have shared objects, and because of that they collaborate and depend on each other to get things done. In this type of organization, information sharing is vital to the success of all the other partners.

2.3.3 Collaborative organizations and information sharing

This research considers collaborative organizations as inter-dependent on, and partner with, other organizations in their operations. Frey et al. (2006 p.384) define collaborative organizations as; "the cooperative way that two or more entities work together towards a shared goal". Similarly, Arias-Báez & Carrillo-Ramos (2012) describe collaboration as the coming together of people to complement each other's skills to achieve a common goal using information sharing. For clarity, collaborative organizations and extended organization in this study are used interchangeably throughout this thesis.

This process of collaboration can be complex and is often accompanied by problems as it involves different extensions. Such extensions require the organization to manage and accommodate relationships with a range of stakeholders and to maintain flexibility in these relationships which recognises and attempts to reconcile areas where there may be a lack of congruence between aims, systems and processes.

The creation of a team of experts with similar skills and knowledge that can be put together towards the achievement of a specific goal is an important way of solving the problems associated with collaboration. In the light of this, Borghoff & Schlichter (2000) define collaboration as communication-based on joint and coordinated individual action. Thus, Talja & Hansen (2006) describe the process of collaborative information sharing as mostly the same as individual information sharing but with more emphasis on a group undertaking purposeful, collaborative effort as against individual sharing. They further go on to say that such distributive collaboration becomes part of the everyday practice in a work setting. However, researches before that of Talja & Hansen (2006) identify having

common ground, without which it becomes difficult to collaborate (Clark & Brennan, 1991; and Olson & Olson, 2000). They argue that collaborators do not always agree on everything and that without a reasonable degree of common ground, collaboration can become unsuccessful and cause problems in the relationship. For these reasons it is important to establish common ground that is acceptable to a majority of the group; only then can the issue of reduction be eliminated.

In like manner, Talja & Hansen (2006) encourage groups to make a purposeful, collaborative effort as against the single individual effort which can drive teamwork. Such distributive collaboration, according to them, becomes part of the everyday practice in a work setting. A new way of looking at collaboration, according to Hertzum (2008), is to categorise it into six dimensions: 1) Purpose; 2) Type; 3) Role; 4) Activity; 5) Granularity; 6) Coupling. All of these are essential to the success of information sharing. Similarly, Lozano (2008) argues for collaboration in organizations, emphasising the need for building a sustainable, stronger and oriented system through collaboration which can only be achieved through kyosei activities, since such collaboration is expected to be seen at different levels looking within and outside the organization.

Considering that collaborative information cuts across boundaries, it is important to touch on global collaborative information sharing as the complexity due to an extension also covers stakeholders and global partners. Therefore, the next section looks at collaborative information sharing with global partners and its importance.

2.3.4 Information sharing with global partners

The importance of this section is that it touches on global information sharing and analyses how distance in this type of relationship affects the sharing of information. Thus, it is believed that with the correct information sharing tools and good cultural understanding, the barriers between the collaborating partners can be reduced.

The need to associate with other international organization as global partners is a response to customers' demand that make organizations competitive to provide the best service and regulate their activities in the industry (Boudreau et al., 1998). Studies like that of Lozano (2008) advocate the need to collaborate globally with other organizations to discover global challenges and find ways to solve them. Goodman (2013) states that, despite the problems in global information sharing, it is believed that a prevailing wind

of acceptance is blowing in the direction of more global information exchange, especially in cross-border cooperation. This, according to him, has become necessary to encourage cultural intelligence between different organizations and to build a robust knowledge management setup that will be responsible for collecting, storing and disseminating such important information (Goodman, 2013).

Rather than technology becoming a problem, technological innovations have challenged the whole environment where businesses have been extended and operate to meet the changing nature, which has resulted in growth, involving multinational organizations (Kanter, 2003). However, these types of relationships need structuring and guidance to be able to compete internationally. Some areas that are of interest to this research are discussed in the sub-sections below.

2.3.4.1 Virtual organizations

This type of organization, as discussed in section 2.3.2 depends upon a coalition of alliances and partnerships with other similar organizations. These organizations may have contractual, partial or other forms of arrangement, as such provisions allow working in a variety of different locations (Boudreau et al., 1998). This type of relationship is seen even among extended organizations and understanding them may reduce the complexities that might arise when sharing information under such arrangements.

2.3.4.2 Need to match technology to fit with federated members

According to Boudreau et al., (1998), the need to conFigure the technology in use with that of other federated partners is necessary for better coordination among members, avoiding any temporary barriers in transacting business. This process may affect areas including; electronic data interchange (EDI); inter-organizational systems (IOS); language translation software; internet/intranet; organizational memory systems (OMS).

Thus, the use of an intranet in an organization to encourage intra organizational collaborative information sharing is vital to enhance productivity and allow collaborative information sharing. The intranet can also be a problem solver. However, intranets alone cannot provide the solution needed but need to combine with connectivity and interactivity. The need to expand both globally and otherwise has made it difficult for face-to-face communication, and there is, therefore, a need to embrace human to computer interaction in an organization for better and faster communication. The use of

the intranet to meet the communication needs of an organization, both globally and between locations, is, therefore, essential to enable workers in different places to communicate and contribute ideas to the overall decision-making process. Similarly, Panteli et al. (2005) argue for connectivity and interactivity as the fundamental features of the intranet, which encourage information sharing and use within an organizational setup, with collaborative tools such as emails, video and audio applications. Effective communication within an organization is essential to create a productive environment where an employees' ability to relay a message is supported. It is also necessary to provide information about the use of such technology to stakeholders to contribute to the overall success of the organization. Similarly, Burke & Ross (2013) argue for information interoperability to be employed in organizations as a means by which to share information quickly both globally and locally.

2.3.4.3 Understanding cross-cultural difference

Recent calls for cross-cultural collaboration in research have prompted more scholars to turn their focus to the educational and business sectors (Cho & Shin-Lee, 2008). This is to understand how relationships between social, cultural and technological factors affect business.

Moreover, the success of an organization will also depend on the type of relationship that exists both within and outside the organization. Bilinska-Reformat & Sztangret (2013) support the ideas of Goodman (2013). They believe that information sharing is a product of a transformation from normal business relationships resulting in a more collaborative one. Information is the product needed to meet the demands of the market. Information sharing between producers and intermediaries is crucial in meeting the requirements of customers. Other scholars such as Chaneski (2013) believe that in meeting the demands of new customers and intermediaries, some challenges should be expected since more risks are involved as the two parties lack familiarity with each other. Accordingly, Chaneski (2013) argues that existing customers offer quick approval to products relative to new customers because existing customers provide easy ways of solving problems, more information, greater idea sharing opportunities and more patronage regarding paying for products.

2.3.5 Intra and inter information sharing

Inter-organizational information sharing is a driving force required in this modern technological era to streamline activities in an organization and maximize working benefits (Chen et al., 2014). This process of information sharing is possible when the two partners successfully develop trust and build long-term businesses.

Corporate information sharing is considered a vital determinant of sustainable competitive rewards. However, Loebbecke et al. (2016) argue that recent resource-leveraging strategies highlight the need for inter-firm alliance and information sharing across firm boundaries. The above statement suggests the need for new reliance that reconciles both intra and inter-organizational information sharing processes. The need to share information between organizations cannot be over-emphasised, but the mode of sharing is of great importance in achieving the goal of information sharing in collaborative organizations. Jarvenpaaa & Staples (2000) state that information sharing in an inter-organizational context is positively related to profit and productivity, and negatively linked to labour cost. The statement refers to more benefit flowing to the organization because of more productivity, with less cost incurred in terms of the labour needed to perform the work.

2.3.6 Application of information sharing on complex organizations

Having considered the characteristics of complex organizations in section 2.2, some of the uses of information according to Taylor (1991) are highlighted as follows;

1) Acting as in instrumental use.
2) Knowing facts which are for factual use.
3) Verification of facts known as conformational use.
4) Motivational use which assures the users.
5) Predicting which is projective.
6) Social use which is personal.

The ways the literature implies these are set out below as a lens to structure this investigation.

Building a relationship with partners and stakeholders need a good understanding of the type of relationship one is venturing into to understand where expertise is required (Kerosuo et al. 2015).

Where there is no information or the information available is overloaded (volume), it becomes a problem to workers, especially when faced with many different types of information to choose from Barkow (2004); Edmunds & Morris (2000); Soucek & Moser (2010). Such a problem is linked to a lack of information sharing where channels of information are not defined

Task complexity requires a specific information type that needs to be dealt with. Likewise, the channels and sources of such information must be defined, since if that definition is not given it becomes a serious problem to the worker (s) at that point (Bystrom & Jarvelin, 1995). This specific challenge may be prevalent in organizations where no procedures are given for accomplishing a task; however, this factor needs to be identified from this research.

The length of time needed for information to be shared is another problem, as put forward by (Goodman, 2013), due either to the lack of tools for information sharing or use of the wrong communication channels in the organizations.

Cultural differences among staff are seen in the relationship between the social and cultural factors of workers, and even the organization. These affect how they interact with each other, and with technology, to achieve a good distribution pattern even with remote co-staff. The context above can be a significant problem that needs to be investigated in the context of organizations with multi-cultural workers since not all workers have the same way of approaching their work due to the cultural background (Cross et al., 2002).

Management response to the information available is also a problem regarding how flexible they are with policies on the use of information tools and the provision of such to enable workers to share internally and with external organizations that share everyday organizational activities, or even with stakeholders (Agarwal et al., 2002).

Organizational and management perspectives, political perspectives and technological perspectives are all factors that, if not correctly handled, become a serious problem for information sharing. Moreover, their proper handling brings about productivity and efficiency (Yang & Maxwell, 2011, p. 164). Understanding the complexity caused

because of extension and how information is shared in such relationships is essential for this research.

2.3.7 Information use in organizations

Information use is defined as the application of assimilated and transferred information in organizations for decision making (Leonard-Barton & Deschamps, 1988; Nutt, 1986). Despite the interest and importance attached to this information use, there is still a call for more research in that area (Greifeneder, 2014 p 200).

Choo et al. (2008, p.794) explore the information capabilities which organizations should adopt for superior results, including information technology practice; information management practice and information behaviours and values practice. According to them, such capabilities will enhance the use of information in organizations. They go on to give eight uses of information in organizations, specifically:

1) Enlightenment use associated with sense-making situations for understanding problems used in comprehending a challenge.
2) Instrumental use for knowing what and how to approach it.
3) Factual use for determining the facts of a situation.
4) Conformational use mostly used in verifying other information available.
5) Projective use for a predictive purpose.
6) Motivational use to be able to sustain involvement along the direction of action.
7) Personal or political use for developing relationships, increasing status and for personal fulfilment.

Like the work of Henningsen & Henningsen (2003), Choo et al. (2008) explain that information use is a common practice in a collaborative organization during group decision-making as against unshared information. However, two factors (normative and informational) influence decision-making. These factors are because of efforts to either go with the group, or base decisions on fact and evidence, which may cause members to re-evaluate their stand and change their position.

In the same vein, Hughes (2006) argues that information use also includes the need for such information, the sharing of the information and the behaviours associated with it, which also correspond with Choo et al.'s (2008) information capabilities. The use of

information in an organization, however, is significantly affected by the function, needs and the calibre of management (Bryson 2012; Moorman 1995). This again corresponds to Choo et al.'s (2008) capabilities. In contrast to the above, Bersin (2013) explains that structure and information are important principles involved in information. Likewise, for information to be shared within an organization, a foundation or basis needs to be defined to highlight the importance of sharing information within that organization.

The second aspect of Bersin's (2013) information sharing doctrine is the taxonomy, which talks about how to categorise and find the needed information and the last is to create the authority which the organization will use in decision making. Similarly, Goodman (1993) explained that successful management must use information as a factor to strategically improve the organization. According to him, a good correlation has been proven between successful management and proper information needs assessment, coupled with information gathering and use.

Similarly, Choo (1996) gives three uses of information in organizations which are; to make changes in the immediate environment, to create knowledge which in turn will lead to innovation and decision-making in an organization. He went on to argue that information for decision making is based on good selection and different causes of action that is aimed at the overall interests of the organization. Today, knowledge of an organization is a product of a more flexible approach, combined with powerful collaborative management of information tools for both internal and external uses with other organizations that share a common organizational goal (Agarwal et al., 2002). Bryson (2012) states that the performances of information use could be of help in this era of public reforms to address the issue of accountability and behaviours in workplaces. He goes on to argue that, the performance of information use is a way of determining if workers are acting by laid down reform rules.

This system is not only open to the organization but also in collaboration with stakeholders, who monitor the performance of the workers and organization through sharing the information available to them. In the highly dynamic environment where organizations operate, however, the ability to act immediately on information as it becomes accessible is referred to as instrumental information use, and this can create ground-breaking solutions to problems (Weick, 1993a, 1993b). The argument above

supports Taylor (1991) who gives six different forms of information uses: instrumental; factual; conformational; predictive; motivational and personal.

Similarly, Pereira & Soares (2007) also support information use as the careful combination and absorption of different pieces of information within organizations, sometimes referred to as conceptual information, which can produce encouraging performance outcomes. Likewise, many information studies have also suggested that lack of information use, which may have characteristics internal to the organization such as its tactical positioning as well as the external environment, may affect both economic performance and the motivation of the user (Moorman, 1995). Different types of information use given by Song et al. (2005), as accepted information use theorisations; these are instrumental and conceptual. The instrumental use of information involves applying reasonably structured acquired information directly to decision responsibilities, while the theoretical use of information involves integrating new information into an organization's current knowledge base to develop meanings and consequences.

The emphasis here is on the commitment to an understanding of the information before its application to decision making, as supported by Beyer & Trice (1982) and Fredrickson (1985). Paisley (1968), cited in Byström & Järvelin (1995), states that an individual will only seek information if it is relevant to his/her schedule. As such, he highlights many factors responsible for determining the workers need for information such as cultural and political background, profession, reference group, personality, workgroup and organization. The use of information in an organization can only be achieved if barriers and challenges are considered and avoided. The next section highlights the challenges and obstacles to information sharing and uses in organizations.

2.3.8 Significance of information sharing in extended enterprise

The importance of information sharing in complex and extended organization is significant because of the interdependencies that exist between different firms, customers, employees and even employers. Many organizations today are involved in inter-organizational networks which extend organizational interactions outside organizational boundaries, with a consequent shift towards a business environment that is complex both regarding its operation and concerning the relationships involved. Mihm et al. (2010) argue that complexities evolve to address problems caused because of the use of multiple technologies, multiple interrelated business processes and team

collaboration involving other partners. They further argue that information sharing failures are more commonly seen in such complex and extended organizations than in those with less extension and complexity.

The practice of collaborating with others has a positive influence on trust with business partners and their shared vision (Li & Lin, 2006). Among the reasons for the creation of complex relationships are: a reduction in the development process involving materials, an increase in sharing information, product and infrastructure; the increased speed required for products to reach markets and improved delivery time; acceptance of an expansive life cycle orientation; provision of dynamic organizations and the expansion of organizational vision (Jagdev & Browne, 1998, p. 218). Information sharing, and communication tools are vital to achieving organizational success and to maintain relationships because interconnected organizations use information systems to function and carry out work which is vital to their performance and necessary as to how stakeholders operate (Young & Finger 2014). They are also a way of increasing efficiency and performance which are driving factors within any organization (Yang & Maxwell, 2011).

The call for businesses or organizations to adjust, to meet the challenges of today's rapidly changing environment, has been made both by researchers and practitioners alike (Dunning, 2014; Fullan, 2014). The changes brought about by the challenges in a complex and extended organization are the driving forces behind innovations and uses of technology in solving problems (Gunasekaran & Ngai, 2004). This idea still applies even with new and modern ways of working that require an understanding between collaborators to enhance businesses.

2.3.9 Barriers and challenges to effective information sharing and use

Information sharing is essential, and a means to increase organizational efficiency and performance (Yang & Maxwell, 2011). Moreover, with the level of global information and communication technology presently attained, information sharing is now more feasible across organizations. Information sharing can also be a complicated task if the factors influencing the sharing are not correctly identified at the personal level, covering individual circumstance and environmental factors (Robson & Robinson, 2013). These different behaviours include the individual motivational level, the individual approach to sharing information and channels of sharing. On the intra and inter-organizational levels,

these include the internal bureaucratic approach and access to information which is covered under the structure of the organization and the culture, ritual and norms of that agency, as shown in Figure 2.4. The inter-organizational factors according to Yang & Maxwell (2011) may include the technological perspective; the organizational perspective and the political and policy perspectives, all of which are critical considering the diverse and complex nature of the relationships involving different stakeholders, government and other agencies of government, as seen in Figure 2.4.

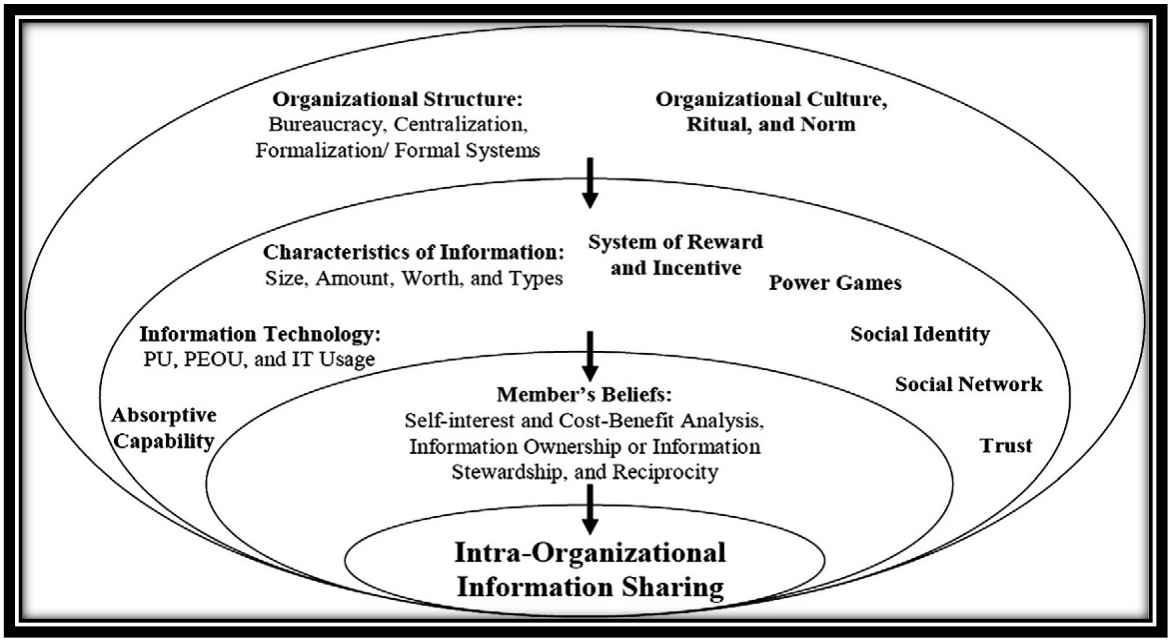

Figure 2. 4 Yang and Maxwell model showing factors influencing intra-organizational information sharing: Sources Adapted from Yang and Maxwell, (2011).

An example of factors influencing inter-organizational information sharing in a public sector is shown in Figure 2.5, which highlights the different factors responsible for information not being shared properly. For Bilal & Kirby (2002), however, the factors that affect information sharing are age, task, knowledge of how to use the system and interest. Mulligan et al. (2003), meanwhile, identify some issues associated with the lack of information sharing and use among group members which correspond to those of Bilal & Kirby (2002). These include age; different search engines and various sources of information obtained in the digital environment. As a result, uncertainty about the choice of which channel to follow from the search stage to retrieval and even after the information has been received, resulting in a situation of persistent uncertainty. The case above may bring about negative feelings and frustration (Chowdhury et al., 2011), the

problem of uncertainty decreases as more information is found, however, with the potential to bringing about creativity and new knowledge through innovation.

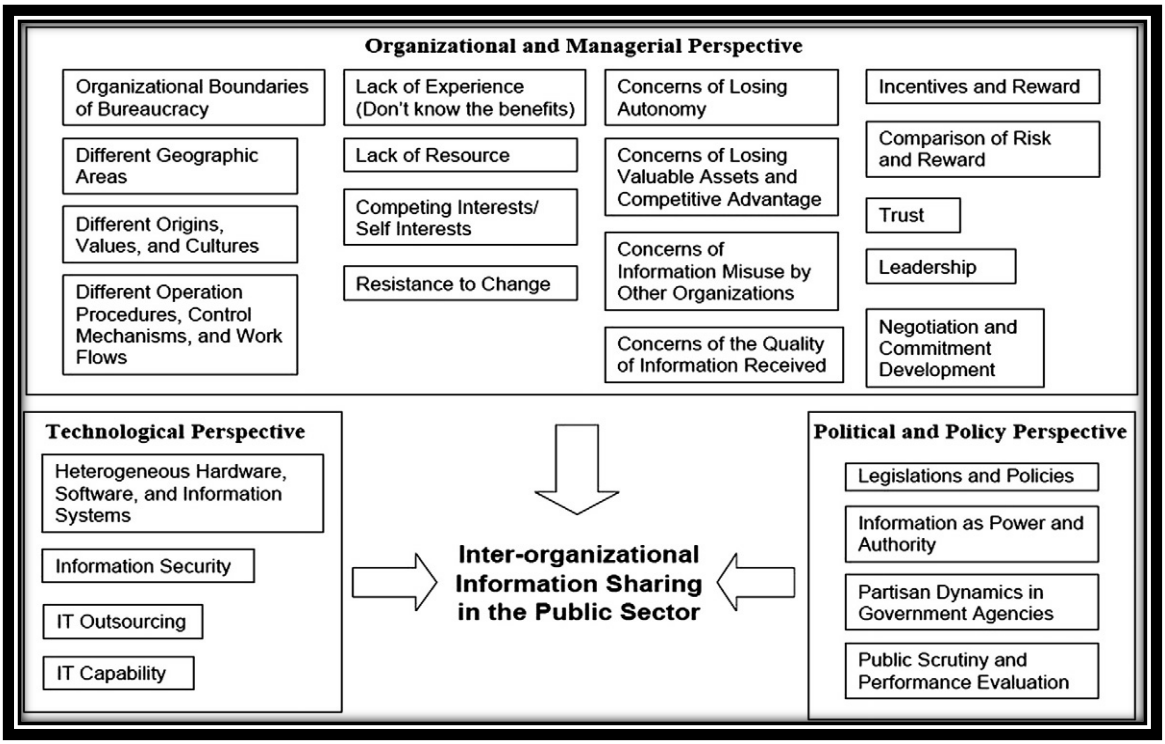

Figure 2. 5 Yang and Maxwell model of factors influencing inter-organizational information sharing in public sector: Sources: Adapted from Yang and Maxwell, (2011).

Allen (1978), in his research into information seeking, found out that in a public administration context these effects are systematic and logical. The meaning, therefore, calls for employers of labour to find out their employees' strengths and weaknesses when it comes to allocation of information (Barkow, 2004). Similarly, Tiamiyu (1992) at an earlier year states that in any organizational background, a basic framework for human information-seeking behaviours, like the work activities for which information is evaluated and used, is to be provided as a guide to the employee performing such tasks.

Bystrom & Jarvelin (1995) add that task complexity is also a problem that affects information seeking and use. According to them, task complexity requires a specific information type to deal with it; likewise, the channels and sources of such information must be defined. To this end, the management of such an organization should focus more on information management instead of information creation. They also argue for motivational assessment to be used to determine the strengths and weaknesses of workers to handle such situations well. Regardless of the information management in organizations, Goodman (2013) argues that the significant problem that exists within

organizations is a waste of time and effort inherent in replicating schedules and work that already exists within a workplace and therefore calls for management to look out for such problems. Thomson & Perry (2006) state that organizational managers and handlers of collaborative settings should be aware of five complex issues around collaboration that may hinder the process. These factors are; governance; administration; autonomy for organizations; mutuality; and finally, the norms of the people. These issues could hinder information sharing if not managed well. Thomson & Perry (2006) and Yang & Maxwell (2011) share similar ideas on the factors that influence or become barriers to information sharing.

As a way of summary, this section has discussed information sharing and information behaviour based on the literature. Emphasis has been placed on information sharing in complex and extended settings, collaborative organizations and their information sharing behaviours, how information is shared with global partners, intra and inter information sharing, and how information is shared in complex and extended settings. The section has also looked reviewed information use in organizations, the significance of information sharing in extended organizations and barriers and challenges to effective information sharing and use. Having considered the problems of information sharing and its barriers, the next section looks at the culture and ways information is handled in organizations.

2.4 Organizational culture

2.4.1 Introduction

Organizational culture is studied in this review because it highlights ways by which corporate members relate to their work, co-workers and their environment including the outside world. A study by Cadden et al. (2013) suggests that there is a positive correlation between organizational culture and business/operational performance.

2.4.2 The culture in organization

Organizational culture is considered historical and can reveal the principles the firm owners have (McKinnon et al., 2003). Though corporate culture can be either visible or non-visible (salient), they are often hard to change. Nonetheless, they influence the behaviours involving the seeking, sharing and use of information. Organizational culture helps by influencing expectations; defining interactions; impacts relationships between employees and employers; and shapes the way new awareness is created (McKinnon et al., 2003). While organizational culture influences the sharing ability, the culture of

sharing within a team is determined by inter-team ability to respect each other, the existence of mutual trust between members, an excellent form of exchange and constructive relationships (Zakaria et al., 2004).

Looking at the issue of culture from complex and extended organizations point of view, which affect the inter-organizational relationship, what needs to be understood according to Cadden et al. (2013) is that of a cultural fit of compatibility between the integrating partners and their culture. They went further arguing that study has suggested that, dissimilarity in culture between integrating firms is responsible for lower productivity, lower relationship satisfaction, lower financial gains, and a higher level of conflict.

Valencia (2011) defines organizational culture as a specific collection of people and groups in an organization with shared values and norms. Culture also controls the way they interact with each other and with stakeholders outside the agency. Another definition of organizational culture according to Kleijnen et al., (2014) is that "intends to enhance quality permanently and is characterised by two distinct elements. On the one hand, a cultural/psychological element of shared values, beliefs, expectations and commitment towards quality and on the other hand, a structural/managerial element with defined processes that enhance quality and aim at coordinating individual efforts".

Organizational culture is not homogeneous, and it is highly likely that subcultures exist within the same organization or changes from one unit to another in the same organization, however, in the central organizational culture that unit is made up of practices, assumptions, values and symbols that the members of that organizations hold in high esteem guiding their behaviour. Some of these symbols such as dress code, the way of greetings and attachment to a place are more permanent while the values are based on historical events which determine the perception of the people (Wiewiora et al., 2013).

The relationship and new ways of working in a complex and extended organization may be hindered if resistance to changes in culture is present (Carlström & Ekman, 2012). According to Carlström & Ekman (2012), the established culture in an organization causes inactivity and maintains the public structure. Though according to them, cultural influence in an organization can be associated with low willingness to accept change, it, however, sees subcultures as a means to translate culture into a changing value. They

further argue that some tools such as symbols; artefacts; anecdotes and metaphors have not been seen as ways of dissolving conflicts and differentiation in organizations but could also be as values that make subjects act in a certain way. Therefore, the view that suggests organizational culture as connected to consistency is evaluated (Carlström & Ekman, 2012).

Culture has a way of establishing some context of interaction by creating social norms about what is right and wrong which may impact on information sharing. Such social norms can also influence communication. Evidence exists to suggest that the structure of an organization has an impact on the approach to information sharing and in the direction of flow (Wiewiora et al., 2013). Similarly, Friesl et al., (2011) argue that where different cultural attributes exist in an organization, it tends to influence sharing of information within the organization. However, where there are collaboration and collective responsibilities, it leads to better understanding, and the staff of such organizations, go extra miles to avoid disappointing colleagues.

In another related study Sattar (2011) argues that organizations where there are trust and proper coordination amongst the various teams, the source of control on cultural difference, there is a considerable amount of knowledge sharing (KS) and training. Moreover, it was stated by Friesl et al., (2011), that a culture which rewards people for the exchange of information and encourages its people to use existing knowledge, produces different information sharing patterns as when compared to a culture that does not promote such practice. Likewise, studies have suggested that for an organization to achieve its objectives and increase its organizational performance, it has to be an organization which encourages organizational learning focussing on information, knowledge and development. These characteristics are capable of changing behaviours and improve results (Sattar, 2011).

Correspondingly, we see information culture in an organization as a set of beliefs, values and behaviours shared by most members of an establishment (Lim, 1995). In other words, organizational culture is the practice outlined by an organization which controls all the activities of the said organization and encompasses the values and behaviours that make an organization exceptional in any given society. No two organizations share the same culture as each has unique characteristics which develop with time and reflect the identity

of the organization in two dimensions which are visible and invisible (McDermott & O'Dell, 2001).

The visible dimensions reflect the visible characteristics which cover the values, philosophy and the objectives of such an organization, while the invisible aspect is the unspoken set of values responsible for the employees' perceptions and actions in the work environment. The critical issue involved, however, is the set of values strongly held and widely shared amongst different individuals in the same situation, which is considered to be a strong organizational culture (Chatman & Jenh, 1994).

Riivari et al. (2012) argue that organizations that have principles have apparent issues and standards which their employees consider vital. There is also an assumption by Gordon (1991) that essential constituents of culture in similar industries lead to similar values within that industry, an example being an organization that operates by its rules and regulations, another similar one being more likely to be a formal organization. Alternatively, it can be argued that cultures vary even across similar organizations (Chatman, 1991). These shared assumptions and values are developed within a group and used to cope with problems of both external and internal integration, and it is what new members come to accept as the correct way of seeing, making sense, and problem-solving (Parmelli et al., 2011).

The culture according to Scott et al. (2003), therefore, is the shared mental and symbolic nature with which organizations can best be understood when it comes to their beliefs, norms of behaviours, general routines, values and even traditions. In other words, it is seen as a lens through which different organizations can be understood, and their shared values observed.

The process of organizational cultural change has so far suggested that issues of culture can be utilised to support improved productivity and performance in an organization (Parker & Bradley, 2000). More so, organizational culture is considered as a quick fix for managers in gaining more productivity. Similarly, Abdul Rashid et al. (2003) see corporate culture, which according to them is related to organizational commitment, as a way of enhancing organizational performance. Curry & Moore (2003, p. 96) believe that "organizational culture is a result of some dynamic factors, including operating and

cultural systems." This position considers the infrastructure of the organization regarding technology usage and the type of personnel available since these affect the shared value of both individuals and the organization. The organization founder's vision influences historical frameworks in an organization, and the values of the organization in the past, and are affected by public perceptions of the organization.

Maduenyi et al. (2015) argue that organizational structure is a form of division where everyone is told what is expected of them. It also coordinates the activities of an organization which is directed at achieving the goals and objectives of that organization. This aspect of the literature is essential to this research as it is crucial to communication and highlights the right distribution of authority. On the other hand, a structure can be a by-product of culture. Schein (1991) argues that the levels of structure could be seen as the visible facet of culture which is underpinned by values, beliefs and assumptions. The form of structure existing among the parts of the organization can be responsible for control and coordination, and that also serves as a means of employee motivation (Maduenyi et al., 2015).

Since this research is concerned with finding ways of meeting organizational objectives, looking at the structure will help in achieving the goals and results in organizations. Consequently, these established patterns, divisions and responsibilities bring about a formalisation regarding rules which can obstruct the impetuosity and flexibility needed for personal development (Chen & Huang, 2007). Similarly, sharing information practice is found in most organizations which are becoming traditional organizations in today's organization. However, a complicated system of sharing information may reduce responsibility, as these systems slow information sharing processes and cause constraints. This action has a consequent effect on time lost in the organization, in getting information across to all levels (Al-Alawi et al., 2007).

The next section considers information culture as it is concerned with the manner and ways information is handled in organizations, including the internal information flow. This section helps to illuminate the flexibility of how information available to employees in an organization can be managed.

2.4.3 Information culture

This section is concerned with the internal information flow within an organization which reflects the organization's cultural norms and its values. Information culture, according to Ginman (1988), is the achievement of material resources through the transformation of intellectual resources using knowledge and information as primary resources. According to Curry & Moore (2003), there is no consensus definition for information culture. However, the value and the usefulness of information used to realise the operational and strategic success is acknowledged, as information is used as the basis of decisions and the use of technology serves and enables a real information system.

Choo et al. (2008), however, give their definition of information culture as the socially shared forms of behaviours, values and norms within a formal setting, which define the significance and use of information. Again, Curry & Moore (2003, p.97) argue that the non-recognition of a cultural gap is responsible for failures in information systems (IS) projects. It may also be accountable for projects running late, and expectations not being met.

2.4.4 Information management

Here the cooperation and support of the management of an organization towards the implementation and use of technology in allowing free flow of information is a welcome culture. Also, information policies within the organization and avoidance of information surplus encourage information use and become a good culture within the organization. Furthermore, the use of a common linguistic process is a welcome development as understanding each other is an intrinsic aspect of part of the community.

Information management is considered as an organizational activity and is concerned with the acquisition of information from different sources, the custodian and the distribution to people needing it. This makes it part of information behaviour as it is concerned with the exchange of information. Cronin & Davenport (1991) define information management as coded knowledge which requires process automation for decision making and information retrieval. Similarly, Butcher & Rowley (1998) view information management as a process of organising a range of policies, creating and maintaining integrated services and systems which allows information to flow to the end user regardless of status. Additionally, Taylor & Farrall (1992) describe information

management as a process that identifies information, coordinating and exploiting its entities within an organization to adding meaning and value to the current information level and gaining an advantage in a competitive market.

Hughes (2013) suggests that for a business to grow in this information age, it has to learn to pull information rather than push it. A system where information sent to individuals is not practically accepted; instead, individuals should pull information using all forms of social networking; this action allows discoveries and reduces the time wasted in looking for solutions to problems. Bilal & Kirby (2002) make a similar point but note that the web is hypermedia and the most useful information retrieval system which allows users to evaluate what type of information they need. Shin (2000), meanwhile, highlights the needs for the use of computer networks in achieving organizational productivity.

To make proper use of information, therefore, there must be the need of such information, and the need brings about sharing. Information behaviours describe the way people interact with information which includes seeking and utilising such information, the channels of access (pooling and retrieval), and factors that inspire people to use information (Wilson, 1997). Different disciplines, however, have different meanings concerning what constitutes information use.

2.4.5 Information system management

The issue here is getting a good information system strategy that will be linked closely with the core business of the organization and be acceptable and easy to use by employees in the discharge of their duties as a matter of importance. The organization must align the information system strategy to correspond to that of the business strategy using information technology systems as enablers.

2.4.6 Communication flows

Effective communication in an organization is essential, though it is subject to several potential distortions as seen even in the context of this study (complex and extended organizations). The organization must encourage a two-way communication flow which also covers vertical and horizontal, that way employees of the organization will be well informed and be able to provide feedback which could be used in decision making.

2.4.7 Cross-organizational partnership

Here the organization must encourage collaborative working and the achievement of departmental goals. Integration of units and inter-departmental networking and collaboration will benefit the organization by reducing rivalry and will encourage communal working. By so doing, there will be synergy and understanding of different functions and that of the departments.

2.4.8 Procedures and processes

Good documentation of policies, processes and procedures is a good example of good organizational culture. It is essential to set up an information culture that has clear guidelines and procedures intending to achieve consistency; continuity; quality and operational services.

2.4.9 Internal environment

The internal environment must be conducive to good work practice encouraging employees to contribute to the development of the organization. Trust is also important and plays a role in the development of the entire organization, shaping both the organizational and information culture.

Curry & Moore (2003) emphasise that the combination of information culture and organizational culture is an integral part of understanding and using information that will bring about a knowledge-based organization. However, in another related study by Marchand et al. (2001) on the relationship between people, information and mediating technology, it was discovered that organizations that take account of information behaviours, information management practice and information technology encourage good behaviour and values, manage information and applications to support operations well.

The next section introduces the concept of information sharing and information behaviours because sharing is a vital aspect of information behaviours and the achievement of organizational goals depends on how well information is shared within the organization. The reason for studying information behaviours is because it affects the way information is being shared when it comes to collaborating with different organizations because of the extension. This extension causes complexity in many operations and the way that information is utilised in this type of setting. Consequently,

organizations need to understand the importance of sharing and using such information to the advantage of the organization.

2.5 Different lenses for understanding complexity and managing them

This section uses different lenses to help to extend our understanding of complex and extended organizations of the kind found in the third group in section 2.2.3. One of the main characteristics of complex and extended organizations is networking with its stakeholders. Over the years theories on networking have continued to evolve and increasingly cut across many disciplines (Provan et al., 2007).

To understand the concepts of networking better is to understand the need to collaborate and partner with other stakeholders as described in this study through complex and extended organizations (Bienkowska & Zablocka-Kluczka, 2014; Camarinha-Matos & Afsarmanesh, 2005; Miles & Snow, 1986; Robins et al., 2011).

2.5.1 Networking

Different terms exist for networking; however, all the terms and different definitions are consistent with the themes of collaboration, network organizations (Miles & Snow, 1986), network governance (Jones et al., 1997), flexible specialisation (Piore & Sable, 1984); quasi-firms (Eccles, 1981); and management of inter-firm networks characterised by unceremonious social systems (Powell, 1990). Moreover, some common terms like social interaction, relationships, trust and cooperation, connectedness and collective action are all associated with networking as given in the study of Provan et al. (2007).

Brass et al. (2004) sees networking as a set of different nodes and ties representing relationships, or the lack of them. All the possible definitions of networking are clustered around two concepts which are; forms of exchange and relationships (Jones et al., 1997, p.914). The focus of this research is centred mostly on the inter-organizational networks which look at relationships between the organization, its suppliers, competitors, other organizations and their customers and stakeholders. This type of relationship allows each organization to retain a form of control over their resources while networking and agreeing on joint usage (Brass et al., 2004).

Each of the collaborating partners in this type of relationship is a unit which also has a team they work with and are committed to sharing their ideology to achieve a goal. These entities are attracted by a shared object and have things in common. This form of

relationship is seen as a way of value creation and innovation, in accessing new skills, markets, new knowledge and new technology (Romero & Molina, 2011).

Networking amongst different organizations is known to act as a driver to value co-creation by way of gaining new knowledge and sharing organizational risk and resources through complementing skills and capacities available to them (Romero & Molina, 2011). This concept will help us to understand why firms network and suggest what benefits they gain in such relationships, going into more detail and looking at relationships. Networking also describes the ways firms manage such relationships which are famous for mutual gains. However, networking communities and their constituencies are not necessarily contractual (though some are) but they can also be based on social interactions and understanding which are obtainable in the existing relationships (Sachs, 2002). Complex and extended organizations are known to cover the dynamic nature of communities and the different rules and norms in operating within certain organizations. This form of relationship involves different types and means of interaction through information sharing.

Recently, there has been a rapid rise in the practice of network governance (network organization) which has resulted in a growing sector that has also received significant attention from the scholarly community (Jones et al., 1997; Provan et al., 2007). Despite this, there is still not enough knowledge of the functionality, complexity and conditions that lead to the achievement of some level network outcomes (Provan & Kenis, 2008, p. 229). The type of relationships associated with networking, partnering and collaboration, enable organizations to cover multiple stakeholders which include customers, suppliers and government. The joint ventures which these different groups are involved in have an enormous impact on their performance and existing relationships (Humphries & Gibbs, 2015). Such mergers call for both vertical and horizontal understanding of relationships to create value in businesses and gain a competitive advantage over others.

Network organizations can also be social systems which coordinate inter-firm relationships to safeguarding exchange by way of socially binding agreement rather than contractual. By governance here, we mean organization as implied and as an entity. Consider a situation where an organization has the potential to achieve its objective but is limited due to a lack of technical competence, market information, financial means,

managerial staff and skilled labour. In such a circumstance there is a need to establish cooperation with others to assist in the form of networks. Such organizations are called networking organizations or enterprises (Bienkowska & Zablocka-Kluczka, 2014).

Similarly, Robins et al. (2011) describe network organizations as a system based on established or different actors connected by a form of formal partnership and natural collaboration. Some characteristics of organizations that network are:

1) Businesses are a set of autonomous organizations;
2) Either non-profit or profit-making organizations;

They can be involved in the provision of services based on understood agreements. Due to the fundamental transformation in the system of governance, and the economic benefit attached to such relationships (Jones et al., 1997), different networks are now coordinating their diverse governance by non-state actors (Ansell, 2008). These types of organization, according to them, have recently received attention and more networks are emerging because of either real attractions or incentives which are deemed necessary for the collaboration. Stakeholders in such scenarios find a familiar ground for collaboration (Giest & Howlett, 2014). According to Lewis (2005), this form of governance is an alternative to hierarchies and markets and can respond to complex changes. Lewis also added that there are some weaknesses of network organizations, which include undergoing some difficulties in the hierarchical management because of division, changes and complexity; having issues related to the outcomes involving public goods in the marketplace; being slow in the adaption of cultural changes due to different systems involved. Although networks are meant to provide the desired social mechanism, there is, however, no guarantee that such a network will be effective.

Networks may cultivate a life of their own irrespective of the type of service and planning they provide. Looking at the characteristic of networking organizations, one will find that performance drives the achievement of their objectives, and this calls for the establishment of a network structure in line with that of Robins et al. (2011). This will coordinate effective action through evolving trust and team collaboration, subject to the endorsement of agreed goals and efforts towards achieving such goals.

Similarly, Pirson & Turnbull (2011) describe networking organizations as a more humanistic paradigm having the power to operate through their multiple boards and an ability to perform checks and balances because of such boards. It would also have dedicated self-actualising and motivated personnel and an active system that involves its stakeholders in its business striving towards a long-term relationship with the aim of serving humanity. This idea is what flourishes in extended organizations having multiple boards and an arrangement for checks and balances. They have dedicated specialised personnel and involved skilled stakeholders in their operation.

Networks, therefore, are a way of value creation and innovation, as a way of accessing new skills, markets, new knowledge and new technology through risk sharing and using each other's abilities (Romero & Molina, 2011). The latest trend in today's relationships involves the integration of organizations skills and that of customers, to achieve co-creation on products, the value of services and experience. The outcome of these integrations is the creation of forms of extremely networked structures of collaborative machinery capable of giving that needed competitive advantage combined with core competencies from joint organizations (Romero & Molina, 2011, p.1). Therefore, there is the need to determine the level of such a relationship. However, this action calls for the understanding of the concept of coupling in relationships. This new concept, 'coupling,' is discussed in the next section as it points out and gives more understanding to, the form of control in extended relationships.

2.5.2 Coupling

Coupling describes the link or inter-connection existing between a firm and its stakeholders and the degree to which such relationships are either loose or tight (Beekun & Glick, 2001). Babb & Chorev (2016) describe tightly coupled inter-connection as characterised by interdependence; standardization and use of central authority, these characteristics producing the enforcement of policy, rules and disseminating the organization's norms and regulations, while the loosely coupled system is characterised by flexibility and a way of responding to uncertainty.

During the process of coupling, an organization's technical core and the level of authority are the key indicators of whether the coupling is tight or loose (Plowman, 1998). The technical core here refers to the primary function of the organization, while the elements of authority are the power to make decisions on tasks, rewards and sanctions. Coupling

is commonly used in business-customer relationships, and it also suggests the degree to which an organization is customer oriented.

The concept of coupling is used in this section for a better understanding of how extended organizations can manage their relationships with their stakeholders and customers. Some relationships in complex and extended organizations may be based on, and governed by, well-articulated and formal contractual arrangements with its stakeholders for service provision which is fixed, while others may be based on evolved and informal arrangements which, while accepted and accommodated, are subject to far lower levels of formality and governance (flexible). These two forms of relationships need a kind of control either to operate a tightly or loosely coupled relationship depending on the required objectives to be achieved. Therefore, running a tightly coupled system may require acceding to the demand of their customers' needs and producing according to their requirements. Alternatively, loose coupling is used to deal with environmental uncertainty through the flexibility of control.

Another form of relationship is allowing a section in the organization to deal with such issues while management concentrates on the critical aspects of administration (decoupling). Sometimes there is even the need to combine both tight and loose coupling in responding to the complex nature of the relationship. This research looked at all the forms of coupling to understanding which kind of control will be needed in different situations.

2.5.2.1 Tight coupling

Tight coupling refers to a closed type of relationship between the firm and its customers that will result in a greater understanding of the needs of an organization's customers as well as for closer modification of products and services needed by the customers, as such a relationship is customer driven. It also entails given a satisfactory service to customers with easier demand forecasting and a faster way of understanding the relationship. The connection between the firm and its customers appears to be jointly reliant on each other. There is, therefore, the likelihood that such a relationship will be abused as (the firms relies on what the customer wants which may not be a general representation of the broader representation), the organization may be driven more by the needs of the customer.

2.5.2.2 Loose coupling

Loose coupling is the degree to which relationships are considered loose or flexible. A loose system is not a faulty system but rather a social solution to continuous environmental variations (Berente & Yoo, 2012). This is a flexible type of relationship created in response to the dynamism of the environment (responsive), and one that is not entirely resolute. It gives firms the ability to remain flexible in a changing environment while keeping an eye open for opportunities and threats. Lukka (2007, p.80) notes that loose coupling is practised by organizations that are likely to have rational and unknown elements simultaneously and are also characterised by partial harmonisation, rules and standards.

2.5.2.3 Decoupling

This concept was introduced in the context of a tight coupling system. In decoupling a unit is created within an organization to handle the issue of relationships, while the management of the organization focuses on the core technical aspect of administration (Sauder & Espeland, 2009). This type of system may work for more prominent firms with different customers or markets but may not be applicable to firms or organizations that have a defined mandate (objective) to achieve. It has also been argued that not all systems are suitable for decoupling (Sauder & Espeland, 2009, p. 65) because decoupling is also affected by environmental factors and the absolute power of the external structure and decoupling often takes place in organizations where productivity is hard to quantify. It is therefore essential to note that some organizations operate both tight and loose coupling at the same time because even when the tight coupling works for them, it is equally vital to run a loosely coupled system in order to remain responsive to changes and be ahead in the business.

An interface is a key determinant of the direction organizations follows. However, the big question is what the position will be of an organization that finds it necessary to operate both tight and loose coupling as a direct response to its environment and a means to survive? A simple answer to this is that organizations placed in this type of situation are usually faced with uncertainty, as a result of constraints outside their boundaries which they have no control over, but rather they respond to the situation (Chase & Tansik, 1983) by adopting tight coupling to eliminate uncertainties and loose coupling to address the situational challenge. Some organizations, however, need specialisation, which may not be available to them, to meet some of their organizational objectives despite the use

of both tight and loose coupling (Saiz et al., 2005). In this context, the concept of team, knot formation and knot-working may be applied, and this is related to team and team working as discussed in the next section.

2.5.3 Introduction to teams and knot-working

Although the primary focus of this study is information sharing behaviours in complex and extended organizations at the organizational level, however, this has been explicitly extended to examine the role of the temporary specialised teams. These teams are a part of the way that extended organizations, and those within them, share information, mitigate and deal with issues resulting from deficits in information sharing. (Camarinha-Matos, 2004; Chae et al., 2015; Maciejovsky et al., 2013 & Mankin et al., 1996).

McNely et al., (2015) describe the new ways of working common in multiple-work relationships in four different ways; by using new tools; new technologies; new spaces and modern practice. According to them, the new devices are different ways of communicating with different activity systems in complex and extended organizations which are eye tracking system widely in use. One example is of connecting personal smartphones and touchscreen devices to see and communicate. With new technology, they are referring to collaborative documentation and editing with content management. E.g. multimedia messaging service (MMS), instant texting. The new space is the new way of working involving hybrid workplace, virtual offices, team working and call centres. Finally, the new practices are contextual designs and interaction designs and single work sourcing. This research looked at teams in detail, due to its importance in a complex and extended setting.

2.5.4 Teams and their forms

Teams have always been a part of the organization from time immemorial. However, their uses in modern day organizations have changed, as they are used nowadays to tackle different parts of the work and to solve pressing needs, unlike the way they were used in times past (Tannenbaum et al., 2012). Teams are considered a small number of people with complementary skills who are committed to a common purpose, performance goals and an approach for which they hold themselves mutually accountable. Team is usually not more than 25 members and known for having structure and hierarchy (Katzenbach & Smith, 1993). Moreover, their existence depends on the availability of performance

challenges and a severe problem confronting the organization. Cohen & Bailey (1997) sees the team as a selection of individuals who rely on others' skills to make a whole.

However, there is a growing trend that has put pressure on the use of specialisation inherent in inter and intradisciplinary sectors to financial reasons, career motivations, increased productivity, ease of travel or growth of disciplines and information technology (Mauthner & Doucet, 2008).

2.5.5 Different forms of teams

Delarue et al., (2008) describes a team as a vast area of research that lacks a standard definition of the concept. Meaning that different definitions exist for the term as discussed in the literature. However, history, according to Tannenbaum et al., (2012) has suggested that both practitioners and researchers alike assumed indirectly that teams have a few shared characteristics. Table 2.3 gives the different definitions of teams and some of their features.

Recently, there has been a rise in temporary teams and team-based working as argued by Chae et al., (2013), which are becoming more prevalent in today's organizational landscape, and this includes both permanent and temporary teams.

Temporary teams are known by different names for different reasons and according to various industries. Some of these are; Task Force (Force, 2008); Committees (Lund, 2015); Self-managed teams (Aznar et al., 2012); Cross-functional teams (Aime et al., 2014); Virtual teams (Hoch, 2014). This topic has gained increased attention, with a good number of research studies emerging (Camarinha-Matos, 2004; Maciejovsky et al., 2013 & Mankin et al., 1996), yet there has been a limited amount of work examining information behaviours in temporary work contexts, as most work already undertaken has paid attention to different work contexts which include tasks (Allen et al., 2014; Allen & Wilson, 2005); disciplines (Pilerot, 2014); supply chain (Chengalur-Smith et al., 2012) public sector (Yang & Maxwell, 2011),and moreover, trust among team members.

Moreover, studies which focus on teams and especially on the way they work, i.e. Belbin (2012a, b, c); Camarinha-Matos (2004); Cohen & Bailey (1997) & Mankin et al. (1996), refer to the importance of information in passing but not in depth. Thus, while reference is made to information as an essential aspect, there is, however, a lack of cross-

referencing of information behaviour literature or cross-fertilisation of ideas with the research on information behaviour in temporary teams.

In collaborative teamwork and teams, it is evident, that literature makes reference to information as an essential aspect but does not reference literature on information behaviour or do so in depth. Some literature characteristics of teams are discussed. Tuckman & Jensen (1977) referenced a small group which is another form of team and state that a small group consists of between three and nine people with a common goal or purpose that meet and communicate through a medium on a regular basis to achieve that set goal. According to them, small groups vary from a team consisting of individuals with complementary skills who compliment other members' shortfall in skills and are accountable for their actions and this team will disband after the purpose of formation has been achieved. Some characteristics of the small group are that they go through four stages as forming, storming, norming and performing.

Engeström (2008) defines a team as a coming together of people with complementary skills, committed to an ideology to achieve a goal. An example is a production line with a stable formation. Similarly, Richards et al., (2012), discuss another form of the team which is the high-performance team and state that some high-performance teams could be described as knots as they have characteristics in common. These include; diversity: autonomy: empowerment: seizing opportunities: commitment: development opportunities and clear rules: Egolf & Chester (2013) define their team as team members who have different skills. An example would be a team of experts set up to purchase a house. Here, each member must have different skills which will aid the negotiation. Team members are all accountable for their actions. They take responsibility for their efforts in case of underperformance.

Landy & Conte (2016) state that teams are mostly created to address productivity problems and to increase the quality and quantity of product. More literature on teams highlights different issues on teams, Camarinha-Matos (2004) identify and characterise collaborative organizations; Belbin (2012a) looked at management of teams, Belbin (2012b) looks at a team's role at work and Belbin (2012c) studies how people and jobs can be connected beyond the team. Again, Kerosuo, (2015) looks at how best to enhance collaboration across directorial and team boundaries.

Although temporary teams are formed for a short duration to achieve a stated goal (Tannenbaum et al., 2012), others are used for more extended periods, e.g. executive teams in an organization. Two types of temporary teams are discussed in this section, the formal and informal temporary teams. Formal teams could be teams deliberately created to carry out a specific task, for example, command teams. Although these may exist for an extended period, as in the case of an administrative team, the type of formal team considered here is the temporary type.

2.5.5.1 Formal teams

Formal teams are those that are expected to be constituted for a particular assignment in a specific industry. These teams deal with specifically identified problems and are disbanded after dealing with them. Examples include construction (Gann & Salter, 2000) and filmmaking (Sorenson & Waguespack, 2006). Membership of such teams may transcend organizational boundaries to include other boundaries, depending on the specialisation needed. Information sharing informal teams is based on the structure of the organization and the procedure in operation (Bechky, 2006).

An example can be seen in the case of a Microsoft team working on web-based help and support services where structures exist with a head and other support staff (Poltrock et al., 2003). Another example is in the area of inter-organizational product teams which reveal that communication guidelines and organizational social events play a significant role in knowledge sharing (Lawson et al., 2009). Similarly, the study by Weller et al. (2014) concludes that team information sharing is critical to their effective cooperation in developing a common mental model in the event of an emergency. These emergencies may require specialised teams to form and handle situations on the ground using knots, although other emergencies may only require a team of ordinary people to manage the situation. Whichever is needed, however, requires knots to form and work together as a team, to solve the problem through information sharing.

2.5.5.2 Informal teams

Informal teams, on the other hand, are teams that have emerged because of emergencies or uncertain conditions which require immediate action. Informal groups can also emerge where people come together on a regular basis to interact. These types of groups are well known within a recognised organizational structure but are not formal teams. An example of informal team formation is the response to a natural disaster or a quick response to the

leaking of examination questions on examination day. The constitution of informal teams is not guided by structure, nor does it have legal backing, but operates naturally around the norms of the community where it is taking place. This informal team naturally disbands after the problem has been resolved.

To help understand team formation and how this is used as a tool for information sharing, this research conceptualised the structure of team formation using knot-working and coupling to aid our understanding of information sharing in intended teams where rules, tools, communities and division of labour are in play, which allows subjects to regulate their activities through signs and tools (Vygotsky, 1978).

Knots are a different form of the team, described as the idea of professionals and clients coming together to form a temporary knot based on shared objects which change rapidly, changes which may require forming more knots to handle such changes (Engeström et al., 2012). Knots do not have leadership like that of teams, and members are drawn from different backgrounds having different perspectives and approaches but for the same profession, to undertake specialised problem-solving. Such a knot is often a product of an emergency that needs immediate action and is difficult to operate. An example is where things happen naturally that require the formation of an informal structure to handle the situation. The issue discussed is that of specialisation necessitating knot formation, which is seen as the concept that requires team formation to solve a particular problem. Knot-working has been found to solve persistent problems in organizations where different elements are found in inter-connectedness and continually changing situations (Kazlauskas, 2014). One advantage of such a team as of knots is the ability to improve collaboration and social processes in inter-disciplinary areas through information sharing about their activities. These teams are known to connect people, tasks and tools across boundaries to achieve a specific task (Kerosuo, 2015).

Table 2. 3 Characteristics of Teams and Groups

S/N	Definition	Formation/Example	Characteristics	Comment	Authors/year
1	Small group as consisting of between three to nine persons with common goal or purpose that meet and communicate through a medium on a regular basis in order to achieve that set goal.	Anyone can form a group as long as they have a purpose to achieve.	Four stages of formation forming, storming, norming and performing.	Small group varies from a team in that a term is comprised of individuals with complementary skills to solve a problem, and they are accountable for their actions and this team will disband after the purpose of formation has been achieved.	Tuckman, B. W., & Jensen, M. A. C. (1977). Stages of small-group development revisited. *Group &Organization Management*, *2*(4), 419-427.
2	"A team is a small number of people with complementary skills who are committed to a common purpose, performance goals and an approach for which they hold themselves mutually accountable."	Members are chosen based on individual skills and they learn from each other and build on one another's achievements. Example is a working team with performance challenges that need to form to enhance the performance of the organization. Here, different individuals with different skills are taken to form membership of the team. This requires good leadership and a clear mission to make such a team work.	Teams and work teams usually outperform working groups of organizations or that of individuals There must be performance challenge. Team must have the right mix of skills to complement each other not the right personalities Success of teams requires control and discipline and is known to sharing work and behaviours. Team start from separate individual to a coalition which looks after each other.	A working team is usually not more than 25 members and known for having structure and hierarchy. And their existences depend on the availability of performance challenges and a difficult challenge comforting the organization. Teams depend on the leaders' ability to set clear goals and how best to achieve them. Discipline within a team is needed to achieve its aim. They learn from one another and depend on other members skills. Team disbands after achieving their goal.	Katzenbach, J. R., & Smith, D. K. (1993). *The wisdom of teams: Creating the high-performance organization*. Harvard Business Press.

S/N	Definition	Formation/Example	Characteristics	Comment	Authors/year
3	"A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems"	A selection of individuals who depend on other skills to make a whole. Example is in the production industry where one part of the production is completed and passes to another team to continue their part.	Stable, usually full-time, and well-defined. Has a supervisor who takes decisions about who does what and how it is done. Members are trained in a variety of skills relevant to the tasks they perform.	Classify team as; (1) Work teams, (2) parallel teams, (3) project teams, and (4) management teams. These types of teams have routine, and management.	Cohen, S. G., & Bailey, D. E. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of management*, *23*(3), 239-290.
4	Multidisciplinary teams are an attractive organizing option found where there is a complex problem that needs solving. It is when individuals possess different information, knowledge, and expertise that bear on a complex problem or issue.	Brings representatives from different relevant areas with expertise covering the subject of discussion to form a team to handle that complex situation. A specific example is including; Product development teams, cross functional teams, brainstorming groups, and man agreement teams.	Have a routine, leadership, and have a common purpose, used for organising work, different expertise forming a whole.	Such type of team needs motivation to overcome some disruptive and problem tendencies in some phases of their team work before they can actually exert the determination to do so. Example using different professional language, perspectives etc. (see Jackson, S. E. (1996).	Van Der Vegt, G. S., & Bunderson, J. S. (2005). Learning and performance in multidisciplinary teams: The importance of collective team identification. *Academy of Management Journal*, *48*(3), 532-547.

S/N	Definition	Formation/Example	Characteristics	Comment	Authors/year
5	Work team uses talents and skills of various employees to accomplish a given work	They form by the coming together of people with complementary skills committed to an ideology to achieve a goal. Example a production line with a stable formation.	Teams are static, are meant as a form of organising and managing work.	Some problems of teams are that it ends up creating more confusion as it is seen as a political entity (p.3)	Engeström, Y. (2008) From Teams to Knots: Activity-Theoretical Studies of Collaboration and Learning at Work.
6	A group of individuals that are responsible for producing an output or that share a common goal. However, some high-performance teams exist. Factors responsible for high performance team include Positive climate which allows work to take place, sound communication with members, shared goals on what is expected, and constructive conflict to build each other and find the best way out	Such team forms when a group of individuals that are responsible for producing an output or share a common goal come together.	A work team is characterised by deeper sense of purpose from all members, has a motivated goal, and teams complement skills all resulting in a fuller mutual accountability by a leader.	Though some high-performance team can be equated as knots as their characteristics are basically as knots. These includes; Diversity: Autonomy: Empowerment: Seizing opportunities: Commitment: Development opportunities and Clear rules:	Richards, B., Carter, N., & Feenstra, F. (2012). High Performing Work Teams.

S/N	Definition	Formation/Example	Characteristics	Comment	Authors/year
7	Having different members playing different roles but covered under the same term.	Example sport where different players play different positions but on the same team and with one motive.	Task dependency and work flow sequence.	There is a form of reliance between different members of a team	Belbin, R. M. (2012). *Team roles at work*. Routledge.
8	Group between 3 and nine with a common purpose meeting and communicating through a medium to aid the achievement of their goals. However, others put the number to up to 20 -25 as members of small group (i.e. Fisher, 1974 and Moxon, 1993)	Team members have different skills. Example- team of experts purchasing a house. Here each member must have a different skill which will aid the negotiation. Team members are all accountable for their actions. They take responsibility for their actions in case of underperformance.	Each member has different skills from the others the team lasts for only the time of the project, it must have a purpose of formation, and it disbands after achieving the purpose.	Small group as a team must have all the requirement of a group but must complements other members' skills and the team must disband after achieving its goals.	Egolf, D., & Chester, S. (2013). *Forming storming norming performing: Successful communication in groups and teams*. IUniverse.
9	Sees group as individuals working together or sharing resources while team are individuals Whose task are interdependent.	Only individuals with interdependent skills, working towards a common goal, shares responsibility for specific organizational outcome. Example is sport, management team, assembly team, surgery team etc.	Created to solve a particular problem, disbanded after completion of the project and can be refer to as ad hoc committee or task force. Other types of team include; quality circle, project team, production team and virtual team.	Used mostly to address productivity problems and to increase the quality and quantity of product.	Landy, F. J., & Conte, J. M. (2016). *Work in the 21st Century, Binder Ready Version: An Introduction to Industrial and Organizational Psychology*. John Wiley & Sons.

Table 2.3 gives a tabulated description of small groups, teams and groups looking at their definition, formation, characteristics and authors'. This is to help our understanding of the different concepts and their functions.

2.5.6 Team leadership

There has been a growing debate about team performance and leadership influence as little is known about how leaders handle team issues and create actual teams (Zaccaro et al., 2001). There is a growing demand for teams in complex and extended settings to perform more often due to conflicting agenda, changing situations and high demand of information (Zaccaro et al., 2001). Also, the increasing use of technology has brought about the use of virtual teams whose performance requires member's coordination.

Previous theories of leadership fail to explain how leaders foster and manage the activities of subordinates. However, other theories like path-goal give an insight on how leaders manage their subordinates' expectancies but fail to discuss the developing and maintenance aspect (House & Mitchell, 1975).

McGrath, (1962) gives some behaviours required of a leader ensuring tasks are accomplished and maintained and deliver the needs of the group. It can, therefore, be said that a leader is a problem solver with the responsibility of ensuring that the group achieves its goals, plans and implements these plans in the best interests of the group. The next section discusses some problems that can hinder the performance of a team.

2.5.7 Factors affecting team functioning

Sundstrom et al. (1990) give factors that are likely to affect teams functioning, such as technology and task, organizational culture, mission clarity, sovereignty, reward, feedback, consultations and lastly the physical environment where such teams operate. They argue that three issues affect a team's effectiveness, internal process, organizational context and the boundaries of such an organization.

The idea of teams in this research was not sufficient to describe the specialised aspect of teams where collaborative expertise is required, and this expertise transcends departmental boundaries within an organization or the organizational borders. It is a type of temporary team (knot) where specialised professionals and clients come together

based on shared object which changes rapidly. This team does not have a routine. Such characteristics make them a different team.

Again, the ability to put resources together from scattered collaborative expertise, irrespective of boundaries, to solve a particular problem also makes it different from a team. Therefore, the literature on knot and knot-working in this research is also reviewed.

2.5.8 Knot-working

Knot-working initially represented a group of scattered collaborative experts working to accomplish a task that is organised for designers in the construction industries; however, the concept is now applied to various inter-organizational studies and disciplines (Kerosuo et al., 2013). The type of collaboration in knot-working is considered for a short period and is expected to accomplish the task it was set for after which the group disbands. The concept is somewhat similar to the idea of a team but differs in that knot-working needs collaborative expertise, unlike a team that needs members with complementary skills. Knot-working as a concept suggests the need for resources to come together from different specialisations, irrespective of boundaries. It is not particular about routine, it does not have the type of leadership seen in teams and is purposely made to solve a specific problem. Knot-working as a relationship is not only open to one particular organizational setting; it is a practice that is now recognised as a common and emerging, used across organizational boundaries to improve collaboration.

The concept of knot-working is used in this chapter to suggest the need for relationships to come together from different specialisations to solve a particular problem. The concept remains an area of research that is, “undertheorized” regarding its application and is still open to empirical testing and practical application in a different field of study (Bleakley 2013, p.25). In the examination setting, the concept is commonly seen as one where different people come together based on a shared object of a credible certificate to form groups of supervisors, markers, and invigilators to get the examination done, after which the group ceases to exist. Moreover, the next examination period does not guarantee anyone being a member of that particular group. Again, in the case of unexpected problems during the exams, a team of experts from different areas is constituted to form a specialised team to handle that problem.

Knot-working is, therefore, defined as tying, untying and retying of separate threads of activities (Engeström et al., 1999). The study of knot-working in academic libraries using this same concept of shared objects is also found in complex and extended organizations which allow for several activities to be conducted at the same time, each handled by a knot. The term knot-working represents an alternative means of managing work in progress which requires the collaboration of groups involved.

Knot-working according to Kerosuo et al. (2013) and Kerosuo (2015) is fast becoming an area of interest to many scholars and is widely accepted as a way of involving different expertise in various inter-organizational studies and collaboration. There are indications based on the literature review that suggest knot-working has over the years received attention from scholars. This makes knot-working, not a new concept, but rather an emergent recognition of an age-old practice that has been used across organizational boundaries (Kerosuo et al., 2013). However, the concept (knot-working) remains an area of study that is, "under theorized and still under-researched" and this same area is still open to empirical testing and practical application (Bleakley 2013, p.25). The call for better understanding of knot-working and the process of information sharing is indeed a welcome idea (Jap, 2001). This understanding can help in improving collaboration in the formation of the structure of temporary teams aimed at solving specific problems (Kerosuo, 2015). Some characteristics of knot-working as given by scholars are discussed below.

Engeström et al. (1999) describe knot-working as when problems arise in the organization. Knots form to handle such problems based on expertise and specialised members forming them, whereas, Payne (2006) described knot-working as a joint negotiation of different professionals with a specific community of practice. Engeström et al. (2012) see it as transacting boundary-crossing, and as a way of collective problem-solving in organising work. Bleakley (2013) groups' knot-working into precarious-rapid which are uncertain (slipknots) and hitch knots which are planned and expected.

Korpela & Kerosuo (2014) describe knot-working as a shift from a co-ordinated talk in the organization to collaborative problem solving, characterised by new ways of working as a group for a short period, to accomplish a critical task. Kerosuo et al., (2015) see it in terms of actors constantly changing according to the requirements of the task, which

include improvisation instead of fixed rules or procedures and has no single actor with fixed authority. Another work of Kerosuo, (2015) describes the concept as multi-disciplinary expertise also seen as a temporary team due to changing membership, having a limited time of existence but mediating both human activities and work activities. Kaatrakoski & Lahikainen (2016) describe knot-working as a proactive development that requires collaborative working to (or "intending to") familiarise group with changes.

All the literature on knot-working has centred on collaboration considered for a short period with the knot expected to accomplish the very task it was set for, after which the group disperses. Kerosuo et al., (2015) propose that the actors involved in knot-working are continually changing with the task and this means that there are more informal knots than the formal ones and rules are improvised rather than fixed ones. Some significance of informal teams which also affect knots are; creation of on-going positive interaction that will enhance the working of the knots; creation of strong working relationships between members; creating a vibrant culture needed for achieving success in teams and serve as a morale builder through communication. Others are; creation of trust among members which enhance the completion of team's work strengthens orientation and improves conformity to opinions by different members and knots behaviours (Chan, 2002 and Kratzer et al., 2005).

Knot-working, as seen from most definitions above, represents an alternative means of managing work in progress which requires the collaboration of groups involved (see also Table 2.4 for more summarised rationale and characteristics of knots). Engeström et al., (2012) view the working of a knot as an innovative way of consolidating work as in the case of a complex and extended organization where professionals and their clients' form knots based on a shared object. These types of knots can adapt to rapid changes and are less fixed when compared to teams, but their formation is dictated by the circumstances and on a need basis. Similarly, Kaatrakoski & Lahikainen (2016) sees the concept of knot-working as a negotiated working whereby different specialisation work on a specific task involving a shared object.

In carrying out their work as knots, they collaboratively examine the type of work, the form of collaboration to familiarise the group with changes which are rapid. This

description of knots is similar to Engeström et al., 1999 which states that new knots form as a result of new changes in an organization.

The reality of relationships and the nature of a complex and extended situation and the ways of their dealings with others can be constrained by rules or the time set aside for achieving the set goals of the organization. Some teams, in the form of knots, are formed to handle different tasks that could be subjected to some constraints, such as a need for specialisation and operate in uncertainties. Such teams are referred to as temporary teams (knots) based on specialisation, and their purpose is to solve particular problems.

Members of such knots are skilled, and the process of constituting such knots and working together is referred to as knot-working (Kerosuo, 2015). Knot-working is known for improving collaboration, and social processes in an interdisciplinary field and some knots are known to connect people, tasks and tools across boundaries to achieve specific targets. Similarly, Korpela, (2015) describes knot-working as involving participants with substantial expertise in their field. Kazlauskas, (2014) sees knot-working as commonly associated with ways of solving persistent problems with contradictory elements found in inter-connectedness and continually changing situations. The solution to such problems lies in various categories of expertise with multiple viewpoints of professionals and stakeholders which cross boundaries and necessitate cooperation from different organizations with different organizational cultures and objectives.

Karhula (2012) adds that the effectiveness of knots in organizations depends on the problem-solving arrangement with a dynamic organizational preparation. According to him, knot-working does not necessarily involve permanent organizations as it can override its' boundaries and hierarchies. The formation is rapid and is designed to combine a range of skills for different problem-solving capacities. It can also challenge the professional skills of members with new working practices and can cause contradictions as a result of changes brought about by this new form of practice (Daniels, 2012).

For Mizushima et al. (2012), however, the concept of knot-working is seen as a way of organising and executing a productive action in response to sudden or impromptu demand by a combination of factors which regularly change with each event. They give

some factors that affect knot-working in an emergency situation as, time since fewer resources mean that there is the need to eliminate all bottlenecks and go straight to the action. Other reasons are, shared issues which call for changing personnel as the situation changes dramatically; elite team building which requires the filtering of skills as the situation changes and the need to form another team arises, which in turn emphasises communication channels in filtering such skills. Boundaries are necessary to determine where a knot starts and what defines its end. For online virtual communities, however, flexible knots are essential in responding to unstable situations through the use of online communication channels. Table 2.4 outline the knots, how they form and their characteristics which can be seen at a glance.

Table 2. 4 Rationale and characteristics of knots

S/N	Rationale	Description	How knot-working is treated	Classification of Knot-working	Citations
1	Is that as problems arise knots form to handle such problems.	Knots form according to new changes in the organization	Expertise and specialised members form the knots	Formation is rapid and immediate. Example emergency not expected but happens fast, therefore such knots are classified under; Reactive knots	Engeström, Y., Engeström, R., & Vähäaho, T. (1999). When the centre does not hold: The importance of knot-working (Vol. 381). Aarhus.
2	Classical networking where interaction is used to modify more general professional identities.	Teams/knots such as multi-professional teams.	Joint negotiation of different professional to a specialised community of practice.	Plan for Professional interaction as a modifier to professional identity. (Plan), i.e. knots that are planned and expected. Classified under; Conscious reactive knots	Payne, M. (2006). Identity politics in multi-professional teams palliative care social work. Journal of Social Work, 6(2), 137-150.
3	Illustrates how demanding it is to change one's own working method or organization.	Crossing boundary-, collective problem-solving way of organizing work	Create continuity in the production of the shared object. Knots are formed, dissolved, and re-formed as the object is co-configured time and time again, typically with no clear deadline	Plan knots and rapid formation; are formed spontaneous. Example- planned and expected. Classified under Conscious reactive knots	Engeström, Y., Kaatrakoski, H., Kaiponen, P., Lahikainen, J., Laitinen, A., Myllys, H., & Sinikara, K. (2012). Knotworking in academic libraries:
4	See knot-working as an area that awaits future critical review and further pragmatic application. It also sees knot-working as still open to empirical testing.	Knots as activities to be explained and not problems to be solved.	Recognition of complexity and uncertainty in the environment.	Precarious-rapid-uncertain formation (Slipknots) and Hitch Knots. Panned and both expected and unexpected. Classified under; Unconscious reactive knots and a shift to understanding problems with a view to managing them.	Bleakley, A. (2013). Working in "teams" in an era of "liquid" healthcare: What is the use of theory? Journal of Inter-Professional Care, 27(1), 18-26.

S/N	Rationale	Description	How knot-working is treated	Classification of Knot-working	Citations
5	Shifts from coordinative talk to collaborative,	New way of working as a group for a short period of time to accomplish a critical task	Quick changes between working individually, in pairs, in small groups or in the whole group characterise the pulsating quality of working in a knot	Rapid, fluent. Planned formation. Classified under; Conscious reactive knots	Korpela, J., & Kerosuo, H. (2014). Working together in a knot: The simultaneity and pulsation of collaboration in an early phase of building design. In Procs 30th Annual ARCOM Conference (pp. 865-874).
6	Found in a setting ruled by institutional conflict and even hostility in which actors are easily driven apart instead of being pulled together. On the other hand, the multi-project partnership arrangements taking place in this industry can support the repeated arrangement of improvised knots through the continued collaboration of the contractors.	Described the concept as where actors constantly change according to the requirements of the task, which includes improvisation instead of fixed rules or procedures and has no single actor with fixed authority	Experts utilize their specialized knowledge to solve problems identified in the organization. It also enables the crossing of organizational and expert boundaries that easily prevent collaboration between designers representing different design disciplines	Planned and form as the problem develops. Classified under; Unconscious reactive knots and membership change.	Kerosuo, H., Mäki, T., & Korpela, J. (2015). Knotworking and the visibilization of learning in building design.
7	No general way of solving problems.	Multi-disciplinary expertise	Temporary teams due to changing membership, limited time of existence. Mediating both human action and work activities.	Experimental and Planned. Classified under; Conscious reactive knots and collaborative expertise.	Kerosuo, H. (2015). BIM-based Collaboration Across Organizational and Disciplinary Boundaries Through Knot-working. Procedia Economics and Finance, 21, 201-208.

S/N	Rationale	Description	How knot-working is treated	Classification of Knot-working	Citations
8	Korpela describes it as a big room, where designers work in the same place side by side.	A new way to work as a group for a short period of time to accomplish a task.	Continuity is connected to the object of activity	Improvisation and quick negotiation are an important part of knot-working, providing immediate solutions to emerging problems. Classified under; Conscious reactive knots and membership change with a shift in way of working	Korpela, J. (2015). Significance of Knot-working from the Client's Point of View. Procedia Economics and Finance, 21, 209-216.
9	Proactive development	Collaborative, working with a view to familiarise group with changes.	Knots are less stable and fixed	Changes are rapid, and the process is planned. Classified as reactive and planned with a shift in managing problems.	Kaatrakoski, H., & Lahikainen, J. (2016). “What We Do Every Day Is Impossible”: Managing Change by Developing a Knotworking Culture in an Academic Library.

2.6 Conclusion and chapter summary

In this research, the context discussed is both extended and complex, and the issue of concern is information sharing failures. The complexity in the setting is, in part at least, a product of the extension of the organization and its stakeholders with whom it has to collaborate. Extension is the ability to work with others toward achieving goals that on its own is not possible.

The context of this study (complex and extended organizations), with focuses on both public and private sectors, are two areas that have received increasing attention in the past few decades (Provan & Lemaire, 2012). Although there has been growing attention on them, there are still no definitive conclusions on many issues regarding organizational extension and how this operates (Provan et al., 2007, p. 479; Provan & Lemaire, 2012, p. 368). This statement makes their complexities and challenges an understudied area (Provan & Lemaire, 2012).

Whilst there appears to be significant literature about information sharing and uses, discussing various topics with reference to the following areas, discipline, Pilerot (2014); emergency services, Allen et al. (2014), public sector, Yang & Maxwell (2011), or a supply chain, Chengalur-Smith (2012). There is a shortage of research in the area of information sharing and uses in complex and extended organizations where we see different sharing behaviours. This shortage can be attributed to the complexities and challenges associated with extended relationships and its type of complexity which remains an understudied area as stated above (Provan & Lemaire, 2012). There is, therefore, a need to extend our understanding of the structures involved and the ways they operate. Thus, the literature evidence reviewed demonstrates that there is some level of inter-relationship between extension and complexity but doesn't explore it at the level that is appropriate to explain failure points.

Having studied the literature related to organizational extension, it can be argued that modern-day organizations use teams as a way of information sharing and getting things done. The research on teams has received immense attention in the past decade (Cohen & Bailey, 1997). Examples of researches emerging in the area of team are; Camarinha-Matos. (2004); Maciejovsky et al. (2013) & Mankin et al. (1996). The focus in this study

is on temporary teams and their information sharing behaviours which it can be argued has received a limited amount of work in terms of research as most works already undertaken pay attention to different work contexts which include task (Allen et al., 2014; Allen & Wilson, 2005); disciplines (Pilerot, 2014); supply chain (Chengalur-Smith et al., 2012) and public sector (Yang & Maxwell, 2011).

The literature which focuses on teams and especially on the way they work, i.e. Belbin, (2012a, b, c); Camarinha-Matos, (2004); Cohen & Bailey, (1997) & Mankin et al., (1996) makes references to the importance of information in passing but not in depth. Thus, while reference is made to information as an essential aspect, the following are still lacking;

1. There is a lack of cross-referencing of information behaviour literature or cross-fertilisation of ideas with the research on information behaviour in complex and extended settings
2. Other areas that are of interest are the areas of team and its uses discuss in section 2.5.3, particularly, collaborative teamwork and specialised teams. It is evident that literature makes reference to information as an essential aspect but does not reference literature on information behaviours nor do it in depth.
3. knot and knot-working, reviewed in 2.5.8 which reveal that the concept remains an area of research that is, “undertheorized” regarding its application and is still open to empirical testing and practical use in different field of study (Bleakley 2013, p.25). Therefore, this study in the light of the identified gaps answers the two research questions put forward in chapter 1.

Chapter 3 Methodology

3.1 Introduction

This chapter highlights how the research was carried out, starting with the introduction in section 3.1 and research paradigm in sections 3.2, 3.3, 3.4 and 3.5 which begins with philosophical underpinning in section 3.2, and epistemology/ontology in section 3.3. Section 3.4 discussed the role of the researcher. Validity and reliability in general and particularly in this research are discussed in section 3.5. The research approaches are outlined in sections 3.6, 3.7, 3.8, 3.9, and 3.10. Where 3.6 highlights the approach, 3.7 discusses the use of theories in this research and their relationship, 3.8 discusses the research case study, 3.9 explains Activity Theory (AT) used as a framework for this research, and section 3.10 is the conceptualisation of the case study organization, highlighting the need for collaboration and networking. The methods are discussed in sections 3.11, 3.12, 3.13 and 3.14, under, research design and methods in section 3.11, samples in section 3.12, type of data collection in section 3.13 and ethical considerations in section 3.14. Finally, section 3.15 is the conclusion of the entire chapter. The idea is first to present the research underpinning which explains why the approach was chosen before discussing how the research was conducted. It then connects the case study organization with the context of research in detail and finally describes the research methods.

3.2 Research paradigm / philosophical underpinning (social constructivist)

This research is based on the interpretive research paradigm and particularly the social constructivist worldview, to help answer the question put forward of how, why and what (Schwandt, 1994). This worldview is formed by individual's perception of what reality is which varies between individuals and is socially constructed from one person to another (Tracy, 2013). The assumptions which underlie the researcher's approach (interpretive research), are drawn from organizational research which is concerned with giving meaning to patterns of actions which in turn give rise to meaning for organizations (Smircich, 1983). This approach is further discussed in section 3.3.

The reason for the choice of interpretive paradigm and social constructivism worldview is due to the nature of the setting the researcher looked at, which is complex and extended with potentials for failures. The researcher was interested in a granular analysis of the

breakdown (failure) in information sharing within these complex and extended environments which also drives the interest in the behaviours that people use to address and cope with such failure. These phenomena cannot be covered using a survey by assigning yes or no answers; instead, it needs to be investigated more qualitatively through semi-structured interviews, observations and document analysis.

Activity theory is used as a lens to understand information sharing as a purposeful activity between the different categories of the case study organization. AT concept is discussed in detail in section 3.9. The key factors when completing this study are the tensions and contradictions seen, strains and stresses of the system which in turn provoke some of the failures. Where the failures occur, behaviours emerge to deal with them. This situation brings a focus to the idea of temporary teams and the exciting concept of knots, how they are formed, how they manage information and how they manage information deficit.

The research paradigm and philosophical assumptions of how knowledge is gained is in accordance to Hudson and Ozanne (1988 p. 508) which according to them 'are statements accepted without the direct empirical support based on different views of reality, social beings, and knowledge'. These assumptions are based on strong philosophical arguments, however, like in this study, the interpretive approach sees reality as relative and multiple as there is more than one reality which is open to different ways of accessing it. Knowledge, under this approach is socially constructed through subjective interpretations (Hudson & Ozanne, 1988).

This answer the ontological questions of what constitutes reality (reality is constructed). Although the researcher may have had prior ideas about the research, those were insufficient to develop a research design for the complex nature of the reality involved in the study, but instead, the researcher aimed to understand and give meaning to the human behaviour observed in the research setting. The data in this study is collected in small amounts compared to quantitative data collected in other researches and like related study of Geertz (1973). However, the best samples were selected for this research by looking at the totality of the problems in a qualitative manner as against reducing them down into smaller elements. Similarly, the studies of Blumer (1969) and Sanday (1979), as in the present research settings under the interpretive approach suggests that the

context must be in their natural form (habitat) which in this context is the case study organization and the environment of its stakeholders. The researcher will feel comfortable and be able to communicate patterns and know the expectations and problems of the subjects in order, to collect data that is meaningful to the research. This interpretive approach allows an individual to create meaning and is referred to as social constructivism.

Constructivism is based on observation and some scientific studies which centre on peoples' learning and how they understand, based on that learning and knowledge of the world through experience and reflection. The theory according to Cunningham & Duffy (1996) sees the process of learning as involving different interpretations within an established community of practice.

3.2.1 Justification for the choice of research paradigm

In this study, the researcher observes the direct experience of the subject from the inside of the case study and the stakeholders' environment as in the study of Cohen et al., (2007). The focus is primarily on interpretation and understanding to comprehend the problem. This is because the issues at hand involve understanding the meaning given by the subject which can be complex, and as such cannot be measured using a standard measuring instrument.

All this requires the researcher to get involved in the research through interviewing and observing the subjects to understand the main reasons for the subjects' actions in social context, with emphasis on how reality is constructed socially (Walsham, 1995). Moreover, the basis of the interviews and observations allows the researcher the chance to pick up concerns, understand them, follow up and understand how subjects in the research context perceive what is happening. This approach suggests that the research is an exploratory type of research. It is also a procreative type of research aiding development theories, approaches or actions (Robson, 2002; Ritchie et al., 2013).

3.3 Epistemology/Ontology (World View)

Epistemology deals with the nature and sources of knowledge, i.e. enquiring about the nature of the world to establish what valid knowledge is and the ability to obtain such knowledge. Ontology is also a philosophical discipline concerned with the nature and establishment of reality (Giaretta & Guarino, 1995, p.2). By reality here, we refer to how best to understand what reality is (Easterby-Smith et al., 2012). The approaches

commonly seen in the social sciences can take the path of a positivist or an interpretive paradigm, with these approaches founded on the beliefs of the individual researcher and their philosophical inclination which assists in forming the basis of their ontology.

This research adopts the interpretive research paradigm as discussed earlier and shown in Figure 3.1. This approach emphasises people as opposed to objects in positivism (Saunders, 2011). The worldview adopted is that of social construction, to help answer the questions of how, why and what (Schwandt, 1994). The worldview is therefore formed by an individual's perception of what reality is, which varies between individuals and is socially created from one person to another (Tracy, 2013). The research onion in Figure 3.1 shows the research choices, techniques and procedures for research in general, and the approach which guided the study, which is interpretive with its multiple data collection methods.

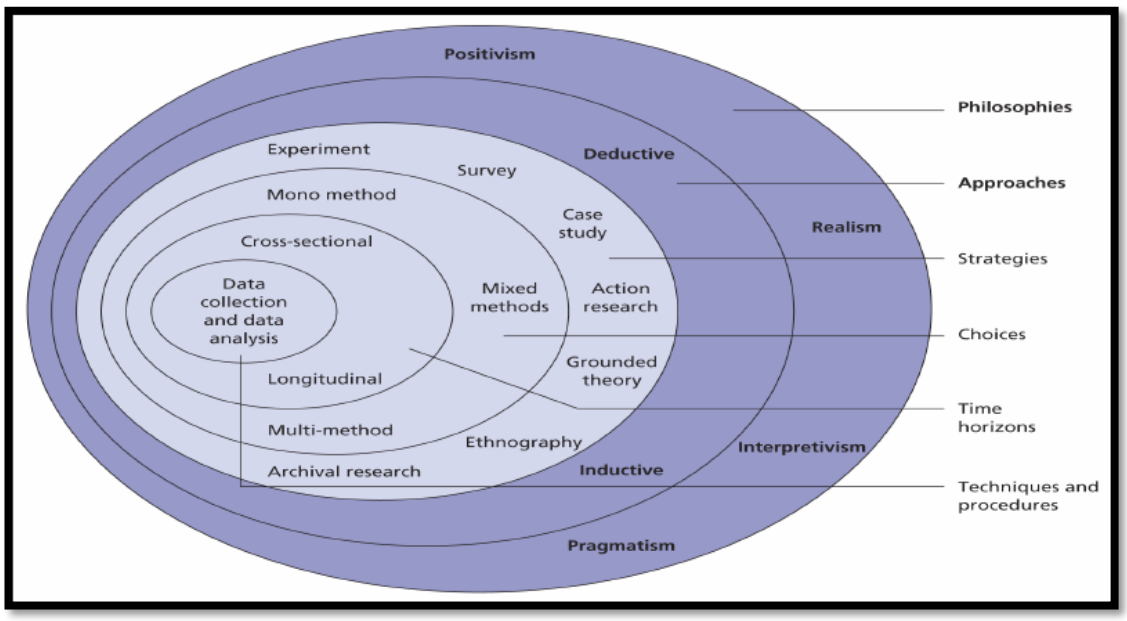

Figure 3. 1 Saunders et al., research 'onion': Source: © Saunders et al., 2009

Understanding the ontological issues helps in developing knowledge of the subject and the nature of reality of the world which interpretivists see as mental and perceived. In this approach, individuals make use of theories and other devices to create meaning of their worlds (Burrell & Morgan 1979); however, the interpretivist's approach believes that reality cannot converge into a single reality as it keeps changing (Berger &Luckman, 1967). This approach looks at historical phenomena in time and place as opposed to concepts established by immutable laws as in positivism (Geertz 1973).

3.4 The Researcher's role

The researcher wanted a holistic understanding of both textual and oral evidence through visualisation of the subjects' motivations, experience and context. This then requires the researcher to act as an analytical observer observing the participant from inside the organization. This action provided the capacity to reflect on the surroundings, and on the participants' actions, intending to understand the participants' culture and viewpoint.

The researcher is aware of the potential for bias having worked for 15 years in the case study organization before proceeding with this course, however, using multiple data collection methods for triangulation and having in mind the dual perspective concepts was used to reduce bias. The process of semi-structured interview reduces elements of bias as pre-determined questions from both the literature and self-experience while at work are used as a guide. The method allows the researcher to introduce secondary questions based on prior responses. The dual perspective gives meaning to both the context and participants; and the process requires experience as there is the need to pay attention to the interaction as well as gaining the trust of the participants. The focus in this context is on the present rather than the future and on recording each action as it unfolds. Finally, the ability to immerse oneself in the role of the participants to understand and create the meaning of their actions is another way of reducing bias. The next section explains what constitutes valid research in general cases and explains how it affects the research context using the case study as an example.

3.5 Validity and reliability of research under this approach

The need to show and address reliability and validity in research of this nature is essential in line with LeComte & Goetz (1982, p.32) who in their study considered reliability as 'replicability of both internal and external logical findings' and validity as 'accuracy of logical findings'. Similarly, Lincoln & Guba (1985) cited in Tobin & Begley (2004, p.391) state that qualitative research needs to demonstrate "credibility, transferability, dependability and conformability" for it to valid. In the same manner, Ritchie et al. (2013) identified validity and reliability as some areas that a researcher must demonstrate before the research can be legitimate.

The use of the case study and its different stakeholders as an example of the research context is to show that the study can be replicated based on the given accounts of findings. However, the analysis of Barriball & While (1994, p. 332) did point out that

some conditions may affect reliability and validity and that not all qualitative research can be generalizable. According to them, the respondents' friendly nature can have an impact on the outcome. For the case study organization, though, the interviewees were open in discussing the research questions and frank in their responses even on matters considered sensitive. This does not grantee reliability and validity, however, observation of the respondents in some case of how they manage and share information confirms their responses and validate the finding to be reliable. While the researcher accepts the responses as open and frank, the anonymity of respondents in the final report is maintained.

More so the use of computer software in the data management and analysis stage (discussed in the next section) of this research was one of the essential steps towards demonstrating the four qualities needed for qualitative research "credibility, transferability, dependability and conformability" in line with the study of Tobin & Begley (2004).

1) Credibility here means showing that the results presented are realistic.
2) Transferable showing that the results presented can be replicated.
3) Dependable showing that the results presented can be depended upon by confirming and reliable.
4) Conformability is showing the level to which the results introduced can be verified.

As a way of showing the volume of data used in this study and to demonstrate dependable and conformability of the findings, Table 3.1 and 3.2 highlights the input, data volume, process and output in this research, which shows the four qualities discussed in 1-4 above

Table 3. 1 Input-process-output of data collected.

S/N	Input	Volume	Process/uses	Output	Comments
1	Interviews for management staff	15 Interviews	Code assigned as BNMS, manuscript transcribed, imported into Nvivo, managed and processed by integrating, organising, exploring and querying the data. The interview involving management staff highlights the issues of policies and measures in handling information sharing failures especially with extended partners.	The organising stage sees materials belonging to similar nodes are coded in Nvivo to produce 85 codes as shown in Table 4.1. The nodes and codes discussed form part of the corpus of data for this research and inform the theme used and transforms as the final themes for this study.	The nodes were further reduced during the exploring, text search, word frequencies, querying, differentiation and classification all guided by the literature and activity theory which is the main research framework.
	Interviews for middle level staff	12 Interviews	Code assigned as BNSS. The interview involving this category of respondents (middle level staff) gives a clear understanding of policy implementation, especially involving the rules as it relates to internal and external use and complexities involved in carrying out their duties and relating to extended collaborators.	The process of exploring, text search, word frequencies, querying produced differentiation and classification by further grouping the codes to the corresponding themes based on literature and activity theory teams to produced 6 main themes using colours as shown in Appendix 5.	The process of analysis and sense making also benefited from intuition and intellect of the researchers experience where necessary.

S/N	Input	Volume	Process/uses	Output	Comments
	Interviews for other different stakeholders	11 Interviews	Code assigned as ABSH. This part of the interview highlighted the complexities extended partners are faced with in relating with the examination organization and highlights ways of reducing these complexities. Issues of tension are also picked up during this stage of the interview.	The interview process sees the initial themes going through series of mechanical process and transformation to arrive at the 6 themes as discussed above which inform the areas of contribution for this study.	
	Interviews for end users of NABTEB certificate.	8 Interviews	Code assigned as OENU, manuscript transcribed, imported into Nvivo, managed and process by integrating, organising, exploring and querying the data.	This also form part of the 85 nodes to 6 themes. Each of the 6 themes has different number of nodes according to the classification of nodes as shown in Appendix 6	
	Summary of total interviews/ what it achieved and pointer to this research.	46 Interviews	85 Nodes and codes generated during the process and analysis stage.	6 themes arrived at after the mechanical process using Nvivo and guided by activity theory and the literature reviewed.	The entire process of interview informed critical issues not expected which form an important part of the study. Example is the way they deal with complexities/failures using knots. Issues of tension involving technology etc.
2	Observations of different activities and events				
	6 different observation from the case study organization and 2 from stakeholders.	In total 8 different activities were observed each between 4-6 hour per observation for 42 hours	The transcribed recorded observation was also imported into Nvivo alongside the interview transcribes and coded for analysis.	6 themes are generated based from the interviews and observation after going through different stages in Nvivo and guided by the literature and activity theory.	Issues that were observed are that of tensions arising from sharing information with collaborators due to complexities of sharing tools.

S/N	Input	Volume	Process/uses	Output	Comments
	Total hours observed	**42 Hours observation**	**Part of the 85 nodes and codes produced.** Some difficulties in reaching other collaborators were observed and can be attributed to the different norms of the working and the different technology used in communicating.	The analysis of the observation especially the tensions and complexities observed form part of the 6 merged themes.	The observation conducted form part of the data used in the analysis and inform issues that could not be highlighted by the interviewees. Example is that, complexity is minimal when relating within the organization but more complexity when it extends to other partners.
3	Documents analysed includes; Annual enrolment reports for 4 years	4 Volumes	Documents collected are used to check if the facts of the interviews reflect the different reports collected and analysed.	The issues found while reviewing the different documents are that of; compliance, confirmation of the use of technology, correspondence with extended collaborators and problems faced in carrying out day to day administration of examination including information sharing problems.	The analysis of interviews, observation and document analysis are used to produce the themes. After a careful consideration and merger of different nodes, the six themes during the analysis stage, a further merger was carried out.
	Yearly progress report of achievement for 4 years	4 Volumes	Documents collected are used to check if the facts of the interviews reflect the different reports collected and analysed.	The documents analysed confirms the reliability of interview response by checking with document where applicable.	The six themes are further reduced to produce 3 contributions discussed in chapters 4 and 5.

S/N	Input	Volume	Process/uses	Output	Comments
	NABTEB Handbook for both senior and junior staff	2 Volumes	Documents collected are used for cross-referencing and checking the facts of the interviews reflect the different reports collected and analysed.		
	NABTEB Online report accessed 16/01/15	Volumes 1-6	The report highlights the different links and types of collaboration in the examination organization.		
	The Punch newspaper of 10/06/2012	1 Newspaper	Documents collected are used for triangulation purposed to check if the facts of the interviews.		
4	Other reports				
	Audit commission report 1996	1 volume Report			
	Total documents collected and analysed	18 different volumes of reports and newspapers.	Used to understand the polices, regulations, compliance and implementation procedures. These documents support the sense making process and help inform some of the issues of complexities and extension.		The documents collected were used during the analysis to check if the findings correlate with the policy documents.

3.6 Research approach

This section discusses the research approach used in this study. The approach is based on the literature search and reviewed, information behaviour models and activity theory concepts which produced seven different headings representing the main areas of focus as discussed in section 2.1.1. Thus, this section comprises 5 sub-sections which give detailed explanations of the data sources - including semi-structured interview, observation, and document analysis. The section also addresses how the data collected were managed. The researcher considered the study as an inductive one, as it involves exploring the case study organization which is a complex organization. The idea is to generate theory out of the behaviours observed and help in delivering insights, based on the problem explored. The data for this research was collected in three ways as discussed in Table 3.1 which are semi-structured interviews, observations and document analysis for validity and reliability purposes (triangulation). According to Greifeneder (2014 p 195), these three methods of data collection are among the most commonly used in information behaviour science.

Barriball & While (1994) describe interviews as a method of exploring respondents' opinions and perceptions on sensitive and even complex issues as it affects them. Interviews in interpretive research are a way of developing interpretations of actions in the field. However, time is of importance during interviews, with an emphasis on a balance between passivity and over direction on issues (Walsham, 2006). Similarly, the research uses an observational method for collection activities that are of interest to the research and in line with the study of Wilson & Streatfield (1981).

3.6.1 Data sources

The data was collected from the case study organization and its stakeholders involving four groups shown in Table 3.1 as 1) management staff of the organization, 2) middle level managers in the case study organization, 3) stakeholders outside the organization who have dealings with the organization and 4) the products of the organizations' examination (end users). The data collected were subjected to the process of transformation to arrive at the contribution chapters as discussed in Table 3.2. The data were collected using semi-structured interviews in all cases, and observations for two groups covering staff of the organization (both management and middle-level managers), and other different stakeholders. However, it was difficult to observe the external

stakeholders especially the 4th group. The reason for the difficulty was because most of those that make up that group were students that just finished their exams and don't have need to communicate with the organization anymore or they are fully employed and don't have permission to be observed in their workplace. The table below gives a summary of the different sources of data and show a flowchart of how the contribution chapters were arrived at.

Table 3. 2 Summary of the sources of data and flowchart of output.

Interviews, observation and document analysis.	**Input**	**Process**	**Output**
Number of management staff 15. Number of middle level staff 12. Number of end users 8 and number of other stakeholders 11.	Total of 46 interviews, 8 different set of observation and 18 different volumes of different reports and newspapers to produce a corpus of data.	From the data collected combine with initial sensation from literature reviews, scoring of interviews, own experience, activity theory and Nvivo to produce the corpus of data which produce an output.	The output confirms and show established practice in the setting and exposed behaviours of reactions which is a confirmation of complexity and extension. The process stage which is based on coding guided by the literature, mechanical process in Nvivo, self-experience produced a total of 85 different nodes as shown in Table 4.1. The nodes which were as a result of stage 1 and 2 in the mechanical process of Nvivo produced 6 themes as shown in Table 4.2 and the grouping of nodes under each theme is attached as appendix 6. Six themes were initially proposed to serve as chapters for this study but was changed during the exploring and interpretation stage to avoid having many chapters in the final report. The 6 themes were further subjected to merger based on more exploring in Nvivo and the use of experience and intuition during interpretation of the data to form 3 contribution chapters. However, during the interpretation and writing up stage, the second contribution and the understanding of the behaviours of the knots reported were centred on the research framework AT and especially 4GAT. Therefore, decided to merge chapter 5 and former 6 at that stage to produced what is now the chapter 5 and conclude the report in chapter 6 instead of chapter 7.

3.6.2 Semi-structured interviews and justification of use

Semi-structured interview was chosen in this research to direct the initial questions in the area of information sharing failure in complex and extended organizations. (Saunders, 2011). The interview conducted for the case study organization involve six different stages, the first is the arrival at interview venue and familiarise self with the setting, interviewee and ensure the recorder is working. The second stage is when the researcher introduces the research by stating its nature and purpose while ensuring the environment is conducive for the interview to take place. The next stage is the beginning of the conversation, which starts by asking some background information intended to help set the scene for the interview proper. (Information about the research and what it aimed to achieved was earlier deposited at the entrance of each department for those interested. This has influence and contributed to interviewees decision to take part or not). The fourth stage is the main part of the discussion in which the researcher takes the respondents through a series of questions guided by the themes of the research and AT terms. The fifth stage involves ending the interview by signalling to the respondent that the interview is coming to an end. This stage is to ensure the respondent is not left with unfinished responses. The sixth and last stage is after the interview, where recordings are switched off, and the researcher assures the respondents of the value of their contribution, thanking them for their time and cooperation.

In justifying the method used for the case study, semi-structured interview and the open-ended nature of the questions in it generate further questions that are of importance to the research. The central interview questions were from the literature reviewed and activity theory. Both the literature used, and activity theory centred on information sharing failure. Thus, AT and its artefacts (community and division of labour) help in exploring who makes up the subjects that the organizations relate with, how different division of labour does information sharing in complex and extended organizations and what the critical drivers for information sharing failures are looking at the various tools and how subjects relate with it.

However, during the interview some responses also generate further questions; for example, ‘can you tell me about….?’ ‘Based on your first response, what can you say about….?’

One advantage of using semi-structured interviews in the case study organization is that complex questions are clarified through discussion, as the interviewer and interviewee can discuss the meanings behind actions. Above all, this method is an efficient and practical way of collecting data on issues that cannot be observed, for example, feelings and emotions regarding the subject of discussion.

Interviews can also be recorded both through audio and video; the recording is particularly important when the researcher has only one opportunity of interviewing the interviewee (Bernard, 1988). Though for this research, the interview was not a one-off process of collecting the data since the researcher is immersed in the organization for the period of the data collection. Therefore, the process is a gradual one as the interviewees become available.

3.6.3 Observation

According to Angrsino & Mays de Perez (2000), data collection in interpretive research also takes the form of observations which can be formal or informal depending on the circumstance surrounding the data collection. Observations may be merely observing and recording of results or may involve immersing oneself in the study of happenings in the environment. This method could serve as the only source of data collection or may supplement other sources, as is the case in this research. For this research case study, a total of eight different observations were carried out totalling 42 hours of observation with an average of between 4 to 6 hours a day over a 23-day period. The results of the observations are used mainly in the findings and discussion section (chapters 4, 5 and 6) as empirical data to triangulate with the other data collection and reviewed.

3.6.3.1 Justification of using observation for the research context

The reason for the use of observation in the case study is to provides more information which verbal expressions will have left out during the interview stage and also for the purpose of triangulation. The approach was used mainly in the research context to know if there were actual communications with the extended partners or whether such interaction is missing out. Another important reason is to confirm what has been said by participants during the interview such as less tensions observed in their routine work within the organization but greater tension in dealing with extended partners especially in sharing information. The process gives the interviewer a better insight and confirms an accurate, holistic picture of the phenomena studied. Above all, the approach provides

the researcher with an in-depth understanding of the context and serves to provide some form of validity for the research.

3.6.4 Document analysis

Wang (1982) describes document analysis as a means of providing a compressed general data facility which covers content such as written text, images, speech and cultural artefacts. This method of data collection is used to complement the other two methods in this research for triangulation. The advantage of using this method is for the corroboration of data already collected through another means (Yin, 1994). In this study, some documents were collected to prove a point which would support some arguments where necessary. An example of documents collected in the case study organization is year-by-year student enrolment records to help the evidence that there has been an increase in student enrolment, which is also an indication that the examination is accepted. The justification of the use of document analysis according to Bowen (2009) is that the approach provides convergence of confirmation of the context of the research by reducing the possibility of bias. In particular the documents analysed accord the research the opportunity to understand the implementation of policies and changes to it, different accounts of problems and confirmation of numerous partners which confirms complexity and extension.

3.6.5 Data management and analysis

This section describes in detail the steps involved in arriving at two main areas of contribution for this research (initially three) as 4GAT considered as a contribution is only used to understand the action and innovations in the second contribution, therefore, was merged with the second contribution chapter. In making sense of the qualitative data collected, Nvivo 11 was used to undertake four fundamental processes - integrating the data, organising it, exploring by way of querying the data and, finally, interpreting it. The four-analysis process are described in Table 3.1 and 3.2 and supported by documents in appendix 5 and 6. The four-processes are as explained below.

Integration of data started with transcribing the recorded data to a readable form and writing out the observation reports alongside which was then imported into Nvivo. During this process, all identifiers were removed, and source classification were identified based on the four categories of respondents as explained in Table 3.1, example “BNMS 1 meaning Benin Management Staff Interview 1”. BNSS refers to Benin Senior

Staff. In the same way, ABSH 30 means Abuja Stakeholder interview 30; OENU 43, means Organization's End User interview 43". Integrating the data produced 85 set of nodes and this is shown in Table 4.1. The rationale here to protect the identity of respondent and to have a transcribed document with no identifiers. The next stage is organising the data collected which is explained below in detail.

The organisation of the data is where the data is classified and assigned attributes as codes and classes. This stage may include differentiation based on socio-demographic characteristics or attributes relating to different respondents. Four source classifications were determined for the case study organization: the end users of the organization's products, management staff, middle-level staff and stakeholders. At this stage colour coding for similar terms was performed as shown in Appendix 5 to be able to identify corresponding nodes for ease of grouping. Using other features in Nvivo the search for themes to assign the colours started.

The process of exploring through querying is the third stage which followed the sequence of building codes based on the literature reviewed but using a loose template as there was no pre-determined theme in mind, however, the use of AT as a guiding lens was not left out. Text searching, word frequency queries and annotations were run at this stage with the help of the explore tab in Nvivo. Different queries were examined and used to search the data in multiple ways. This process allowed a comparison of codes or text used across different documents, different nodes, or attribute values, which produced either tabular or qualitative data, which in the case of this research produced six different themes. These are; 1) complex & extended organizations, 2) teams/groups, knots and knot-working, 3) information sharing behaviours, 4) tensions and contradictions, 5) organizational culture, rules and norms and finally achieving organizational objectives. The six themes are based on the literature and activity theory terms which assist in understanding areas of failure. However, each of the themes is assigned the colour where nodes relate to, and the nodes belonging to each are grouped under the theme to show the number of nodes under each theme as shown in Table 4.2.

The last stage entailed interpreting and making sense of the data. However, at this stage, it becomes apparent that the six themes produced could not be considered in the final report as chapters, therefore, there is the need to reduce the number of chapters as that

will make the research have ten chapters considering there are already three chapters and will need a conclusion chapter. Therefore, the immediate thing that came to mind is to further merge the six themes by combining related and corresponding themes together. Thus, intuition and intellect based on experience are not left out at this stage as the two also contributes to the sensemaking and analysis.

Three central themes were arrived at by merging similar ideas together and initially the thought was to use the three central themes as chapters 4, 5 and 6 as explained below.

Chapter 4 was a merger of the themes complex and extended organization and information sharing behaviours which now becomes collaborative information sharing behaviours in complex and extended organizations. Chapter 5 drew on the themes of organizational culture, rules and norms merged with teams, groups, knots and knot-working to become and discuss how complex and extended organizations respond to deficiencies. Chapter 6 drew on the themes achieving organization objectives merged with tensions and contradictions. This chapter used 3GAT, for understanding information sharing failures in complex and extended organizations and also outlines the use of fourth generation activity theory to understand action and innovation involved.

Reviewing the proposed chapters 5 and 6. It appears that chapter 6 is explaining actions and innovations which are embedded in the ways extended organizations respond to deficiencies in information sharing. Therefore, the two proposed chapters were further merged in the final thesis report.

The AT approach used in this research allows an understanding of activities concerning who does what, what is required and how to go about it, and what actions need to be performed to achieve expected outcomes (Engeström, 1999). AT also helps in demonstrating where and how contradictions and tensions have led to failures in information sharing, the collapse of information sharing processes and the improvements perceived to be needed in the system, as discussed in the information sharing and information behaviour literature.

This research uses analysis of data collected from the case study organization, stakeholders and staff at different levels and in various functions to understand how

knowledge is produced in this complex extended organization. It also allows the AT to be combined with other theories to explain the nature of complexity in relationships (Tonkiss, 2000) as discussed in the next section.

3.7 The use of theories in this research and their relationship:

This section consists of the main introduction in 3.7 and justification for the use of chosen theory and other theories in this study in section 3.7.1. Whereas section 3.7.2 explains the research approach which is interpretivism and activity theory. The research used activity theory (AT) as the key framework and a meta-theoretical lens on the problem which guided the data collected. However, the understanding of the problem draws on four different theories including the framework. 1) AT was used to understand the issues as a process which helps to explain the tensions and contradictions. Other theories used as lenses to further understand the complexities are 2) networking, which describes elements of collaboration and partnering with other stakeholders (Bienkowska & Zablocka-Kluczka, 2014; Camarinha-Matos & Afsarmanesh, 2005; Miles & Snow, 1986; Robins et al., 2011). 3) Coupling, used for a better understanding of the element of control (Beekun & Glick, 2001; Orton & Weick 1990); and, 4) knot-working, which explains the need for team formation and specialisation (Karhula, 2012; Kazlauskas, 2014; Kerosuo, 2015; Kerosuo et al., 2013; Saiz et al., 2005). All these theories are discussed in the literature review section 2.5.

3.7.1 Justification of choice of theory and alternative theories

Activity theory is seen as a methodological research tool (Allen et al., 2013) used in the field of evaluation (Fitzgerald & Russo, 2005, cited in Allen et al., 2013), and as a framework for an organizational work system (Engeström, 1987). AT is chosen for this research for its ability to show areas of tensions and contradictions which drives failures.

There is rarely a standard theory and undisputable tool that is perfect for understanding a particular phenomenon in a setting, as theories vary, and their applications differ. The best theory employs characteristics used to articulate the exact factors which are of importance to the research. In the case of this study, which considered complexity caused as a result of extended relationship, AT was chosen for reasons explained in section 3.9. Other theories such as social network analysis could be used in this study as it is aimed at describing and exploring the different patterns apparent in a social type of relationship involving individuals and that of groups (Scott, 2017). However, social network theory was not chosen for this study due to its inability to illuminate activity involving shared

objects that are complex due to multiple relationships, different expectations and the use of a variety of tools. Similarly, the structuration theory was not chosen despite its ability to handle issues of structure and agents. According to Naidoo, (2009, p 105), structuration theory is limited in explaining historical change which may be needed to determine some level of contradiction in AT. It also lacks the interaction between subjects and tools in a shared relationship (Naidoo, 2009, p.106).

3.7.2 Interpretive approach and activity theory

As an interpretive approach, activity theory is concerned with giving meaning to patterns of actions which in turn give rise to meaning in organizations (Smircich, 1983). The approach seeks to bring change and aims at creating theories for practice. Thus, AT is aimed at solving a specific problem rather than a generalised one. In general, activity theory in information science is becoming increasingly important (Karanasios et al., 2009), because it helps to frame the investigation and is important in data collection. The theory is concerned with human behaviour which is embedded in activities (Allen et al., 2013). Thus, AT in this study is used for better understanding and helping to further explain the nature of complexity in the setting, in line with the researcher's aim of understanding and giving meaning to human behaviour.

3.8 Case study

Case studies are considered as one of the strategies for empirical studies of a contemporary situation in an organization (Robson, 2002). This approach is applied to a situation where one needs a rich understanding of the research context (Morris & Woods, 1991). The approach is used in an exploratory study and combines different data collection methods (Saunders, 2011). The organization was chosen due to its involvement with other organizations which is the 'complex and extended' organization. The extension here is with its different stakeholder, while the complexities involved the relationship, the process and operations all related to extension. The study uses multiple interactions with collaborators, scenarios and critical incidence within the case study organization which makes it complex.

3.8.1 Case study organization

The research used National Business and Technical Examinations Board (NABTEB), already introduced briefly in Chapter 1, as a case study organization, where the researcher presently works. NABTEB is a public organization which is based in Nigeria, whose function is to conduct examinations leading to the award of certificates for

admissions into universities/polytechnics or promotion in the workplace. In pursuit of the mandate given to it by the government, the organization has both contractual and social types of relationships to satisfy its stakeholders and 'perform its function in the context of educational provision and certification'. The prime mandate here comes from the Government wanting to see a fair and effective examination system. A secondary mandate is that the organization operates effectively as a business without being a drain (beyond agreed parameters) on Government. With the kind of relationships mentioned, the organization finds it important to share information with its stakeholders concerning its examinations, and the communities, regarding the different forms of division of labour needed to meet the expected goal.

The organization NABTEB was considered as a good example of a complex extended organization because of its inter-dependency on other organizations for its survival, as well as its cross-border relationships under the umbrella of the International Association for Educational Assessment (IAEA) which involves collaborating with more than 50 countries requiring a cross-cultural understanding and information sharing. One respondent, a member of senior management of the case study organization, describes the international affiliation as having value as;

BNMS 02;

> "*Our organization is a member of international assessment bodies both in Africa and at international level which helps us to stay abreast of happenings and new technology for assessment".*

The interpretation shows the cross-border relationships that the organization has with international affiliates in over 50 countries. (which is the sort of things document analysis provide as a supportive and an indication of complexity and extension). This is in addition to co-operating with other local organizations who contribute to the successful accomplishment of its task. This, therefore, calls for the understanding of the areas of theoretical gaps identified from the literature in chapter 2, section 2.2.1 for complex and extended settings.

The areas of the identified gaps also reflect the experiences of the researcher during his years of working for NABTEB. Where instances of failures of individuals and groups to share information effectively in these emerging complex/extended situations has become

more common due to changes in the operational environment, innovation and technology, and personal or environmental circumstances of the individual involved in sharing the information as found in the study of Tannenbaum et al. (2012).

To illuminate the issue of extension and complexity in relationships as affecting the case study organization, the establishment is described as an organization that has its credible certificate as a shared object (explained further in this report) with other organizations. The same organization relies on multiple stakeholders to get the shared object right. E.g. the organization depends on teachers, markers, supervisors, proprietors, item generation teams (mostly universities and other teachers) to get a credible certificate which is the product of the examination. The certificate is also an entry requirement for Universities, Polytechnics and other institutions. Similarly, the same certificate has a dual nature as it is used to gain employment and promotion in the workplace.

Another aspect of the relationship is that in collaborating with the groups above, the case study organization extends and keeps extending further to get the right service and expertise it needs for it to remain in business. Figure 3.2 shows the different levels of extension which extended organization can reach to keep different specialised collaboration going. The diagram can be extended further and further depending on the needs and specialisation required. The characteristics of such extension are seen in its inter-dependent nature, boundary crossings, the use of specialisation, and issues of control. The diagram used in Figure 3.2 is an illustration of multiple extensions. However, the diagram simplifies this selecting a couple of organizations to illustrate extension beyond the sets given in the diagram. The complexity discussed in the diagram is not always caused by volume but also from fluidity and novelty.

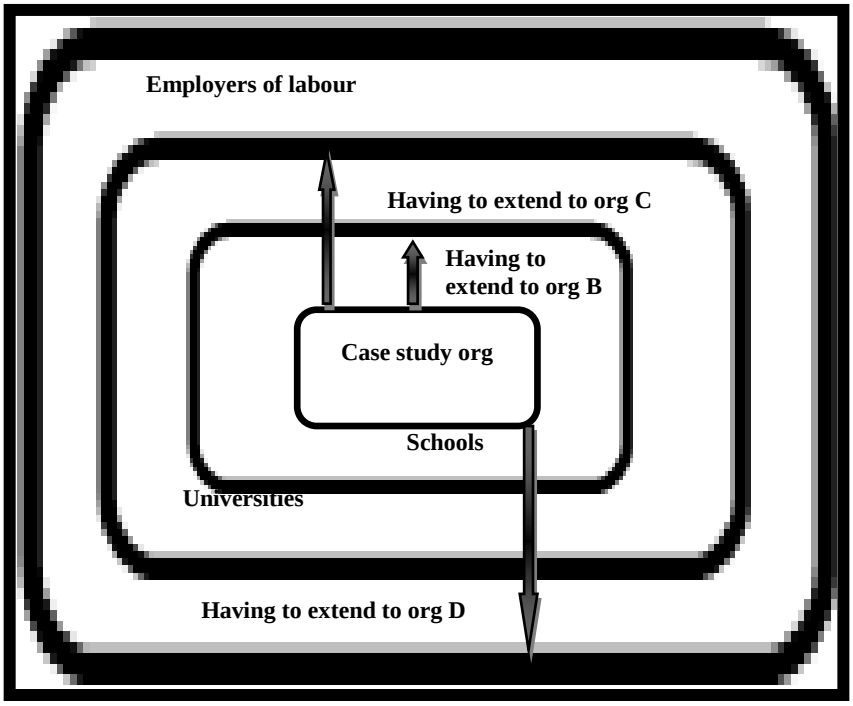

Figure 3. 2 Different levels of extension: ***Source: Author 2017***

The effect of this extended relationship is that information may not be adequately shared due to complications by reasons of extended relationships, i.e. different technology used by different extended organizations, different professional language used, different rules and norms guiding the operation of each extended partner.

All these are drivers of information sharing failure. Therefore, proper networking with other organizations or partners becomes essential to the realisation that other partners can provide the skills which are lacking in the main organization, as stated in the study of Bienkowska & Zablocka-Kluczka (2014). Also, the need to determine the extent to which control is needed between such relationships calls for an understanding of various forms of coupling as discussed earlier in literature review section 2.5.2 (Beekum & Glick, 2001; Orton & Weick, 1990).

The basic idea is that poor Information Sharing (IS) practice can negatively affect the efficient and effective functioning of organizations like this. Specific examples are: 1) an examination setting that depends on teachers to provide the workforce as a supervisor for the exam: 2) schools to offer candidates for the exams: 3) contractors to provide the materials needed to get the exams going. All these partners are external to the exams organization and where there is no proper information sharing between all entities regarding the exams, there is bound to be a failure.

In this case study organization, information sharing (IS) can also be affected internally if there is ineffective communication. An example is a situation where a staff member working on the preparation of poster/media adverts for the examination is given another directive to do a more urgent assignment and ends up not producing the posters for the exams (or the posters come out late after exams have commenced). The failure is attributed to the lack of IS among staff or colleagues where there is no information about what one person is doing or not knowing that another assignment has been assigned to the officer in charge of posters/media adverts. With this in mind, the more significant issue here is that this individual action becomes a general prejudicial issue in the conduct of the examination and, perhaps more importantly, the reputation of the organization in achieving its mandates (aims and objectives).

IS process in this type of setting is an essential aspect of the social understanding between different stakeholders, to enter into contractual agreements, for outsourcing part of the mandates, and for proper networking with various other organizations and stakeholders. Some positive outcomes of IS are timely delivery of the product, the right application and use of rules and regulations in handling issues around the credibility of exams, and successful specialised handling of different tasks.

It is important to mention here that the level of complexity in the relationships is entirely alien to the sort of organization chart that you can get from a basic management textbook. The relationships and processes here have constraints and potentials to complicate things. An example is that there are currently four different public examination bodies in Nigeria, namely the National Examination Council (NECO), the Joint Admission and Matriculations Board (JAMB), The West African Examinations Council (WAEC) and the National Business and Technical Examinations Board (NABTEB). All these bodies are established by law and function in different locations in Nigerian. JAMB is a one-day examination that is meant to determine placement into tertiary institutions. Their candidates sit a multiple-choice online test whose result is instant, and another offline released within a week for the manual candidates. NECO and WAEC are examinations for secondary school leavers, normally conducted over a period of two to four weeks.

3.8.2 Law establishing the case study organization

The National Business and Technical Examinations Board (NABTEB) considered in this study was established by the Federal Government of Nigeria under decree (Act) 70 of

1993. NABTEB is charged with the responsibility for conducting examinations leading to the award of the National Business Certificate (NBC), National Technical Certificate (NTC) and the "Advanced" versions of these, the Advanced National Technical Certificate (ANTC) and the Advanced National Business Certificate (ANBC). The Board is also charged with the responsibility of conducting examinations targeted at artisans and technicians, called modular trade certificates, and the national common entrance exams for admission into state and federal technical schools. They also certify candidates for special training institutes, the national directorate of employment and the products of vocational enterprise institutes. These exams cover secondary school leavers and craftsmen/technicians, which means that NABTEB's mission according to NABTEB (2013) is to be a "globally acknowledged assessment body for craftsmen and technicians, with a vision of becoming a globally recognized assessment and certification body preparing candidates for the world of work and academic/professional excellence." A Registrar/Chief Executive Officer at present head the Board but also has a range of different stakeholders who have a direct input into the day-to-day running of the organization and are considered components of the organization since NABTEB cannot function on its own without the assistance of these stakeholders.

Examples of vital stakeholders are, the government, which oversees the organization and appoints the chief executive, the governing board, which approves and rectifies decisions, the suppliers who supply the examination materials; the schools, where such examinations are held, teachers and examiners who conduct the tests, etc. The examination process is structured as given in Figure 3.3.

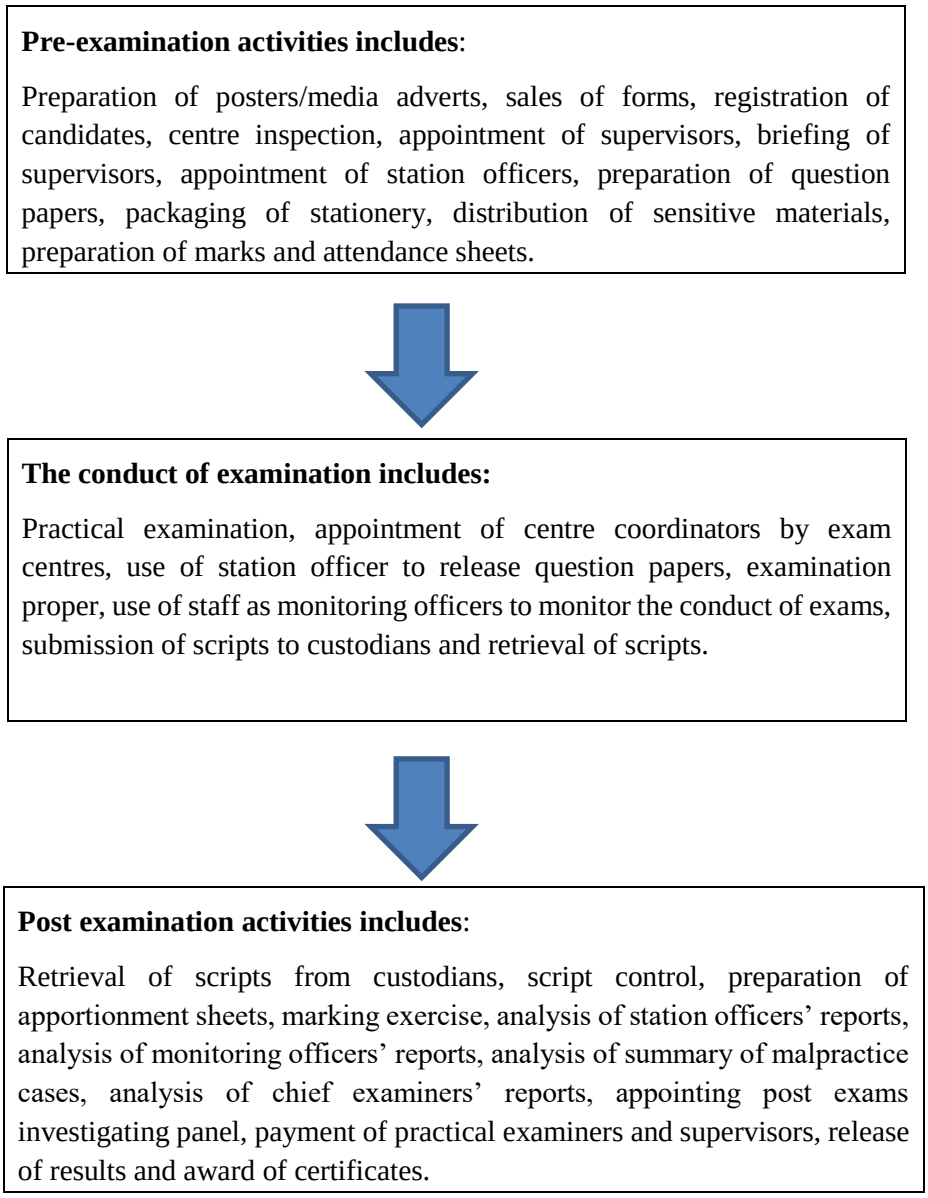

Figure 3. 3 Flow chart showing the 3 main different activities of examination: Source: NABTEB 2012

NABTEB controls the three stages of examination and requires the constant supervision of the activities of the stakeholders involved in all the steps for conformity (issue of coupling is essential here). Failure to conduct the examination is not an option at any stage and timing is very important to the reputation of the certificate. Here failure has a consequent effect on the overall mandate of the organization. Moreover, the most worrying part is that if the organization cannot deliver the mandate which is its primary activity, it has no business remaining as an organization in that capacity. Please note that for clarity, the case study organization deals with a mandate by the government, and the word mandate is same as objectives and will, therefore, be used interchangeably with organizational aim and objectives.

3.9 Activity Theory (AT) in this research

This section introduces AT and charts its development and highlights the congruence between AT as an approach and the research conducted. AT, as presented earlier in sections 3.6 and 3.7, was pioneered by a group of Soviet psychologists headed by Lev Vygotsky (1896-1934), it is a theory based on the interaction of human action with reality producing areas of tensions and contradiction which has the tendency of development. In this research AT was one of the tools selected and used to help in understanding the structures of the research situations, the type of people involved, and different technologies observed which helped to explore complex and extended organizations.

In an attempt to understand the complexities and challenges in complex and extended organization as given by IRM (2014) and Mihm et al. (2010), activity theory was used as a framework and tool for understanding dialogue between different communities, networks of interrelated activities and division of labour in accordance with Engeström (1999). It also helped in determining the best methodology as it defines the subjects, communities and types of division of labour for this research.

The approach also provided the structure used to collect data as it gives awareness of ideas of the entire activity system one is investigating. Not only that, the approach involves purposeful activity which is the prime focus of this research, it helps to understand the other artefacts used. Examples of such artefacts are technology, rules and norms, and the object of the activity.

The approach (AT) put emphasis on tensions and contradictions, seen in this context to aid the implementation of a range of different rules and norms, different communities, different tools involved, different expectations and different motivations. This helps to demonstrate where and how contradictions and tensions have led to failures in information sharing, as discussed in the information sharing and information behaviour literature. The theory also allows the combination and use of other theories as lenses (discussed in section 3.7) to extend our understanding of complex/extended organizations further.

AT as a framework considers object-oriented activities as a prime unit of analysis in common with other activities; it looks at work/activity systems performed by more than

one actor within the environment, where culture and other complexities are considered within the activity. It also sees contradiction as a source of change in organizations (Engeström, 2001). The general concept of AT in the past has not been sufficiently applied to the study of human performance at work (Bedny & Karwowski, 2003). Instead, it has more often been used in circumstances where social and organizational problem understanding is needed, such as "developmental work research" and work activity dynamics.

3.9.1 First generation AT

This section reviews the evolution from first to the third generation AT which is the area that is currently mostly implemented and used within the academic research. 1GAT cannot be considered without an acting agent called the subject which interacts with the directed activity of the object using tools. These activities are represented by a triangle showing the interactions at each node which affects and can be affected by each other. Figure 3.4 below is an example of the triangle showing the subject, object and mediating artefacts called the tools. This type of activity is referred to as first generation activity but has a limitation of being individually focused. The limitations are discussed in 3.9.7.

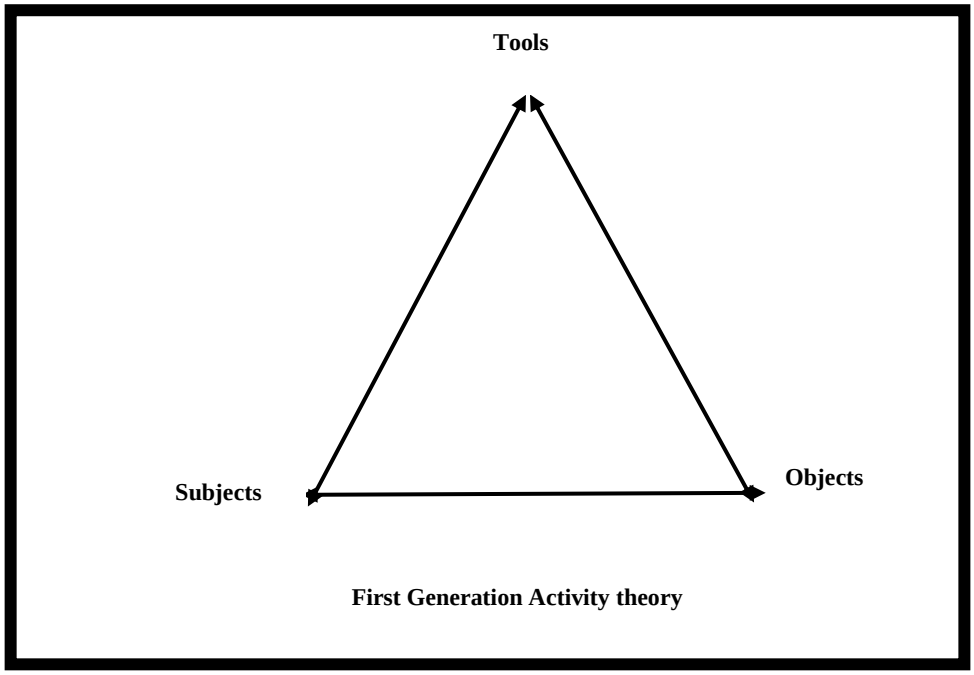

Figure 3. 4 First- Generation Activity Theory: Source: Engeström (2001 p.134)

The characteristics of activities according to Vakkayil (2010) are mediated, pragmatic, situated, provisional and contested. However, when many activities are done at the same time, there are tendencies for the difference to emerge, which may eventually cause

tensions and contradictions among the activities. However, in any given AT context, the constituent activities are not fixed but change with the conditions (Nardi, 1996). Hence, there is a need to interact with the internal and external environment as explained below.

3.9.2 Second generation AT

The evolution of 2GAT is as a result of both the internal activity and the external activity converging and, as such, the internal activity is best understood when analysed with the external activity which is called internalisation, which allows for the potential interaction with the real world without actual handling with physical objects. On the other hand, internal activities are transformed into external activities called externalisation, which is commonly seen when there is the need to correct an internal action. This type of action is needed when there is collaboration among several people who need their activity to be performed externally for proper coordination (Nardi, 1996). The expansion of a larger activity triangle to include the rules, community and division of labour as components was proposed by Engeström (2001) who defined a system of activity as a collaborative process which serves as the generator for a constantly emerging context (Engeström, 1989) as shown in Figure 3.5. This is called the second-generation activity system.

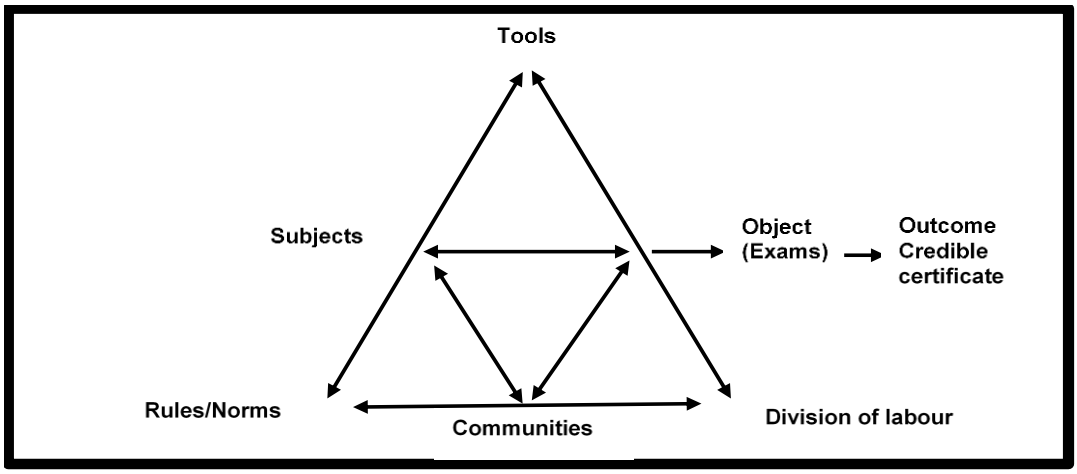

Figure 3. 5 Second Generation Activity System: Source, Engeström (2001 p.135)

The basic feature of activity in the second-generation activity is that it serves as a unit of analysis for human action which shows how the components in the activity system evolve in coordinating the other components driven by systems aiming at resolving contradictions. It also gives an idea of the distribution of human action, and it considers other influential people who have relationships with the system; i.e. the community and different division of labour.

3.9.3 Third generation (AT)

The third evolution/generation of AT (3GAT) is shown in Figure 3.6 which suggests the extended relating communities where dialogue and multiple relationships are needed by way of interacting with different activity systems. 3GAT was proposed by Engeström to serve as a tool for understanding dialogue in a network of multiple activities and the network of interacting activities (Engeström, 1995; Wertsch, 1991) which is an expansion of the original Vygotskian framework. The unit of analysis in third generation activity is expanded from a single activity, as found in first and second-generation activity theory, to multiple activities with a minimum of two interacting activity systems. At this level, five different primary activities are given, as below:

1) First is the relationship between the mediating artefact and the object-oriented activity which is (internalisation) taken as the unit of analysis, although other independent operations can be seen as subordinate units of analysis when looked at from the generality of the activity system.
2) Secondly, is the multi-activity stage (externalisation) which comprises the different traditions, interest, and division of labour, artefacts, rules and different conventions. All these activities serve as sources of concern and as a means of innovation which demand translation and compromises in the system.
3) The role of history in understanding the transformation that has taken place over a period (activity focus) is essential in trying to see how tools and theoretical ideas shape activities.
4) The role of contradictions (shown in Figure 3.8) which serve as agents of change and development in the system when new elements are introduced from outside. An example is in the area of new technology, which causes tension and contradiction, and which will result in change.
5) As a result of the transformation in the system, deviation from established norms begins to be noticed, which may lead to collaborative visualising and joint change efforts being seen in the activity system. This stage is seen as expensive transformation where individuals question the area of contradiction.

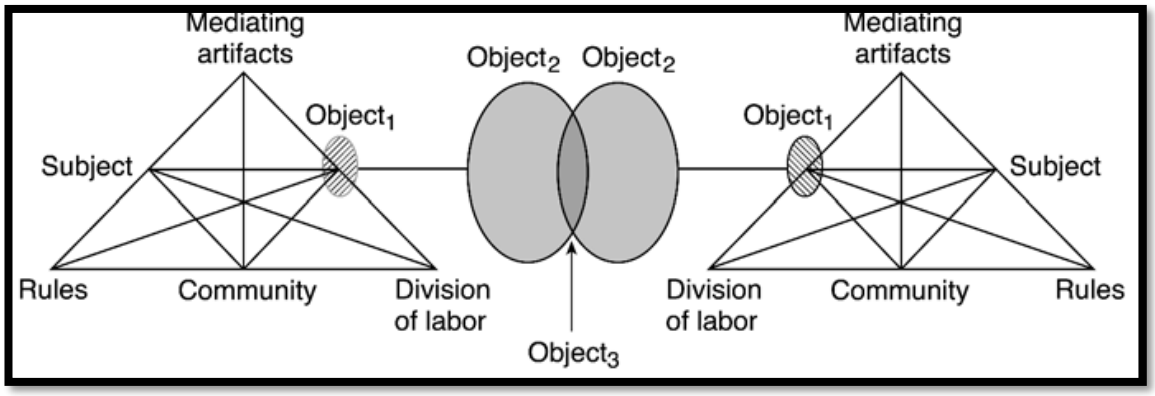

Figure 3. 6 Showing third generation activity systems: Source, Engeström 2001 p.136

Figure 3.6 also shows two activity systems with a common shared object comprising all the interacting components of the activity system, i.e. subject, mediating artefacts, community, rules and division of labour to produce an outcome. The third-generation activity theory tends to accommodate different interacting activity systems as shown in Figure 3.6 (two interacting activity systems) with a shared object as object 3.

3.9.4 Using AT in data collection to define the subjects for data collection

This research focused on the subject, community and object, mediated by social actions such as rules/regulations and division of labour considering the cultural and technical aspects of the relationship where tools are perceived as important in the way information is shared.

The use of tools in research has received attention over the decades with studies like that of Allen et al., (2013); Ferratt et al., (1996); Legris et al., (2003); Pereira & Soares, (2007) & Walsham, (2001). Therefore, tools used in this research will aid our understanding of how information is shared amongst the relationships established based on AT.

The object in the activity system of the case study organization shown in Figure 3.7 is the examinations conducted and transformed into the outcome certificates issued which is the shared object.

The rules are the guide, regulations, policies that also regulate the activities of the subjects and communities on performance. E.g. government policies, examinations rules, staff regulation in an organization, etc.

Division of labour states which actor does what and how the activity is performed, etc. Regarding the division of labour, the issue of specialisation is highly crucial since work is carried out based on teams which consider the area of speciality, i.e. the marking of examination scripts requires specialisation, and item generation involves specialisation and many specific activities. However, activities like the registration of candidates may not necessarily need specialisation. Figure 3.7 shows a complete activity system of the case study organization, showing the different components of the activity system.

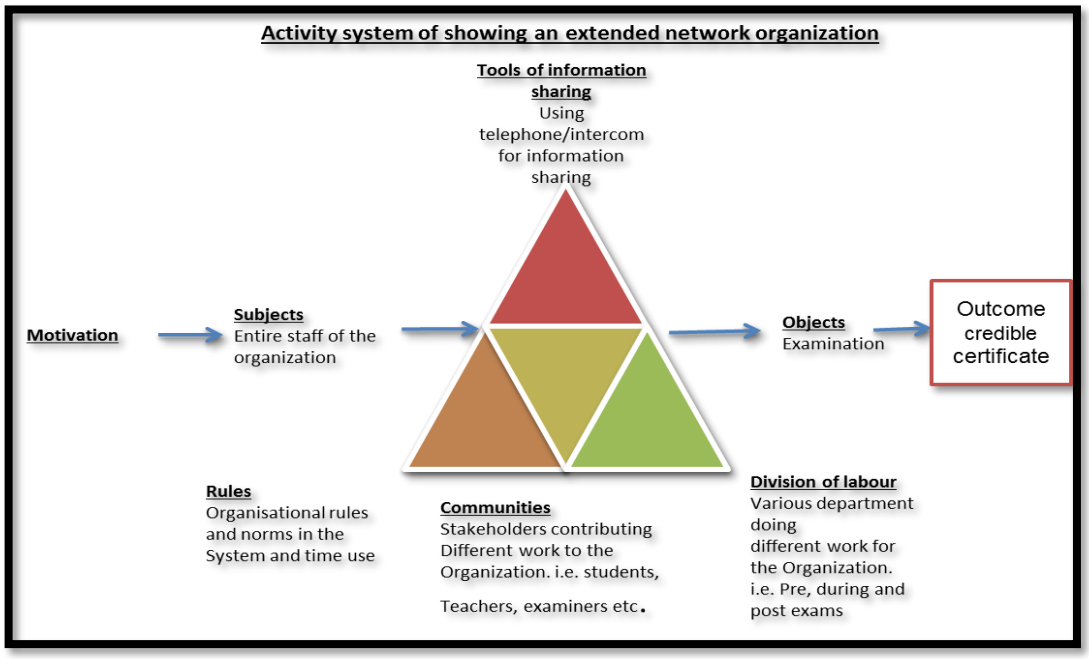

Figure 3. 7Activity system of examination. ***Source: Author 2017***

3.9.5 Contradictions in the activity system

To understand the failures and the innovations in an activity system one must be able to identify the contradictions at all levels of the activities, manifested through deviations from the original norms and practices in the system, also called disturbances, responsible for causing constant instability in the system (Engeström, 2000).

Similarly, Barab et al. (2002) discuss four different types of contradictions, primary, secondary, tertiary and quaternary, as shown in Figure 3.7 below. The usefulness of contradictions is seen to bring about changes in the activity system as a result of the instability caused by the disturbance (Engeström, 2000).

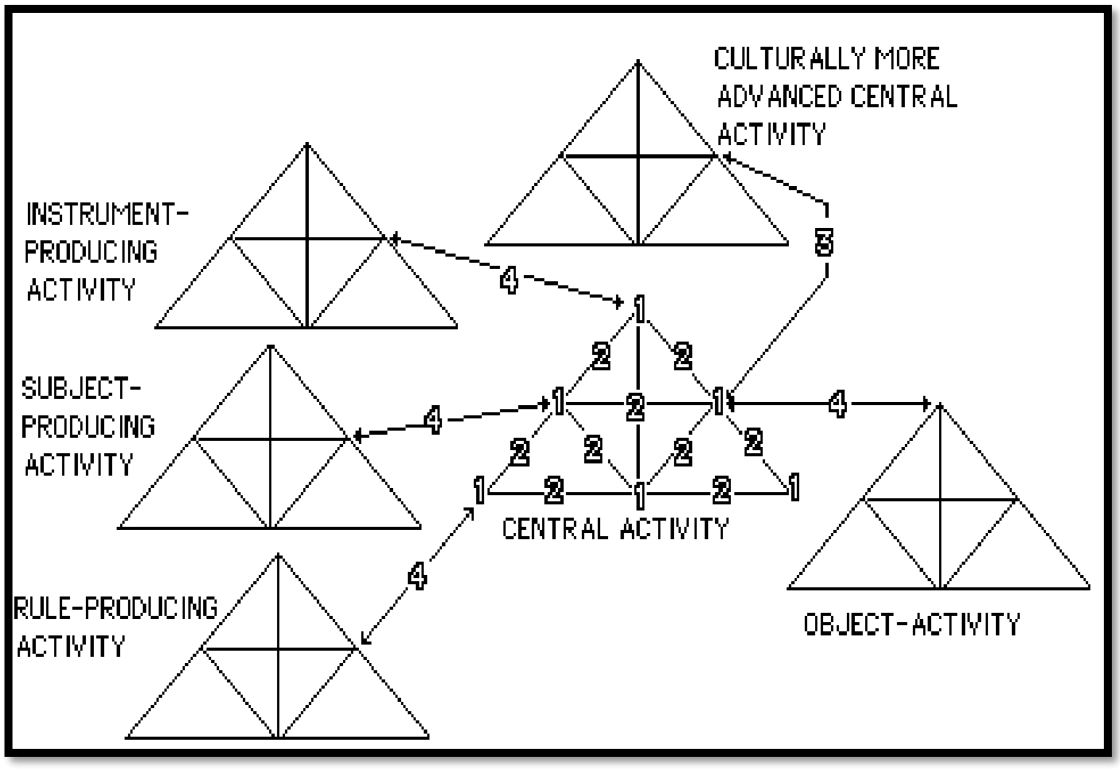

Figure 3. 8 Showing the four different types of contradictions: Source: Engeström 1987

Above is a schematic representation of the four levels of contradictions as stated by Barab et al. (2002). The primary contradiction is seen within each of the constituent components located in the central activity. The secondary contradictions are observed between the constituents in the central system. The tertiary contradiction is situated within the objects between the dominant form motive of the central activity and the culturally advanced motive form of the central activity while the quaternary contradiction is seen between central activity and the neighbouring activities. On the other hand, conformity to expectation causes congruity in a system which is seen when all the expected outcomes are as expected (appropriateness).

3.9.6 The strength and weakness of activity theory

In looking at the strengths and weaknesses of AT, like any other theory, it will have areas of weakness and strengths, AT has its strengths and weaknesses, issues and challenges as raised by many scholars. Researchers like Redmiles (1996) and Spasser (1999) commend the approach for producing comprehensive explanations of circumstances of the activity system under review which is responsible for a better understanding of the world.

The understanding of the nature of the world, according to Barab et al. (2004), is a tool for logically integrating the roles individual and environment play in the understanding of the nature of the world, which includes the issues around consciousness, intentionality and the type of history associated with both the individual and environment. Another strength of AT is its ability to provide the researcher with the understanding of the activity system under investigation, both at the level of individual and as groups (Nardi, 1996). Some other benefits relating to work setting are the use of mutually understood language in describing the different work-related situation and the ability of the approach to accommodate different approaches with a particular theoretical context (Worthen, 2001).

The strengths of AT are discussed in this section, the weaknesses also considered. According to Bannon, (1995), the approach is deeply reliant on own understanding as there is no analysis of the behaviour found in the activity systems. Similarly, according to Redmiles, (1996), the approach can be rigid in explaining situations. Others see the approach more as assumptions rather than explanation (Bannon, 1995; Redmiles, 1996). Moreover, researchers like Wright (1996) describe the approach as lacking an agreeable definition involving key terms around objects while according to Jarzabowski (2003) the approach is weak in illumining the sustainability of changes generated by contradictions in an activity system.

3.9.7 Limitations of the different AT generations

n this section, the limitations of all the three approaches in AT are discussed. The theory is known for identifying areas of tensions and contradictions which are linked to failure and bring changes to complex and extended setting.

Though the general concept of AT has been applied extensively in other settings, among which are the study of human performance at work, the approach has more often been used in circumstances where social and organizational problem understanding is needed, such as “developmental work research” and work activity dynamics (Bedny & Karwowski, 2003).

This same approach (AT) is described by Khayyat (2016) as an approach that is still evolving and developing and states that three generations of the theory, have so far been put to use with limitations. The first-generation activity theory (1GAT), according to

Engeström (2009), was built on Vygotsky's idea of mediating the action of activity. However, this approach is described as being individualistic, since it only considers one subject that engages with tools to achieve an outcome (Engeström, 2009; Khayyat, 2016). Another key limitation of 1GAT is that it does not consider the social aspects of relationships and other factors needed for extended relationships (Montoro & Hampel, 2011; Khayyat, 2016).

Second generation activity theory (2GAT) was based on Leont'ev's idea of an activity system which expands the scope of analysis of the theory to include a range of additional elements, effectively developing a larger activity triangle to include the rules, community and division of labour as components. 2GAT was proposed and developed by Engeström (1989) and a range of other authors who defined a system of activity as a collaborative process which serves as the generator for a continually emerging context (Engeström, 1989).

The expansion effectively addressed deficiencies identified in 1GAT, and the core feature of 2GAT is believed to be the human action seen as its unit of analysis. 2GAT also suggests how the components of the activity system evolve in coordinating the other parts driven by systems aimed at resolving contradictions (Khayyat, 2016).

The 2GAT also gives an idea of the distribution of human action, and it considers other people who have relationships with the system; i.e. the community and different division of labours. However, according to Khayyat (2016), these two approaches are limited by their ability to have more than a single activity sharing one object. This singularity of activity system and object materially restrict the ability of second-generation activity theory to examine modern work settings with multiple systems and activities.

The introduction of the 3GAT, which is presently the recent approach use in AT research, is based on multiple interactions which ratify and takes into consideration the numerous activities which are part of a set of different activity systems that are based on a shared object (Roth & Lee, 2007).

The use of 3GAT and its approach has guided the process of this study from the beginning to the analysis stage, as it took into consideration multiple activity systems as

in the case of the 21st-century work environment. It highlights the part of a setup of different activity systems that in its totality creates the need to interact with each other. The process has helped to understand more in-depth extended relationships as a collaboration, which is deemed necessary for organizations to deliver their business aims and mandates (IRM, 2014; Provan & Lemaire, 2012; Rouse, 2012; Spinuzzi, 2014).

Thus, AT is a good fit because it has guided the process of this study from the beginning to the analysis stage taking into account the type of collaboration found in the 21st-century work environment. It has also helped to unpack and understand the key drivers of extension in organizations and, this, as already noted, tends to engender complexity both in and between relationships and activity systems. However, these criticisms are recognised as valid and have been mitigated by the introduction of 4GAT to accommodate a flexible element for a better understanding of the extension and complexity reported. The complications are attributed to different operational methods that come into play as different organizations collaborate, and different tools that are needed to communicate with collaborating partners to achieve the shared aims. The approach also aids the understanding of change and expansive learning at work, concerned with stabilisation and destabilisation of process and procedures (Engeström, 2001; Landy & Conte, 2016).

In trying to understand the complexity of the case study organization, the next section conceptualised how the different lenses are used in this study.

3.10 Conceptualisation of the case study organization and the need for collaboration and networking with team formation

Putting the case study organization in the context discussed, to understand the complicated relationship they are involved as shown in Figure 3.9. AT is used in examining this organization charged with the responsibility of conducting examination leading to the award of a credible certificate which is dependent on its community and involving different stakeholders and different forms of division of labour.

The idea of a credible certificate mentioned before is discussed further in this section as the overall activity and a shared object for the subjects, community and division of labour using tools and rules to mediate their actions. This activity produced certificate that must

be credible and accepted for use with other stakeholders that consider it for admission to schools or employment.

The different stakeholders are therefore involved in the process of this examination and rely on the expected outcome, i.e. the shared object as shown in Figure 3.9. This shared object can also be an input for other organization in the relationship, e.g. the universities use the credible certificate for admission of new students into different programmes. As a result of these relationships, there is the need to network, partner and collaborate with the various stakeholders who the organization is dependent upon, and see as important partners, to achieve the organizational mandate.

Figure 3.9 shows the need for networking with the various communities of stakeholders who perform different functions for the organization. This networking is a way of innovation and drives the creation of added value through gaining new knowledge, sharing organizational risk and resources through complementing skills and capacities (Romero & Molina, 2011).

The need to understand the inter-connectedness existing between the elements of a system and the degree to which such relationships relates is of importance. The connections as discussed under coupling in section 2.5.2, can either be loose or tight, depending on the degree to which an organization is dependent. Moreover, some degrees of relationship call for a stricter kind of relationship where control is necessary, and the use of rules is essential, other relationships call for a looser type of relationship aimed at adjusting to environmental challenges. Table 3.3 also shows the conventional practice involving tools, subject and object and how the rules/ norms, communities and division of labour affect such relationship.

Table 3. 3 Expected practice involving tools, subject and object and how the rules/ norms, communities and division of labour affects such relationship.

Tool and nature	User(s) and uses	Rules / norms governing	Communities (coupling, knots?)	Division of labour	Notes (e.g. cyclical importance)
Email/official mail Email systems are common across virtually all of the participants in the activity systems and are used routinely for both formal and informal communication.	Mostly used by subjects, communities and different division of labour. Email is used by virtually all groups as a basic tool of communication. It is more likely to be used for explicit rather than tacit knowledge and information and is, however, unlikely to be used for rumour, unsubstantiated communications etc. by people who don't already have a strong level of trust	The use of email is governed by a set of organizational rules restricting the type of information which can and cannot be shared. Overriding and above these are national rules – although it is highly unlikely that in the case of a routine examinations operation the law would be breached. It has become the norm for people, wherever there is a level of trust to use email for a "gossip" level of communication – for example problems, complaints about managers or jokes.	Email are used between both loosely and tightly coupled parts of the organization (using organization and the wider sense of the extended framework) although it is more likely that informal use will be higher where coupling is tighter, and trust has been established. Email may well facilitate performing of knots for knot working in the sense that there are some of the precursors to knot formation present if there has already been some communication.	Email systems operate pretty well automatically without any specific division of labour, but they will be a prime means by which the division of labour – in order to achieve the organization's objectives and mandates – are discussed and operationalised. As such there will be both senior and junior users and a fairly pervasive use of the medium.	Email communications are likely to increase significantly at times when there is pressure on the organization as an individual or the organization in the extended sense to attain goals, when there are problems, or when a level of formality needs to be brought into what might otherwise be a corridor conversation.

Telephone/Intercom systems. Given the nature of the changing environment due to uncertainty, it is faster to use telephones for quick feedback, ensuring the message gets to the right person.	All stakeholders are presumed to have telephones and, in a situation where changes need to be affected immediately, the use of telephones becomes more reliable and faster in reaching such stakeholders. Although this tool can be used in both formal and informal ways, there must be a distinction between official and unofficial calls.	The organizational culture allows for such contact even when emails are sent. This is since most people check their mails infrequently and information in such situations must be delivered promptly. Formal communication has to come from a formal channel not through any member of staff. This helps to distinguish instruction from rumour.	The nature of knots and channels of communication are established in reaching the various stakeholders. The use of coupling must be tight in such circumstances, as loosely coupled systems will mean passing information which does not originate from the centre.	A clear division of labour is used in this circumstance as each group has a contact and spokesperson. This process helps make the organizational objectives more achievable.	The nature and importance of timing in the conduct of examinations to be considered also for faster implementation of changes and flexibility in the process of communication. Telephones are an acceptable means of making formal changes, regularised using email and official means of communication. This process is however seen as cyclical and more likely to form part of the change process.
Face-to-face means, communication based on groups, departments and stakeholders	Informal means of communication are considered important in times of urgency. Such forms of communication can later be supplemented with official memos or follow up letters.	No rules apply for informal means of communication, but when this is formally confirmed it then becomes official communication which means all the rules and regulation regarding emails/official mails apply.	Informal means of communication may apply as there are times that information is sent by using the telephone and face to face messages for immediate action before an official communication is sent. Depending on the urgency of what needs to be done,	Such could also apply to divisions and division of labour.	In the event of making a decision, a senior officer who will take responsibility for his action issues an informal message which is complied with because the source has sufficient seniority to be responsible.

			unofficial means of communication can serve to make things happen. This is because it does not go through all the needed approvals and office politics.		
Subjects	User(s) and uses	Rules / norms governing	Communities (coupling, knots?)	Division of labour	Notes (e.g. cyclical importance)
The subjects here are the entire staff of the organization. They can also be considered as a department. So here they are individuals or groups in getting things done using tools and taking advantage of intra and inter connectedness with various stakeholders.	They have the absolute responsibility of ensuring that the organization achieves its mandate of conducting exams and awarding credible certificates. Use of departments is made for specialisation as each department has a particular role it wants to achieve.	The rules and regulations guiding both senior, junior and management staff are in operation, and it is expected that each and every staff member complies with them. In addition, there is an examination rule which is binding on all subject to the exams, either as a staff, candidate or stakeholder. Deviation from the rule is an abnormality and is subject to sanctions and punishment in order to keep others in check and avoid such mistakes.	The subjects are normally from different departments which are responsible for a particular aspect of the exams and specialised in that aspect. They must still work with other departments for the continuity and success of the exams. For example, the exams admin department is responsible for every aspect of the examination administration. The Post Exam department is responsible for any aspect of the exams after administration, like the marking, committees for exams. Here the subjects are expected to work with others outside the	Division of labour is necessary here: the exams are undertaken both sequentially and in parallel. It is expected that a team handling a particular aspect must finish and hand over to another team who will continue its part and then hand over to the next team….. The finished product of a team here is the raw material of another team. It is therefore necessary to	The subjects are the engine room for the entire examination and must combine with other specialisations to achieve that success. This requires networking, formation of knots, and the use of either tight or loose coupling as the situation warrants or outsourcing part of the work where the specialisation does not exist within the organization. For example, markers, practical examiners, shorthand readers etc. The complexity here is that all the different groups must relate and interact with each

			organizations, like the stakeholders, to jointly deliver the expected outcome. Flexibility is needed in relating with various stakeholders. Not only that, stakeholders are expected to form part of the team delivering an outcome, therefore, formation into knots is necessary to achieve a particular task.	network and interact with different teams. Information sharing must be constant in keeping the various teams informed about the next line of action and reporting back on outcome.	other. The subjects here determine the form of control to use in keeping such relationships and inter-connectedness, as shown in fig.1. Uncertainty and changes could occur at any stage of the examination and may require different approaches. For example, a change in exams date due to unforeseen circumstances will require new question papers, distribution of the papers, and new processes, each of which requires input from different committees.
Object	User(s) and uses	Rules / norms governing	Communities (coupling, knots?)	Division of labour	Notes (e.g. cyclical importance)
The object is the examination as seen in fig. 3.7. This object is shared with all the stakeholders involved in the examination process.	The sole mandate and responsibility of the organization, and this organization does not have the technicality of handing all aspect	The object must be acceptable to the general public; consequently, the exams must be conducted in a manner	The entire process of examination is conducted based on planning using the right people for the job. Different activities take place from the sale of	Division of labour, dialogues between different communities, presentation of different	The object activity is characterised by uncertainty due to different stakeholders working together. The importance of time is

All the different activities are targeted towards the success of the exams. No activity/interaction/relationship takes place without reference to the examination	as such relies on stakeholders who also benefit from such relationships. For example, the schools produce candidates for the organization to examine. The relationship is based on social understanding and the school may not have existed and if there are no candidates to examine, the organization has no business operating.	seen as transparent and acceptable to all their stakeholders. There is no room for mistakes or misconduct. It must go according to plan with no deviation. This therefore, calls for the implementation of strict rules and regulations. Sanctions are passed on to any defaulting stakeholders in the event of failing to meet up with standards. Staff are faced with punishment for compromising standards and checks are in place for smooth implementation of rules.	forms to the release of results. These different activities are sometimes based on contractual agreements and are sometimes based on social interactions. Networking with various groups in order to achieve success calls for using specialisation in the form of knots and forming temporary committees with different stakeholders, partnering, collaborating and using coupling for control. Problem solving is the key characteristic of the involved communities and must be timely. Uncertainty may crop up and the use of knots is appropriate to tackle such situations.	perspectives and networks of interrelating activities between activity systems are important for conformity, which is also called congruence. This informs stability and is an indication of a working system. Any deviation is a sign of contradiction and may require changes to take place.	highly noticeable as time is a means for measuring success in the system and needs adaptability to meet the increasing challenges of a changing environment. This is very important in maintaining relationships which are seen as complex.

In trying to explain the forms of relationships existing between the different stakeholders, a bigger picture of the way stakeholders and organizations relate is conceptualised in Figure 3.9 which is based on a shared object showing different entities that work towards achieving the shared object, centred on information sharing within the different bodies or complex communities.

Figure 3.9 depicts four different stakeholders that depend on examinations to obtain a credible certificate which is a then used as starting input for each stakeholder. Information sharing through the use of technological tools and face-to-face methods is essential in maintaining relationships and keeping each stakeholder informed about the process of examinations. It is therefore expected that candidates, staff, employers of labour and universities (all stakeholders in Figure 3.9) abide by the rules and regulations governing the conduct of their organization, in addition to that of the examination. These networks of interactions and relationships within the activity system proceed either in parallel or sequence but culminate in examinations which produce an outcome certificate. It is important to note that some smaller activities are carried out within larger activities (described as nested activity), and this also implies that different activities are located within a particular identified stage. An example is Figure 3.3, showing the different stages of examination with different activities at each stage.

There is a shift from considering single stakeholders, as seen in Figure 3.4, which represents a limited first-generation activity system, to a multi-stakeholder network as seen in Figure 3.5 (second generation activity), which reflects the importance attached to partnering and alliances between various stakeholders with a view to solving a specialised problem, as is in the case of knot-working as stated by Engeström & Kerosuo (2007). The addition of more stakeholders in multiple relationships and the need for more interaction introduced the third-generation activity theory. The ability of third generation activity to tackle the expansion to numerous organizations is demonstrated in Figures 3.6 and 3.7, especially, where the communities are large and extended as in the case of the examination board.

The examination organization is characterised by division of labour, which is essential, due to the need for specialisation and expertise in the various components of the exams

and for specific problem solving that is necessary to meet the expected outcome of the overall activity system.

The scenario depicted above (the examination setting) is similar to the concept of networking, where social systems are used in coordinating both intra and inter-firm's relationships to safeguarding exchange by way of either socially binding or contractual agreement, formal partnership or natural collaboration. Network interactions are seen as a way of information sharing with stakeholders, which proceed in a multi-dimensional way, as seen in Figure. 3.9, where actions are all channelled towards the shared object to achieve an outcome. These actions are taken by stakeholders who rely on the examination for survival, and the interactions here are done both in sequence and in parallel.

This type of networking requires different stakeholders to come together for a common goal, and at the right time, to perform their part of the responsibility as shown in Figure. 3.9. An example is where the suppliers of examination materials must supply those materials using agreed contractual terms. A failure to do so means the examinations cannot proceed, or markers must mark within the stated period for the organization to be able to release the results in time for Universities to use for admission. Similarly, employers of skilled labour rely on the exams to get certified skilled workers to fill specialised skills vacancies.

As a way of summary, section 3.10 conceptualised the type of relationships found in the case study organization which was used as the example of complex and extended setting as shown in Figure 3.9. Activity theory has been used in this section to explain the concept of division of labour, shared object and different stakeholders as communities involved in making the shared object work. The section also highlights the likely drives and complication in sharing information amongst extended collaborators.

Having described the picture of the research settings, the paradigm and the framework used, the next section discusses the research design and methods used in carrying out the research.

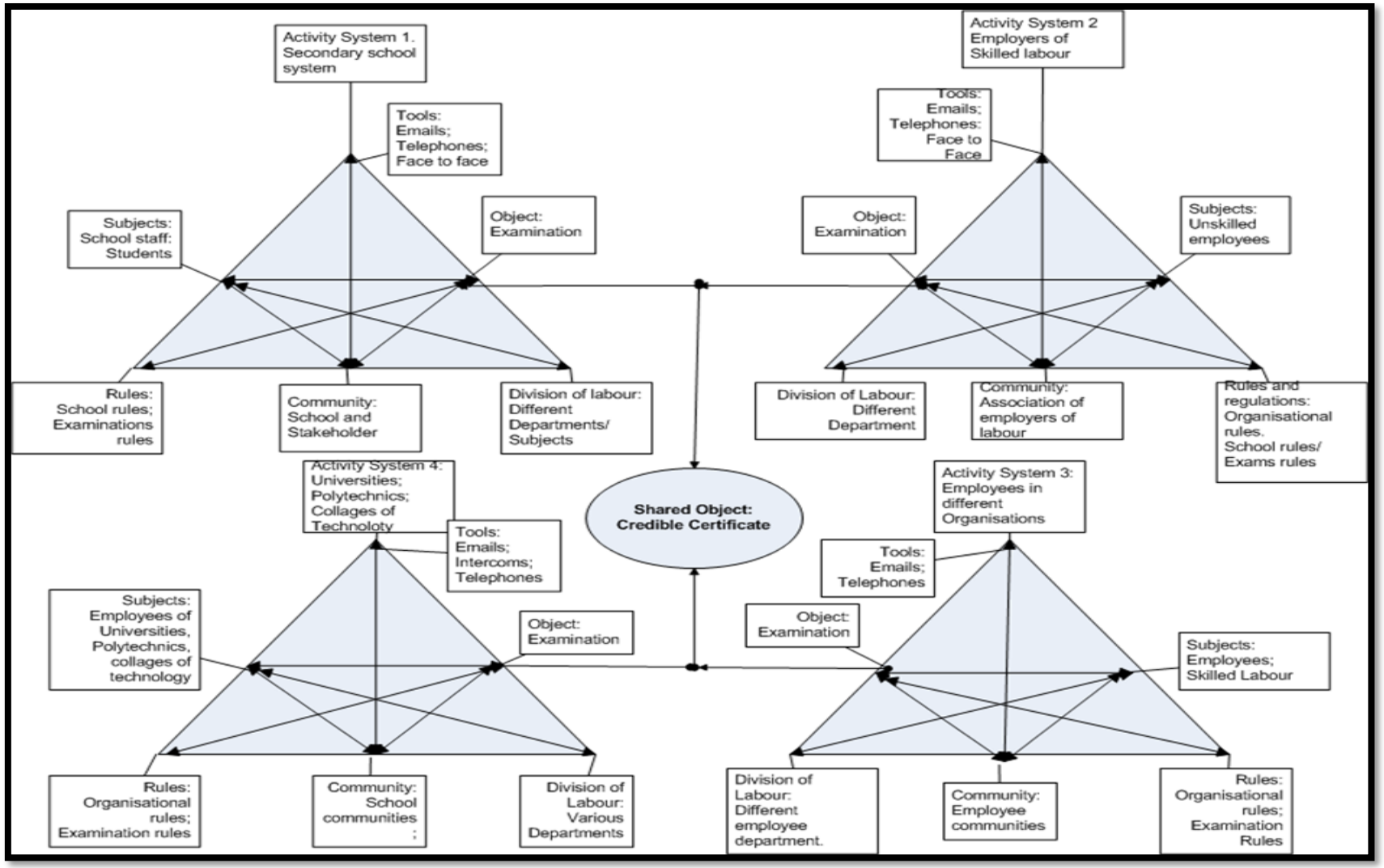

Figure 3. 9 Conceptual model of complex and extended relationship: *Source: The Author*

3.11 Research design/methods

A good research design must clearly define the research purpose and show coherence between the method and research questions as well as generating valid and reliable data (Ritchie et al., 2013). For research of this kind, a qualitative methodology was employed, and AT was used as a framework for understanding the complexities in relationships and as a meta-lens to frame the investigation and direct the data collected.

Considering this research as an interpretive case study means exploring an organization considered complex. This study is in line with other studies like that of Bevir & Kedar (2008); Klotz & Lynch (2007); Prasad (2005) and Yanow & Schwartz-Shea, (2006). The use of the case study approach allows the study to focus on an organization intending to a generalisation using findings of similar organizations.

However, for the issue of validity, as discussed in section 3.5, this research uses four different categories of the sample for robustness and credibility. These are 1) management staff of the organization; 2) middle level managers in the case study organization; 3) stakeholders outside the organization who have dealings with the organization and 4) the products of the organization's examination. These four different categories support both robustness and credibility as discussed and are covered in a single case study.

An interpretive methodology sees every human act as a meaningful interpretation of its situation (Bevir & Kedar 2008). The approach also helps individuals working in groups to construct different meanings of reality as a result of activities in the system. According to Falconer & MacKay (1999 p.288), qualitative researchers describe “things in their natural setting, attempting to make sense of, or interpret, phenomena concerning the meaning people bring to them”. Case study research is defined by Yin (1994 p. 1211) as “an enquiry that investigates a contemporary phenomenon within its real-life context especially in a research situation where the number of variables far outstrips the number of data points”.

3.12 Samples

This research uses non-probability sampling, associated with qualitative research for selecting the sample population. This method allows the selection of a sample to reflect some particular group features of the population which is not statistically intended but purposive (Mason, 2002) and which has some specific features that will allow more detailed understanding of the researcher's aim. This approach enables the researcher to choose a sample based on purpose, with the aim of covering the key constituencies and ensuring some representation of diversity (Ritchie et al., 2013). The samples are based on AT initial analysis which defines the subjects of this research.

3.12.1 Defining the samples

A total sample of 46 was used for this research, based on convenience and chosen from NABTEB, to include 15 members of management that were willing to take part and 12 middle level staff from the headquarters and the north-central zone of the office which serves as the country's capital and where all forms of diversity in the workplace are present. Also, 11 external stakeholders took part in the interview and 8 end users of the case study products.

The stakeholders are mostly from the country's capital (Abuja) and covered the Federal Ministry of Education, and similar organizations as the case study organization, as well as Universities, Polytechnics and Technical Colleges. For the end users, it covers the employers and former students working on their own who are now also employers. Initially a total of 35 staff, end users and stakeholders were listed for the interview but as the interviews progressed more staff indicated a wish to take part, which took the number from 20 to 27 and stakeholders from 10 to 11, while that of end users from 5 to 8. These changes and a willingness to participate could be attributed to the friendly atmosphere in which the interviews were conducted, especially for staff, since management did not interfere with the selection process.

3.12.2 Samples and participants

Sampling in interpretive research uses contextual factors which are common in our daily life and the generality of our social situation. This, therefore, requires that the participants must have knowledge and experience of the circumstances which the researcher is

studying (Coyne, 1997). Non-probability sampling was used to determine the sample but was guided by response according to departments in the organization. The researcher targeted a specific group of staff directly involved with examinations for the interviews and observations. This group was composed of staff who were directly engaged in the activity of interest to the research, which is the examinations.

According to Marshall (1995), the choice of research sample is of importance, since it is not possible to study the entire population, and therefore a representative sample must be drawn from the population which must have the general characteristics of the main population, called subset. This subset will represent the totality of the population as it is a smaller group of the main population. For this reason, considerable care was taken in ensuring that the subset was not biased. Marshall (1995) proposes three sample strategies as convenience sampling, judgement sample and theoretical sample. For this research type consideration was given to convenience samples and a few based on purposeful sampling for observation.

3.12.3 Access to samples

Access to field sites, which in this case is an organization, was negotiated before the commencement of fieldwork, through email, and permission granted via a formal letter allowing the researcher to conduct the interview (see appendix 1). Bearing in mind the nature of the organization and practicability of meeting staff from the chosen organization on the ground, due to examination activities, it was important for the researcher to obtain permission on time. Also, since the researcher is still a member of the staff of the organization, the case study organization was also hoping that the results of the research would be of practical use to the organization and, indeed, to others.

3.12.4 Recruitment of sample

The initial stage of recruitment of interviewees was as a result of face-to-face meetings where the researcher explained the purpose/aim of the research. The issues concerning anonymity and data protection were highlighted, assuring each member of staff that no one would be victimised as a result of participating in the interview. The interview consent forms were distributed and kept at the entrance of each department for staff to pick up, complete and return directly to the researcher. Subsequently, the time and location of the interviews were discussed, with these taking place on the organization's

premises and during working hours. All those that took part in the interviews gave their full consent.

3.13 Type of data collected

The research interest was in the way organizations enable information sharing, specifically within the context of complex extended organizations. The focus was on shared information with regard to the core operations of the organization (the setting, delivery, assessment and validation of vocational qualifications) and this includes both the content of examinations and the operational requirement of the delivery of the correct number of examination materials to the right candidates in the right examination centres. The operational requirement also involves the assessment and return of marks from examinations, and the integration of this information with candidate and examination centre information, in order to provide reliable results to candidates and centres. Much of the data was in the form of text, some spreadsheets, telephone conversations and emails. None of this information was in graphics or pictorial form. The interviews were recorded and later transcribed into a text form, with the audio recording being immediately deleted.

3.13.1 Duration of data collection

An initial proposal was made to the organization concerned that allowed the researcher a three weeks rotation in each department, to understand how information is shared within these departments between staff and with the stakeholders that deal with them. It was during this period of rotation that the researcher conducted interviews and carried out observations of a team as they performed their job roles. Observations were of the activity of a department and permission was sought both from Directors of the department and from the individuals in that department collectively (some by email). Where staff refused permission to be observed, data collected from that observation was not used.

3.13.2 Writing the report

The report was based on the analysis of findings and observations conducted in the field. Notes written down during data collection stage are referred to during the report writing to be sure nothing was left out. The report covers the type of relationships existing in organizations considered to be complex, the general problems encountered during the

entire process of this research and what was learnt from this study. The process of writing which started with the initial first-year proposal was that of 15,000-word document produced which served as the handbook for the research. This first generated document ensured that everything was done as specified in the plan (proposal). The same proposal was the basis for getting ethical approval. The final report allowed for up to 100,000 words.

3.13.3 Reflecting on the data collection stage

For this type of research, reflecting is a way of supporting the reliability and validity of the study. This requires the researcher to have reflective skills, together with a good understanding of ethics and practice guiding the conduct of such research needed at all stages of the data collection (Delamont, 2004). An aspect that reflects the experience is understanding the timing of exams which coincide with the period of data collection.

3.14 Ethical considerations

Ethical considerations such as privacy, autonomy, consent and care for the interviewees' well-being were of great concern during the planning and execution of the data collection phases. Approval was obtained from the university before embarking on the data collection stage (see appendix 2 for ethical approval). The University of Leeds ethics code of practice, the guiding principle of academic excellence involving the community covering integrity and professionalism, was applied in the research by keeping the identity of respondents anonymous while seeking their permission notes and audio recordings of the interview (see a copy of consent letter as appendix 3). Consent letter was used to ensure that respondents willingly attended, and the interview conducted in private, not in open place. It should be noted that most of the data collected by observation were not of the performance of individuals but the performance of roles. However, before the start of both interviews and observations, the purpose of the research and its intended benefits were explained to each participant with assurances regarding anonymity and that there would be no victimisation as a result of participation in the study.

On the issue of the vulnerable group such as children, this research did not involve any vulnerable group. Standard procedures with regards to consent were followed, and it was made clear to respondents that if there were questions, they did not wish to answer they

were free to skip these. It was also highlighted to respondents that if there were information which they believed would identify them they are free to highlight this to the researcher who would ensure that this was not included in any analysis of data.

Respondents were also offered the opportunity to see transcripts and MP3 files to review them before they were incorporated into the data for analysis. None of the respondents showed interest in that aspect of the research. Data files, including notes and recordings, were stored temporarily on the researcher's laptop but were transferred to the secure SharePoint system operated by the research group with which the researcher is working.

3.15 Conclusions

This chapter reports three main components of this research as philosophy, approach and methods. The aspect of philosophy dealt with the research paradigm, underpinning and justification. Followed by the epistemology and ontological worldview, the researcher's role, validity and reliability of research.

The approach looked at research approach justification, data collection, data sources, justification of the semi-structured method used, observation, document analysis. The use of social constructivism and particularly an interpretive position as a meta-theoretical underpinning were discussed. The used of activity theory as the identified framework was reported in understanding and addressing the complexity involved in extended relationships. AT approach according to Karanasios et al., (2009), is becoming important in information science due to the ability to frame an investigation. The theory is, however, concerned with human behaviour which is embedded in activities (Allen et al., 2013), this approach is used for better understanding, helping to explain the nature of complexity in the setting further. One rewarding feature of the theory is its ability in demonstrating where and how contradictions and tensions have led to failures in information sharing, the collapse of information sharing processes.

The methods discuss the sample, data collection, analysis and ethical consideration. The chapter shows in detail the entire process of this research and justification of the validity and reliability of data collected with a view to answering the research questions as discussed in the next chapter which is the findings and analysis.

Chapter 4 Finding and Discussion: Collaborative information sharing behaviours in complex and extended organizations

4.1 Overview

The focus of this chapter is to report and discuss the findings that emerged from the reported and observed behaviours of participants involved in collaborative information sharing. The behaviours were observed in complex and extended settings comprises NABTEB and its stakeholders. These behaviours are part of the activities described in the examination stages shown in Figure 3.3 and are centred on the shared object which is the credible certificate involving different stakeholders. The aim of the chapter is therefore to illuminate the organization and individual responses, primarily organizational, to show information sharing failures and do so differentiating responses in complex and extended setting, from responses in settings that are different, i.e. not complex and/or extended. Activity theory is the framework used to identify and analyse the activity systems and areas of tension and contradiction.

The chapter is structured as follows: Section 4.1 provides an overview and introduction to the chapter, section 4.2 highlights and revisits the issues of complexity and extension as discussed in chapter 2 and places them against the findings from the data analysis. Section 4.3 then uses this analysis to examine the specific issue of information sharing failures in such settings which are placed in the context of the case study in section 4.4. Section 4.5 examines factors in the case study organization that creates positive sharing behaviours, and this and all the other sections are discussed against the backdrop of collaborative information sharing behaviours in complex and extended settings in section 4.6. Section 4.7 highlights the chapters' contribution and section 4.8 concludes the chapter.

The research at this stage contributes to the following research objectives;

1. To explore how complexity and extension influence collaborative information sharing in complex and extended organizations
2. Explore why information is not properly shared in complex extended settings and how organizations/individuals react or cope.

The above two objectives are concerned with the main areas of focus of this research, which are (1) complex and extended organizations and (2) information sharing failures.

Chapters four and five are based on AT analysis, literature review, intuition and intellect of researchers experience during the sense-making process as discussed in the methodology chapter in section 3.6 and supported by Tables 4.1 and 4.2.

Table 4. 1 Nodes/sources and references of transcribed data

S/N	Codes/Nodes	Sources	References	Created On
1	Aims of your Organization	31	37	09/01/2015 16:28
2	Articulating and vetting of memo by the Director,	1	2	27/01/2015 17:07
3	Body higher than your organization or is your organization the overall body	2	3	30/01/2015 11:26
4	Classify NABTEB according to type	2	5	12/02/2015 12:58
5	Collaborating with the office and officers sent by the Board.	3	3	24/01/2015 11:22
6	Collaboration as a necessary tool for staff with common goals	10	12	30/01/2015 15:10
7	Collaboration as a necessary tool in meeting NABTEB mandate	3	5	06/02/2015 09:46
8	Competition	12	18	27/01/2015 15:55
9	Competition and the mandate of NABTEB	1	2	02/02/2015 11:44
10	Concurrent list of both the federal and state	1	1	24/01/2015 11:21
11	Contribution to organization	4	5	27/01/2015 17:42
12	Credibility	7	9	12/02/2015 16:31
13	Difference in the way information is shared with the global community~	1	1	27/01/2015 11:30
14	Differences in the way global community share information (2)	1	1	27/01/2015 11:30
15	Direction of information	8	11	31/01/2015 12:39
16	Dual purpose certificate	3	4	02/02/2015 13:31
17	Effect of lack of collaboration on the mandate of that organization~	5	7	28/01/2015 19:33
18	Effect of lack of total collaboration on individual work~	2	2	31/01/2015 12:48
19	Ensuring integrity	21	30	24/01/2015 11:22
20	Examination malpractice	6	9	31/01/2015 14:26
21	Fear as a factor that hinders information usage	3	4	30/01/2015 14:38
22	Fear of making mistakes can prevent people from sharing information	1	2	30/01/2015 11:43
23	Financial gains in sharing information	3	6	02/02/2015 11:32
24	Gains of sharing NABTEB information	3	3	12/02/2015 21:38
25	Global culture as a problem in information sharing~	15	15	27/01/2015 11:29
26	How is information shared within the organization	9	12	24/01/2015 12:15
27	How often do you use information you get from others~	26	30	24/01/2015 12:42
28	In situation were by people are given different instructions	2	3	02/02/2015 13:39
29	Indicators in a system	11	11	09/01/2015 17:23
30	Individual culture as it affects collaboration in your organization	8	10	30/01/2015 12:08
31	Information failing to reach its target	1	1	02/02/2015 14:46
32	Information handling	19	28	24/01/2015 11:56
33	Information makes the organization better	1	2	12/02/2015 20:15

34	Information shared with stakeholders outside the organization	18	21	24/01/2015 12:22
35	Information sharing as a factor that determines use	27	30	24/01/2015 12:40
36	Information sharing in your organization, how you translate this into the mandate of your organization…	6	9	27/01/2015 11:53
37	Information sharing process as complex	17	27	27/01/2015 17:43
38	Information sharing with divisions	1	3	02/02/2015 12:39
39	Information sharing with global partners' or similar organization globally	27	38	24/01/2015 12:31
40	Information sharing with others in carrying out the function of the organization~ (2)	7	7	27/01/2015 11:25
41	Information sharing with similar organization beneficial	17	25	24/01/2015 12:28
42	Information used for	1	3	12/02/2015 21:05
43	Interact with others while performing any of this information sharing roles~	10	10	28/01/2015 19:25
44	Is there trust between you and other staff while carrying out your duties	1	2	30/01/2015 15:40
45	Level of collaboration. (Partial or Total)	9	11	27/01/2015 12:36
46	Main actors	28	35	24/01/2015 11:06
47	Making certain decisions	5	6	28/01/2015 19:03
48	Mandate delivery	2	5	03/02/2015 18:36
49	Minimizing overhead and maximizing outputs	10	13	30/01/2015 11:54
50	NABTEB as an organization depend solely on its stakeholders to achieve its own mandate	3	5	11/02/2015 20:31
51	Necessary for NABTEB to share information with this other sister organizations	4	5	11/02/2015 21:43
52	Non-credible examinations	2	3	02/02/2015 14:02
53	Organization mandates and other effects	8	12	02/02/2015 13:52
54	Organization using the information	6	8	30/01/2015 13:10
55	Organizational culture	27	31	24/01/2015 12:06
56	Passing information from headquarters to the zones	1	2	05/02/2015 15:58
57	Positive information	4	6	12/02/2015 21:12
58	Problems or issues that need attention	27	33	24/01/2015 11:44
59	Problems that hinder information sharing	25	53	24/01/2015 14:03
60	Relate with NABTEB	3	3	12/02/2015 18:56
61	Relationships that exists between you as the zone and the other stakeholders	2	3	05/02/2015 15:59
62	Relationships with them collaborative or official~	33	44	27/01/2015 11:28
63	Relationships with group of stakeholders	12	15	24/01/2015 12:13
64	Rules in respect to information handling	24	31	24/01/2015 12:00
65	Sanctions for Making mistakes	5	5	24/01/2015 12:05
66	Seeking for information	1	2	30/01/2015 15:06
67	Sending information through other means	1	2	30/01/2015 11:18
68	Sharing information with group of stakeholders	34	52	24/01/2015 11:51
69	Shortcuts to getting things done in organizations	23	33	24/01/2015 12:09
70	Supervision	2	3	31/01/2015 14:03
71	Team work and collaboration	2	3	31/01/2015 13:58
72	Things that encourage the sharing of information in your organization~	12	18	24/01/2015 12:15
73	Things that encourage the sharing of information in your organization~ (2)	11	12	27/01/2015 11:28
74	Tools used within the organization for information sharing	6	8	27/01/2015 16:33
75	Tools which you use for information handling	23	36	24/01/2015 11:58
76	Use of relevant information	3	4	31/01/2015 14:18
77	Ways of improving the system	4	6	06/02/2015 10:08

78	Ways you pass information;	11	12	27/01/2015 19:07
79	What benefit are there for the two organizations	21	37	24/01/2015 12:29
80	What do you do with information you have no need for at that particular time	5	6	30/01/2015 12:56
81	What format does information come to you	18	21	27/01/2015 18:55
82	What will you say about information volume (amount)	2	3	30/01/2015 12:13
83	Where the information you handle for your role does comes from.	9	12	28/01/2015 19:24
84	Working as a Unit or Whole department in organization	4	6	02/02/2015 11:57
85	Acceptability of NABTEB certificates for admission	4	6	12/02/2015 16:30

Activity theory concepts as areas of tension and contradiction are considered as problems and drivers of information sharing failures. 'Complex and extended' as concepts covered in AT terms, drive consideration of communities, division of labour, subjects, objects and outcomes, and rules and norms. The six -themes as discussed in chapter three consolidate the nodes shown in Table 4.1 and forms the main areas of research which are, complex extended organizations with 7 nodes, Teams, knots and knot-working with 19 nodes, information sharing behaviour with 24 nodes; organizational culture, rules and norms with 4 nodes; tensions and contradictions with 9 nodes and ways of achieving organizational objectives with 22 nodes. Table 4.2 shows the themes at a glance for better understanding. The six themes were further merged with similar themes to produce the contribution chapters as explained in section 3.6. The part in Table 4.2 which mention colours are a shown in Appendix 5 from Nvivo as it allows colour coding for easy identification.

Table 4. 2 Themes consolidated

S/N	Theme	Denoted by colours in Nvivo	Number of nodes attached
1	Complex and extended organizations	Red	7 Nodes
2	Teams/groups, knots and knot-working	Blue	19 Nodes
3	Information sharing behaviour	Green	24 Nodes
4	Tensions and contradictions	Yellow	9 Nodes
5	Organizational culture, rules and norms	Purple	4 Nodes
6	Achieving organizational objectives	Orange	22 Nodes

4.2 Findings: Complexities and extension

This section reports findings on the complexities that are inherent and bound up in the extended relationships seen as inevitable in organizations that have to collaborate to meet the objectives for which they were established. Figure 4.1 below gives the framework of the chapter.

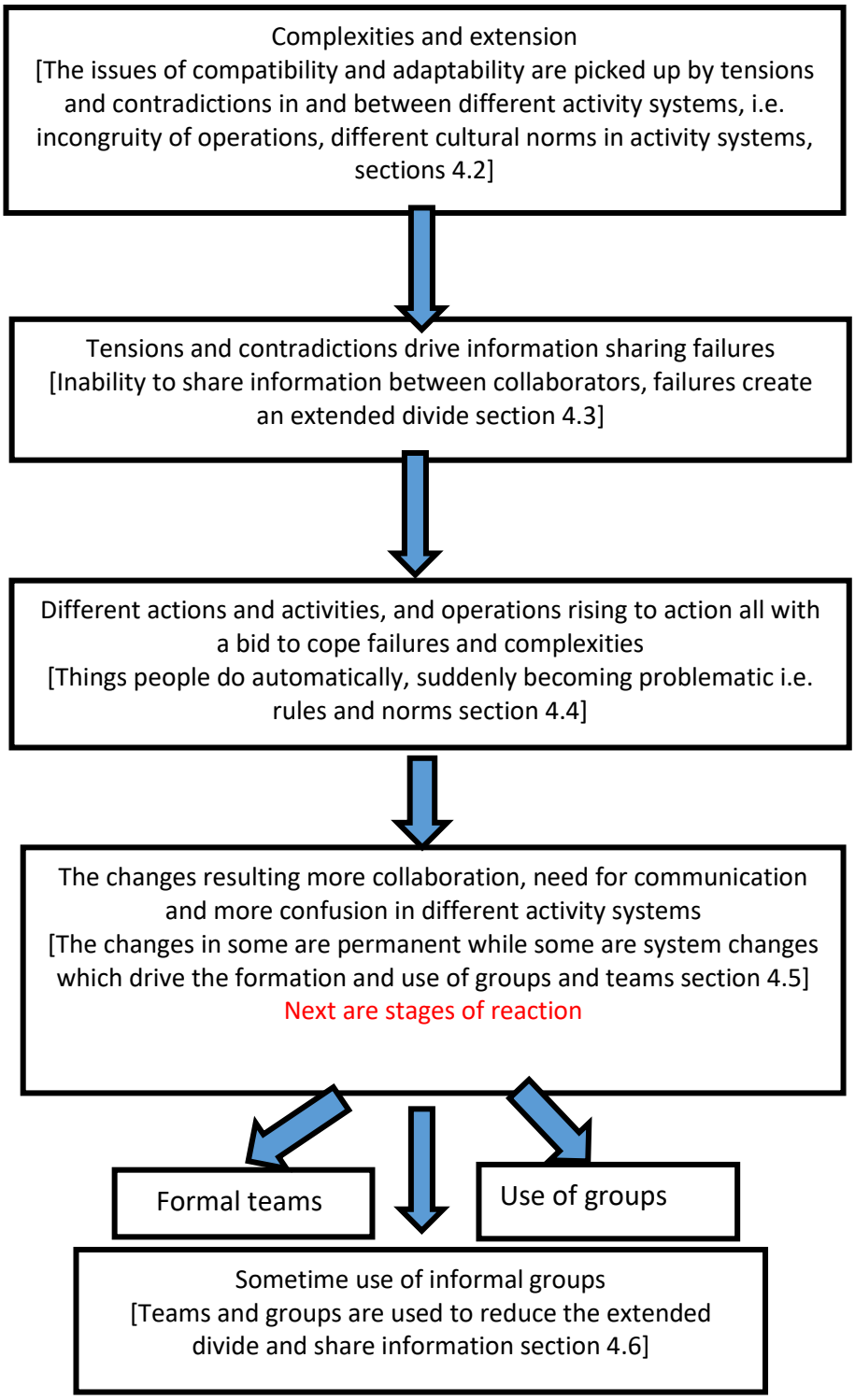

Figure 4. 1 Activity Theory framework of the chapter *Source: The author 2017*

4.2.1 Extended organizations

The inability of organizations to provide the totality of the services needed to achieve their stated objectives is one of the drivers of extended relationships. Organizations have, as discussed in section 2.3, become more dependent on supply chain relationships which draw on the skills and abilities of a range of partners (Liu et al., 2015; Ward & Zhou, 2006). These relationships are increasingly mediated by technology (Chengalur-Smith et al., 2012) with supply chains drawing on potentially global partnerships and relationships to operate at even a relatively local level (Lozano, 2008). The case-study organization draws on diverse skills and partners to meet their overall objective of delivering a 'credible certificate' (as discussed in section 3.8). This form of relationship entails both areas of difference and areas of congruence between extended partners. The term congruence used in this section is based on Activity Theory and is used in this study to refer to areas of similarities both in tools and services.

The definitions of complexity and extension used in this chapter are reviewed in the literature broadly, however, the two concepts are linked. Extension refers to the extent to which the organization has to collaborate with a set of other organizations to meet the aims it has to achieve. Such extension requires the organization to manage and accommodate relationships with a range of stakeholders and to maintain a degree of flexibility in these relationships that recognise, and attempt to reconcile, areas where there may be a lack of congruence between aims, systems and processes. Stakeholders are defined as organizations or groups with a particular interest in an organization's activity. One of the case study stakeholders put it this way:

(ABSH 36)

> *"When you talk of stakeholders particularly in the education sector, it is large, as so many people hold a stake in whatever we do. Foremost are the students, (candidates) as they need the results, secondly the parents who are anxious to see that their children achieve, thirdly the school that trained the child. Other stakeholders are the government."*

The extract above highlights the degree of relationships and the level of connection with stakeholders in the context of the case study organization based on variety (activity systems with all the complexities). Levels of congruence tend to be based around the

shared object of the overall activity system, in that all are aware of the central goal(s) of the activity, but differences (and potentially tension and contradiction) are evident at the level of the activity systems which contribute to the overall activity system. Two organizations may both be committed to the goal of the credible certificate, for example, the examination board and the schools who administer the examinations - but this does not preclude differences in the tools used to communicate, in the rules and norms of the organizations and the understanding of the division of labour.

The lack of congruence in the different activity system may provide a source of tension and contradiction leading to instability in the overall activity system. This is driven by extension and consequent complexity rather than by inherent contradictions within the activity system(s). Furthermore, some of these relationships may be based on and governed by, well-articulated and formal contractual arrangements, while others may be based on evolved and informal arrangements which, while accepted and accommodated, are subject to far lower levels of formality and governance. The various forms of arrangement accommodated in the setting bring with them uncertainties and the potential for failures in information sharing. While the relationships are necessary, they also create a need for information sharing among the different stakeholders, to ensure that they inform collaborators, who are informed of the expectations in respect to the extended arrangement. One management staff member described the failure of information sharing in collaboration as damaging.

(BNMS 20)

> *"It does have a serious impact because it constrains meeting deadlines. For instance, we ask those in the field to send us the list of their supervisors, because the state officers nominate supervisors, we request for three per centre and when the list gets here we now appoint by looking at the most qualified and take one per centre in terms of most qualified and experienced. So, imagine the impact of when we send them an email and they fail to get our email, which will surely affect our job"*

The need to inform and be informed is, however, hampered by the uncertainties and complexities of the relationship as suggested in the extract above and discussed in the next section. Whatever the source of the dysfunction/failure above (which could include

the difference in tools, where one organization is used to email, and another is not. A difference in norms where email is seen as a critical communication tool in one organization and as a 'side channel' in another, or difference in the division of labour where the person receiving the email fails to pass on the request/action to the person required to act). The impact is to create failures in information sharing as a result of extension and resulting complexity. The extension is inevitable, and the complexity which results is a rich source of potential tensions and contradictions. Such instabilities in the activity system then materially increase the potential for information sharing failures in either the overall activity system or in those component systems which make up the foundation activities on which the success of the overall system depends.

4.2.2 Complexity

Complexity is bound up with extension in many cases, in the sense that extension will tend to bring complexity with it, as the organization has to accommodate a range of disparate stakeholders and ways of working. Complexity may, however, also arise without significant extension, or independent of it. Examples of complexity independent of extension may be driven by a range of factors that include the size of the organization, the nature of the tasks undertaken or the degree of novelty in those tasks. In this chapter, however, the contexts discussed are both extended and complex. The complexity in the setting is, in part at least (probably a large part), a product of the extension of the organization and the stakeholders with whom it has to collaborate. One stakeholder of the case study organization who is a teacher in one of the examination centres describes the situation as:

(ABSH 38)

> *"The system is considered a complex system in the sense that we have different components/groups brought together to achieve the same goals"*

According to this stakeholder, the causes of complexities are not only the coming together of different components but the operational technicalities (the different use of technology and the context used) involved in the relationship, which varies for different stakeholders and drives information sharing failures. Examples of areas needing the use of both natural and reserved language are: 1) computing language (in the sense of 'tech-speak' rather than a programming language such as Java) which is a reserved language-set and 2) non-computing language which is the natural language.

The complexity is illustrated by another stakeholder, who is a director in an organization collaborating with the case study organization, and who highlights why the system is considered complex, suggesting the differential levels of information security which will drive potentials for failure. For example, the perceptions of such information may be different (what is seen as needing to be highly secure in one organization may not be seen in the same light in another). The rules regarding handling may have a lack of congruence (one organization may regard an encrypted file as required while another uses a simple password protect, which may itself have become ritualised with everyone knowing that 'password' is usually the password). There may be incompatibilities in the tools used (one organization faxes a copy of a list which was emailed to them and which they printed and amended manually, requiring re-input at the receiving end).
(ABSH 36)

> *"Our work is specialised as it has to do with highly classified documents, whereas others may require less classified information, so the information sharing between different groups is at different levels".*

The description above is of complexity in tools and operational methods which suggests the different level of information needs that exist between the different groups, for example, both classified and non-classified information require different tools and are meant for different roles. Thus, these types of complexities involving tools, rules and roles can be understood and explained using tensions and contradictions as discussed in the methodology chapter (three) using activity theory. These areas of tensions and contradictions as analysed by activity theory and discussed by participants are as given in the next section.

4.3 Information sharing failures in key areas of activity systems and reasons why information is not properly shared.

The complexities in the extended relationship reported in 4.2.1 can be understood in part looking at the areas of tensions and contradictions that are identified. Tensions and contradictions, as discussed in section 3.9.5, are a product of the activity system and common in areas of tools, rules and roles. Contradictions in activity systems are manifested through deviations from the original norms and practices in the system, also called disturbances, and are responsible for causing constant instability in the system (Engeström, 2000). AT (the framework of this study) is the tool used to analyse the

activity system to highlight these tensions and contradictions as discussed in the methodology chapter (section 3.9). They represent a useful approach to identifying the areas of misfit and failures resulting from complexity and other drivers that impact on the achievement of collaborative arrangements. The manifestation of such complexity is through deviations from the fundamental norms and practices, also called disturbances. These failures are responsible for causing constant instability in the system (Engeström, 2000). Figure 4.2 outlines some key areas of tensions and contradictions in the examination activity system (as discussed in the three stages of the examination activity in Figure 3.3).

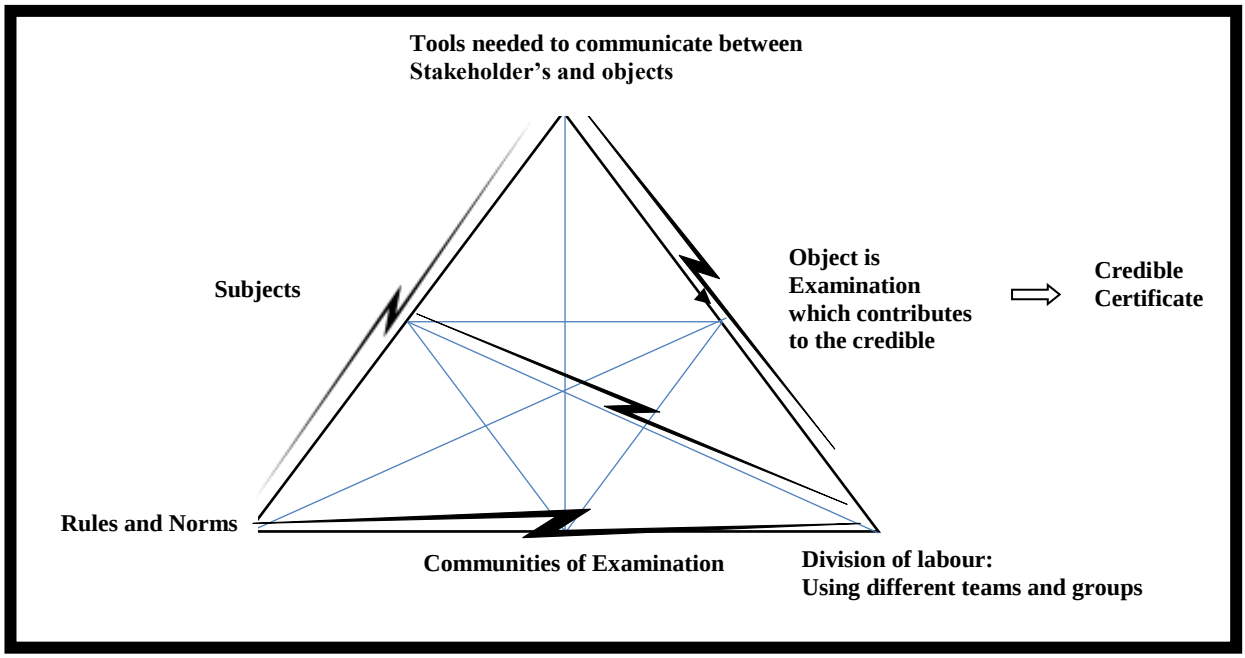

Figure 4. 2 Areas of tensions and contradictions in the examination activity system

Source: The author 2017

Three basic areas from Fig 4.2 suggest areas of misfit that cause tension and contradictions as areas related to:1) tools, 2) areas of rules as it affects subjects, tools and the community of collaborators and 3) areas of object, division of labour and tools. These are explained in the subsections below as rules, tools and roles.

4.3.1 Rules & norms and their interpretation

This sub-section reports how rules and norms of different stakeholders' influence information sharing and obstruct the ability of different activity system to operate in meeting the collaborative objectives.

The area of rules and norms and the interpretation of these rules as they affect different extended collaborations is an area of tension and contradiction in extended settings. Whereas in a non-extended and complex setting rules are uniform and applicable to all its members within the organization, we find the opposite of that in complex and extended setting. The complexity in extended setting is because of its extended members and the need for collaboration with different activity systems and different operational procedures. E.g. organizations in the collaboration, having their own rules which guide their operations, and which differ from those of the other organizations or collaborating members. This complexity as explained by a stakeholder and a director in another collaborating organization is a hindrance to goal achievement.

(ABSH 36)

> *"Rules are factors that hinder good understanding in relationships. This is because different organizations are guided by different rules and the implementation of such becomes a problem in collaborative types of relationship. Some organizations are simple when implementing the rules while others are strict, this does not go well for the kind of relationships we find in examination settings."*

The excerpt above highlights the existence of different activity systems with different guiding principles which have come to be known as part and parcel of the way that activity systems operate. Moreover, what makes this complex and therefore different from the non-complex setting, is that it does not only affect individuals within an activity system in an extended relationship but affects the operation of that activity system as well as the tools used by collaborators.

To further portray the seriousness and the impact of rules and norms on extended members, a mid-level staff member of the case study organization confirms the issue of differences in organizations as due to;

(BNSS 19)

> *"There is no organization without rules; however, there are different rules for different organizations in the same sector".*

The issue of rules affects almost all extended relationships in complex and extended settings, noticeable in the area of the interpretation, where different activity systems have their interpretation of what appears to be a standard rule. In the case study setting, it was observed that tensions were resulting from different rules and norms about presence and working times. Most organizations, including the case study organization, have rules on working times – typically a 'working week' split over five days for all. However, there are differences in differential start times, local arrangements such as Wednesday afternoon closing time and different rules around working at home. Additionally, there are local norms in some cases, attendance 'at work on-time' was valued and enforced, in others, a degree of latitude was exercised with an 'if you get the work done then whether you do it at your desk between 8 and 5 is not relevant' attitude. This complexity caused tensions and issues for staff trying to communicate, especially for those in more regimented regimes, experiencing frustration when trying to contact someone at their desk to be continually told, for example; 'he is not around at the moment, may have gone for a coffee'. Such attitude and regimental treatment are different (contradictory) to different activity systems and create tension.

The lack of congruence in the different activity systems raises tensions and contradictions commonly described by respondents as creating "fear and the lack of trust" among individuals and the activity system. The significant factors (fear and trust) can be linked to the implementation of the rules and the norms of the system which has a severe implication and may impede the information sharing process, as stated by;
(ABSH 36)

> *"There are several factors that hinder information sharing, one of the factors is fear of the unknown, and others are; anxiety; attitude (either positive or negative) …."*

Analysing at the quotes from ABSH 36, although the interviewee and other interviewees have been using the word fear, what they are expressing is the level of anxiety in articulating the ways tensions may impact on the organizations and their situation within it.

The link between fear and rules here is that the way organizations interpret and implement their rules may cause anxiety (which implies that collaborators are not sure

how their action will be interpreted considering that they have to collaborate with other organizations). The anxiety, in this case, is what brings about different attitudes to work which can either be positive or negative depending on how previous interpretation impacted on others. Thus, organizational actions to attitude and regimental treatment of collaborators bring about the lack of trust both for the system and people in authority. What follows is frustration and consequently a delay in working.

An example is where employees of an organization that operates a non-rigid approach collaborate with another organization which enforces strict compliance and controls the relationship. Tension sets in as to what rules or norms to follow in this case, especially where the central organization, known for rigid implementation, imposes their set of rules on the other collaborating organizations. This action may also affect the attitude of staff towards information sharing thereby causing complexity in the system.

Another simple example of how the implementation of rules or norms causes complexity is where the rules/norms in organization A recognises and habitually uses correspondence via email as an official way of relating with partners while the rule/norms in organization B recognises email, but the usual practice is that of using the telephone as a means of communication. This difference results in a breakdown in communication and becomes a problem as there is no congruence in the official method of communication and the practice of organizations A and B.

While in the vast majority of cases this does not cause a problem, instances were recounted where a school where the internal correspondence is mostly done by written memo, receives an email requesting an update on a spreadsheet for additional examination candidates registered after the online registration had closed. Instead of the school updating the spreadsheet and sending it via email, it decided to print it out showing list of additional candidates and send it via the post. Because there was no response to the email, it was concluded that there were no additional candidates and action on that school was closed. However, after a week, a postal communication was received with their list of additional candidates. The lack of response to the email caused severe tension as question papers for that centre had been packed with the original list of candidates. The implication of this lack of congruence in conventional ways of communication is

seen as complexity caused by the norm of the school being different from those of the examination body and resulting in a potential for failure (tension/contradiction) which resulted in information sharing failure.

The example above brings in to perspective the issue of norms and its effect on extended relationships where the rule spells out the process to follow, and the practice ignores the rule and adopts what becomes an acceptable practice in the organization, causing conflict with the rule. Whereas both rules and norms in the example direct action and behaviours, norms in organization B are the unwritten rules with no punishment for violating them and rules in organization A are authoritative directives that ensure compliance which draws punishment for a violation.

From the responses gathered there appears to be a consensus on complexities associated with differential rules and their implementation across the different groups of participants. However, the scale and nature of the tension and contradiction come from extension and complexities. Thus, fewer failures are attributed to intra organizations where rules/norms congruence and familiarity are greater than inter-organizational, even when there is a permanent and longstanding formal arrangement.

Moreover, the analysis of the extract suggests three primary arguments concerning the different activity systems: 1) complexity and extension not only cause tensions and contradictions visible as information sharing failures, 2) it bound actions to deal with social failures, 3) the action in 2 compounds complexity.

The three arguments above suggest that while the need to share information between the collaborating members is paramount, complexities caused by extension and identified as engendering tension and contradictions create a diminished (reduced) ability to achieve this need, due to the impact of different rules and the implementation of them. Moreover, the actions taken by the different activity systems and individuals, to reduce the impact of these complexities, create anxiety and a lack of trust between collaborators which makes it more difficult to share information and achieve the goals. This situation affects the attainment of collaborative relationships and thus the achievement of the overall aims of the organization.

4.3.2 Tools and their impact on extended relationship

This sub-section discusses tools and their nature, categorisation of tools and how they impact on extended relationships. The general perception of tools in the case study organization has to do with how stakeholders are informed about happenings relating to the collaboration. Tools are understood to be the aid/techniques used for communication between entities, with the anticipation that such communication can notify stakeholders about decisions in respect to achieving the objectives of such collaboration. Communication also requires a form of feedback as is described in section 2.4.6 as a two-way process.

Tools in the context of this study are, therefore, instrumental in communication and can be categorised for this study into four different categories as;

1. physical tools which are hardware tools used in communication, this is not only restricted to computers but also including any communication tools that we can physically touch and use in communicating, e.g. are the phone, the personal computer (PC), the smartphone.
2. Software tools which can consist of computer instructions or data used to communicate, e.g. are databases, WhatsApp email.
3. Traditional tools pen and paper tools for communication.
4. Mental tools are tools used for understanding mental maps, of how, what, when and why they are used.

The categorisation as shown in Table 4.3 has been deduced by using responses of some of the interviewees. Example, one of the management staff who is involved with external correspondence between the case study organization and its extended collaborators described the tools as;

(BNMS 03)

> *"We have the formal ways which will require us making memos and writing letters, sending emails or even making calls using telephones where necessary. There are also meetings, discussion forums; all these are avenues and tools"*

Table 4. 3 Categorisation of tools

Formal tools (Technological)		Other tools (Non-technological)	
Physical tools	*Software tools*	*Traditional tools*	*Mental tools*
Phones	Databases	Pen	Face to face meeting
PC	Emails	Paper	Workshops
Smart phones	WhatsApp	Circulars	Seminars
Two-ways communication radio	Instant messaging	Internal memos	Mental mapping

Though the respondent BNMS 03 described his grouping under two main heading of formal and others as suggested in Table 4.3, the others are understood to be the traditional and the mental tools. Therefore four-different groups as shown in Table 4.3 are suggested based on the different responses as the physical tools, software tools, traditional tools and mental tools. The physical tools are involving the use of computers, telephones smartphones and radios. The use of emails, instant messaging, WhatsApp are considered under software (the two categories are referred to as technological tools). Whereas the traditional tools involve the use of memo, circulars, letters, and the mental tools involve group discussion, meetings and any form of verbal communication.

The complexities here are the instances that require a shift from one form of categorisation to another for the message to be understood. E.g. we may see shifts from software-based tools (spreadsheet emailed) to traditional paper (spreadsheet printed out and faxed back or posted) which cause tension because of complexity. Where such complexity is not managed well it causes failure and the lack of understanding of that message.

Another respondent who also is a member of management explains the circumstance where some of these tools are used. According to him;
(BNMS 04)

> "*Mostly circulars, memos and so on are used for immediate information circulation within the organization but where it involves a wider society we use the print or electronic media to get it across"*.

From the extract above, there seems to be more complexity in situation involving a broader society which “here refers to as stakeholders” which Justify what was said earlier in section 4.3.1 that fewer failures are attributed to intra-organizations where rules/norms congruence and familiarity are greater than inter-organizational complexities. This also applies to tools as seen in the extract confirming the use of print and electronic media for stakeholders.

The non-technological tools (here referred to as others), according to a management staff member of the case study organization, are mostly used within an organization and are considered old-fashioned, but an effective way of passing information. Thus, the coverage of a non-technological tool is understood from the extract to be limited, but an effective means of communication within an organization. Examples of non-technological are departmental meetings, organization staff meetings or even group meetings. Thus, the challenge with this method of communication in extended settings is that it can be time wasting, requiring travel time which may be a long distance for extended collaborators. This method of communication is considered a source of tension and contradiction as it does not only delay information getting to extended members, it is seen as a waste of a collaborative relationship as a whole day can be wasted on information needing just 10 minutes to be passed and recovered (considering the travel time involved and logistics for travelling).

Technological tools as described by the extract from BNMS 04 are considered print and electronic forms of communicating and sharing information, effective and faster with the right equipment but could be expensive to provide. Technological tools are useful for achieving collaborative information sharing, but they can also be a source of complexity and a factor that hinders the achievement of goals if there is a lack of congruency between users. A specific example of how technological and non-technological tools become a source of complexity is where one organization still relies on a manual filing system while the other is fully computerised. The two organizations will find it difficult in relating at speed required by the computerised organization, hence, delays and failures in accomplishing datelines may occur which may impact on collaborative goal achievement. An extract from an employee of the case study organization reports how technology can be a disadvantage:

(BNSS 08)

> *"The problem with technology is that we use different technological tools in different organizations and this affects the achievement of goals"*

The understanding from the extract above is that technology in itself is not the issue, but where there is no congruence in the type of technology used between collaborators, it increases the complexity and impedes the ability of collaborators to share information in achieving their goals.

One particular area where technology is reported to affect collaboration is getting the product of the technology in the right format; this is as stated by the head of a department of another examination organization;

(ABSH 36)

> *"Information comes in different forms and platforms, which need to be transcribed into a certain format to make it readable for the target group."*

The term format is here referring to different levels of information need requiring different professional languages, as suggested earlier in the quote of ABSH 36 in section 4.2.2. One level may need information in a professional format which is different from what is needed at another level. For example, the use of natural and reserved language in the same organization where non-professional departments use natural language while a professional unit that manages and updates the organizational website in the same department may use reserved professional language which may be incomprehensible to the non-professional department and the ordinary person.

Moreover, the different multiplicity of tools and either the lack of rules or even following the rules available may require different information format and different levels of information. These different forms of technology tools can be in one of many forms using software for text messaging to send information, using a physical tool as mobile phones for communication and using the smartphone to send text information, or using land telephones for calls and faxes for sending print messages. Others are using computers and computing language, emails and social media. The issue here is that of tools, the

information and the understanding of the message which is the representative end of the tool (three levels of complexities).

The three need to be congruent for meaningful communication and understanding to take place. Therefore, the impact of tools in this study are analysed from the perspective of the tool itself which can be formal, or others, informational and representational. The tools are the informational tools; the informational aspect is about how different stakeholders access the information/the security of that information, whereas the representational tools are the interpretations or understanding perceived at the end of the information which is understood differently. The three likely levels of complexities concerning tools are further explained below;

4.3.2.1 Tools

Tools (formal/others) are the corporeal means of communication used by different stakeholders to share information. These tools come in different forms and disseminate information differently. One of the case study management staff gave an example of physical tools as:

(BNMS 03)

> *"Management has transcended beyond just paper work. It is now an inclusive thing. We all work together to make the establishment grow. We could use the formal ways which will require us making memos and writing letters. We could even make calls when necessary".*

The excerpt above suggests the flexibility of the management in the case study organization in adopting different information sharing methods to reach its different stakeholders. Moreover, stakeholders are at liberty to adopt any method, in as much as the particular method adopted by a collaborating organization is one that suits their situation. Accordingly, that method may differ from the method of other extended members, causing communication breakdowns and complexities raising the possibility of failure.

An example observed of a method adopted by a collaborating organization was where the organization had constant power outages and difficulties communicating using

emails, thus, resulting in the use of mobile phones and text to communicate with extended collaborators due to lack of internet to send email or faxes. Moreover, the method adopted was different from that of other collaborators who created the lack of congruence in tools. Thus, this action is a hindrance to information sharing and drives complexity which impacts on the overall achievement of the collaborative goal.

The situations reported here create complexities and result in disadvantages, especially considering the often time-dependent nature of the research setting. Where the situation may require urgent changes or the need to communicate significant changes that affect the services they provide, the complexities involved, and the consequences may impede these changes from being shared and implemented in a timely fashion.

4.3.2.2 Informational aspect of complexity.

The informational aspect of complexity is about how different stakeholders access information and process from the physical tool and different information sources available to them. This can be in the form of texts or emails, videos or audios depending on the source and output that tool provides. For information to be shared, it requires that tool providing corresponding information be at congruence. This stage encompasses processing the information from the different sources obtained from the tool (i.e. acquisition of the data), validating it and sending it out as output that makes sense to its end user.

An example is an organization using mobile phones to communicate with other organizations using computers. The organizations using phones will at least need to use a smartphone to be able to read and send emails. Thus, if the organization uses ordinary phones for sending and receiving messages, difficulties and failures are bound to occur. Some of the problems are those of different providers and different settings for the different sources, all of which compound the issue of complexities and with a potential of information sharing failure. An example is sending a message from a phone with Secure Sockets Layer (SSL) which are cryptographic protocols servers used in providing secure communications for internet handlers (generally used for web browsing, secured email, instant messaging and secured internet faxing), to a phone that is not compatible

with such cryptographic protocol. Such action will fail to communicate that information due to the complexities involved.

The issue discussed here is that of complexity in different sources of tools where a variety of text editors from different physical tools used are incompatible with other sources due to the lack of congruence. The lack of congruence in physical tools used by different stakeholders has an enormous impact on the information sharing process causing tensions and contradictions which will eventually result in failure. Advocating for some level of congruence in tools between extended collaborators can be of advantage for the collaborators in achieving their purpose by way of faster communication, quick response to situations requiring change and stopping of failure.

4.3.2.3 Representational end of the information

This aspect of information is about accessing the output and making sense by way of understanding what the information is all about. Whereas different sources transmit different forms of information and in different formats. Understanding the information by way of interpretations or to make sense of such diverse information sources, level of synthesis and sense-making is required. This stage is about information quality and security and links clearly to issues of information quality and the differential nature of the information sources and tools available to stakeholders and participants. The problem with this stage is whether the information needs of collaborators are being met and whether the information reaches the right people (security of the information). According to a stakeholder and a director in another examination board, information security is vital as there are saboteurs.

(ABSH 37)

> *"The level that people go these days especially with regards to information technology is alarming, thus, distorting and sabotaging some of these information that are being passed, yes you need to now go the extra mile in trying to ensure that the information you are sharing, you are sharing it with the right person and even while you are sharing it with the right person, it is not going to be used in such a way that it begins to affect negatively your own mandate. Look at the mode of the information and with whom you are sharing it with and those who have unauthorized access to such information, who can use it for things other than what it is meant for".*

Section 4.2.2 explains the different level of information needs which can be for specific purpose and channel at some groups. Likewise, the extract above suggests that where such is not met, or information is not communicated to the right group, it becomes an issue and the complexity at this stage is that of not meeting the required representational end of the information need to the targeted group. The driver here is the lack of quality or insecurity of the information thereby causing tension and contradiction between collaborators in extended relationship and information sharing failure. This section is about the quality and meeting the need of collaborators in such a way that it would create the two-way information circle. The next section considers how roles impact on information sharing in complex and extended settings.

4.3.3 Roles

Information sharing failures in extended organizations are more likely to be witnessed in the different activity system due to the different roles expected to be performed and involved, in meeting the agreed collaborative objective. In discussing the impact of different roles in information sharing failure, there is the need to clarify that the role discussed are of individuals, teams and organizations in meeting the collaborative objectives. The concepts discussed are with no precision to the groups identified as some roles like that of the team are performed by individuals within the team and likewise that of the organization.

The area of complexities as perceived by respondents are experienced in roles for the expectation put on each specific activity system in extended relationships where each activity systems expect some form of contribution to the success of the central collaboration. Figure 3.9 illustrates the different roles in the form of different activity systems where each of the activity systems in the examination plays a significant role in the achievement of the credible certificate which is the shared object.

Each of the roles in Figure 3.9 is differentiated by a distinct characteristic which makes them unique and suitable for the role, the same characteristic is needed to achieve the expected goal and operation. However, the identified complexities in sections 4.3.2 and 4.3.3 as rules, norms, tools both technological and non-technological hinder the

actualisation of their goals. Another factor that affects roles in achieving goals is culture. The area of culture is a vast area in research which may not be exhausted in just a section like this. However, this study will briefly discuss it as according to a respondent who is a management staff of the case study organization;

(BNMS 14)

> *"Every organization has core values and those core values must be adhered to for the organization to achieve its role and these core values and culture include the way we do things which are the ethics of the organization"*

Whereas culture may be an issue in the way roles are discharged and handled as described by a management staff above. The same culture is said to influence expectations; defining interactions; impacts relationships between employees and employers; and shapes the way new awareness is created (McKinnon et al., 2003). According to Zakaria, et al. (2004) some aspects of culture involves mutual trust and respect for members of team or organizations.

The extract above identifies the way we do things which are expected to be within the ethics of the organization, which includes cultural fit and compatibility of the different members and tools used. The study by Cadden et al. (2013) in the literature section 2.4 suggests that it is responsible for lower productivity, relationship satisfaction and organizational conflict. The conflict can be attributed in extended collaboration to different organizations having different ways of doing things for which they are known and become the ethics which guide their operation. However, other respondents have a contrary opinion about the way roles are discharged, for example, according to a middle-level manager in the same organization;

(BNSS 10)

> *Culture is subject to changes. There are new innovations coming in and you don't just limit yourself to a particular way of doing things.*

From the two quotes above, there is the lack of consensus on the way culture affects the discharge of roles in an extended relationship. Some feel that the discharge of roles in extended relationships are guided by professional standards rather than the culture of the people, while others feel that culture matters and affects roles and the way they are

discharged. This argument is, however, summarised by a director in another examination organization as;

(ABSH 37)

> *"I don't see culture as a hindrance, what I possibly see as hindrance is the level of development. Many cultures know true from false, there is no culture that says what is true in Europe is false in Africa and when you talk about examinations you talk about education and what is quality education in Europe will certainly be quality education in Africa. So, the approaches to get to the ultimate may be different but it cannot be a hindrance, it surely cannot be"*

The difference in the way culture is viewed and perceived in the case study organization is an indication of the complex nature of the setting and a source of tension and contradiction which affects the way different roles are performed, and this drives information-sharing failure. Roles are equally affected by the three identified types of tools as physical tools, informational tools and tools of representation. These are explained separately.

4.3.3.1 Physical tool as it affects roles

The use of physical tools in an extended organization allow communication by way of information sharing across different teams and organizational boundaries. This implies that different collaboration is possible with many benefits derived from the use of such tools. Some of the advantages as stated by respondents are that of reduced travel time to meet with collaborators, reduced meeting time as messages are transmitted with ease, thus, enhancing the role task and empowering the person taking on that role. The challenge affecting roles is in the area of adaptation and conformity of physical tools to different collaborators. Some tools are specifically designed for a particular team role or group role use and become immaterial for use by another team or group causing tensions and contradictions between collaborators as described in Table 4.4. An example of a physical tool such as vertex standard two-way radio design for use by essential field officer to communicate with other field staff in the same area is not compatible for use with admin staff using computers.

4.3.3.2 Informational tool as it affects roles

The different sources of Informational tools, i.e. computers, handsets and radios used impact the different role with regards to the ability to reach out to others in collaboration at the right time and in a manner, that can be understood. The timely need for information from the different sources that will enhance team/group role achievement is a way of innovation and knowledge sharing whereby value is added through gaining new knowledge, sharing both risk and resources by way of complementing skills and capacities (Romero & Molina, 2011). The ways of innovation and gaining new knowledge is as stated by a stakeholder and director in another examination organization with experience in handling collaborators, thus, to him innovation is all about enhancing the roles to achieve their goal which is through information sharing and seen as a tool that is beneficial to roles and organizations as a whole;

(ABSH 37)

> *"Like I mentioned, when you share information, you are assisted to make decision faster through roles achievement, when you share logistics, you are assisted to reduce costs, when you share even the use of personnel across Board, you are of advantage of bringing to bear the experience of the other organization in your organization, especially where you have identified that this organization is doing well and an organization can only do well with the combination of staff and the strategies of the mandate".*

The innovation created by way of information sharing is said to assist roles in making a faster decision and a way of mutual benefit for organizations involved. An example observed in the case study is a department (Test development) sharing information with all zonal coordinators as a way of assisting in achieving the goals of the department and making the work easy. It is seen as a way of mutual benefit and learning from what the zonal coordinators see on the field. Thus, the experience gained through this is used for decision making in the interest of the department, field officer and the organization as a whole.

The issue emphasised is that of harmonising the different sources of information by the different tools to have a congruent information delivery that will enhance both roles and collaboration through some form of benefits that is mutual to all.

4.3.3.3 Tools of representation as it affects roles in extended organizations

Where the different physical and informational tools are not in agreement, the substance produced could have a different meaning to teams' roles and a different understanding of role functioning. The tools of representation are all about the output of the different physical and information tools as explained in the two sections above. Whereas organizations that are time-bound will need to deliver in accordance to the timing they have. Thus, having different meanings from different information sources as tools may impact on role time and on the delivery of that task. This is by hampering the understanding of the information that needs to be shared to enable that role achievement. Table 4.4 showing areas of tensions and contradictions involving physical tools, information tools and representational tools.

A key driver here is that while extended and complex organizations will have areas where information is shared effectively, there are also areas and instances of failure. Such failures in information sharing have their roots in many causes including complexities, and the elimination of all such failures is an ideal state that is unlikely to be achieved. Where such failures occur, their impact may be relatively minor or may be very significant, and this may reduce such organizations' effectiveness, leading to lost productivity and efficiency, as stated by Proven & Lemaire (2012).

Table 4. 4 Areas of tension and contradictions

S/N	Subjects/Tools	Objects	Needs	Tensions and Contradictions(T&C)	Impact on role	Outcome
1	This is linked to tools with which organizations' staff are having to use as communication tools to reach out to the various stakeholders in the various stages in the examination process. Where the rules guiding tools are implemented differently in different organizations, it becomes a big issue as communication becomes difficult due to different interpretations.	The object is supposed to be a coordinated process for all the stages of the examinations Where such coordination is missing due to different communication tools and different rules guiding the use of tools, however, the process is jeopardised	The subjects have a greater need to share information with all their stakeholders using the appropriate communication tools.	We see T&C between tools and subjects. Example 1 Some of the stakeholders have computers but no internet to enhance the communication ability. Example 2 Some use different means of communication which is different from that of the collaborating organization.	There is a reduced ability to get the right information for role performance or share information due to the conflict in tools of delivery. Example Examiners who are meant to examine candidates for the examination are left out from important information or changes to the examination calendar as a result of the schools not having the right communication tool.	The credibility of the certificate is threatened since the shared object is affected. Example Registration is reduced due to the inability to register. The conduct of the exams is threatened since candidates do not have the right information.

2	This is linked to roles as different tools used for different divisions of labour in achieving a shared object (examination) cause misfit in the examination activity system by different roles not delivering the expected outcome. Instances are; Example 1 Using email to send out information as it relates to registration of examination where some stakeholders hardly use their emails due to the lack of internet facilities. Or using postal mail for urgent messages as against emails. Example 2 Inability to communicate with supervisors who are meant to handle the exams process due to the use of different tools.	To have a harmonised tool as physical, software, traditional and mental tools in collaborative relationships so as to enhanced role achievement	The rules need to be harmonised to support that objective, however Example Using email as an official source of communication.	The tension here is seen in lack of timely delivery of team/group role achievement which also impact on the overall organizational objectives.	Like in 1 above, there is a reduced ability of teams/group even and organization to deliver and this is caused by not getting the right information.	Ability of different roles to use a harmonised tool for better, faster communication and timely decision making.
3	This is linked to staff and Rules/Norms Anxiety and issue and cause of attitude change toward sharing	1 Using the same rule in one organization in different ways. Example Mr A commits an offence but because he	There is the need to have a unifying rule as a guide for the examination process.	Where the other collaborating bodies have different rules guiding their conduct. Example 1	The ability to implement control becomes difficult when different measures are used in interpreting the rules.	Subject approach to work becomes different due to different measures used to interpret rules and this will have consequences for the examination as

	Rules and communities. Rules and division of labour	is a brother of a director he was not punished. Mr B commits the same office and gets punishment for that. 2 Using rules as a means of control of all stakeholders. 3 Having to adopt a norm that is different from the practice in another organization or group.	Example The need to be guided by one set of rules. Example, examination malpractice act.	Senior service regulation and that of junior staff guides the case study organization. While the collaborating partners have their own rules. Example 2 Different interpretation of the various rules on a particular issue.	The norms of different groups and organization create confusion as to what should be the acceptable practice in the extended communities. Example A practice that is acceptable in organization A becomes a taboo in organization B and a practice that is not known in organization C this complexity impact on roles.	there is a need for compliance, but that need is reduced due to lack of motivation and feelings of insecurity.

In summary, the evidence in this section suggests that complexities influence information sharing in extended and, therefore complex settings. This influence can be said to affect the ability of collaborators to share the information needed to achieve the required efficiency and productivity. These complexities are as perceived and reported by respondents and are analysed using activity theory. The findings suggest the link between complexities commonly caused due to issues around interpretation and implementation of the rule, the lack of congruence between technological tools and the way culture and norms impact on extended relationships. Thus, these factors impede the ability to share information for decision making and use. The factors identified in this section are in line with the second objectives of this chapter which requires the researcher to explore why information is not adequately shared in complex and extended setting. The next section deals with how organization/ individuals in extended settings react or cope with problems of extension.

4.4 Findings: Sharing behaviour practice in case study organization

Organizations have a range of mechanisms aimed at facilitating the anticipated and required information sharing. This includes; formal teams/groups which are expected to be constituted for a particular assignment to deal with specifically identified problems in a particular industry. These forms of teams are discussed in section 2.5.3, 2.5.4 and 2.5.5. An example of such teams includes construction teams and task forces.

On the other hand, is the informal teams which develop to deal with everyday implementation either formally or less formally but emerge where people come together to interact and are well known within a recognised organizational structure but are not formal teams. An example is a temporary team constituted in response to a natural disaster or a quick response to the leakage of examination questions on examination day. Also, there are instances where information sharing has not been formally mandated or anticipated, but where there is an emergent need (which are not all failures), organizations use/develop a range of ways of addressing these needs. This includes using both forms of a team to share information as teams are used as a way of integrating information and for innovation and creativity due to teams' ability to cross-fertilise ideas (Landy & Conte, 2016).

This section, therefore, reports the way organizations/individuals in complex and extended settings react by way of behaviours and practices in dealing with information sharing failures. Section 4.4.1 discusses how the case study organization perceive extension and potentials of failure and section 4.4.2 discusses what makes teams a preferred way of sharing information. The section also addresses the second part of the second objective of the chapter which deals with how organizations/individuals in extended organizations react or cope with the complexity of information sharing failure.

Information sharing behaviours, in general, were reviewed in section 2.3 and defined according to Savolainen (2007 p.1) as "a two-way activity where information is given and received in the same context", this then implies that the need for such information must exist before sharing can take place. The information sharing behaviours in complex and extended settings i.e. the case study organization is driven out of the need to share information with collaborating partners and the ability to be able to do so for use. Thus, in this case, the needs in the case study organization are set out in chapter three (section 3.8) and are created by the need to achieve the shared object that brings different organizations together.

In sections 2.3 and section 4.3, this study identified information sharing failures as a product of complexity and extension resulting from relationships and dependencies. Section 2.6 discussed a gap in the literature in the area of information sharing behaviours; which has over the past decade received increasing attention with no definitive conclusions on issues regarding the organizational extension, their complexities, challenges and how they operate. This area of research remains understudied (Provan & Lemaire, 2012). The literature studied, and the gaps identified also indicate the dearth of research on information sharing behaviours in complex and extended settings which is the area in which this study is looking to contribute.

This section, therefore, is aimed at increasing our understanding of the information sharing behaviours in complex and extended settings and how organizations/individuals in the settings react to failures. The section used observed data and extracts from interviews with activity theory as the frame work used in understanding these behaviours.

In sharing information and meeting the objective of the extended relationship which involved a shared object, teams are used as a way of dividing the labour (specialised labour). The extract, by ABSH 36 a director in another examination organization suggest why information sharing is easy between examination bodies.

(ABSH 36)

> *"Examination bodies share information with other examination bodies in Africa sub regions and indeed the world through their groups and association because all these, exam bodies are official members of the IAEA and AEAA"*

The excerpt from ABSH 36 suggests the use of groups and associations which are here refers to as persons with a common determination and working towards that goal. Groups and associations alike according to Tuckman & Jensen (1977) are considered as another form of team as they have a common goal or purpose. Therefore, it is not out of place to say the quote highlights the use of teams and groups in sharing information.

Example of context where teams are used for sharing information is that of examination team in universities which comprises of different units like the exams central office, sub-office managers, sub-office staff, lead invigilators, invigilators and marshals. Each of the units is considered as a group or a team, and if there is a piece of information, it goes to the sub-office manager who will relate it to the sub-office staff to communicate to lead invigilators or marshals and to invigilators for implementation.

The question is whether the organization knows and appreciates the difference between teams and groups? This section highlights the reasons why teams are the preferred mechanism for supplying specific services through the division of labour. The understanding is that the practice of using teams in the case study organization has become such a standard part of the organization that it sinks to the level of operation and becomes a regular part of the organization which is known to all. However, there are also some parts of the operation that may not be known to people in the organization, i.e. what happens in the event of failure, how individuals or organizations mitigate such a situation.

The behaviour, which has become part of the organization may also be a source of tension and contradiction, as discussed in section 4.2, since other collaborating institutions may not think or act that way. The said behaviour may also impact on issues requiring a team working as the principle in section 4.2 may apply.

Although the team observed in the case study is a work team and a temporary one as stated in chapter 1 section 1.3.2.1, they differ from task force, committees, self-managed teams, cross-functional teams and virtual teams as listed in section 2.5.5. These teams have structure and different routine requiring specialised requirements and are involved in a continuous work process requiring information to be shared like any other team in an extended relationship. The sharing need is also different as information is needed in a professional language for specialised professionals. The needs require different professional languages, different times of delivery, and the need for classified documents to meet the professional standards. All these factors create the necessity to seek information about collaborators, exchange information for daily operations and use information for decision making, as illuminated by respondents.

The impression given by respondents reveals the complex nature of the organization and the use of teams, and that this is not only used for information sharing but as tools and a way of increasing both efficiency and productivity. The extant literature by Tannenbaum et al., (2012, p. 3) gave some specific characteristics of teams which confirm them as having a role to “preserve and manage boundaries” which is what is observed in the case study organization due to the specialised division of labour practised by different departments.

The complication is that the situations that create these needs are also hampered by the complexities of the relationship created by the boundaries, which require different levels of information needs and the need for different information sharing channels to serve the different levels, as well as different tools to meet the demand. These are complexities that come because of the extension, as suggested in Figure 4.2, and as explained by the serving director of the case study organization;

(BNMS 01)

> *"In this organization there are different departments and within the department there are different sections with sectional heads who relate to the head of the department. There are also intra-relationships between one department and other, because they are programme departments which must collaborate with one another for their success. So, information can pass from one group to another (department to department) using team leader"*

The quote above supports the argument about the use of teams, the existence of different levels of information needs and the boundaries that exist within the organization and with external partners in an extended relationship. Thus, the argument uncovered the complexity that exists in this context and illuminates the need to share information in reducing the existing boundaries and for achieving the objectives of the collaboration (shared object). Therefore, one of the reasons for the use of teams in this context is to bridge this boundary and ensure information is shared in achieving the objective of the collaboration.

In summarising this section, the study has reported the use of different teams as information sharing tools. The information sharing behaviour is based on different levels of information needs. These different levels of needs can be attributed to the professional needs of some groups and the need to satisfy specific groups in the relationship, example, are the stakeholders that cut across different boundaries both within an organization and involving external partners who are outside the organization for reliability. The different needs and different levels of needs drive tensions and contradictions and the need to mitigate these complexities informed the used of teams and groups. The same information sharing behaviours found in teams are also a way of reducing the existing boundaries within the different collaborating stakeholders in achieving the objectives of the collaboration.

4.4.1 Perception of the shared object in general

This section reports the findings on the perception of what is considered as a shared object in the case study organization. The examination as reported by stakeholders to the case study organization is the object targeted at the shared object the credible certificate which is said to attract extended relationships. This common shared object (credible

certificate) is the expected outcome in that different organizations/schools/universities working towards the achievement of the outcome, here known and conceptualised as the ‘credible certificate’.

The conceptualised certificate is understood to be the product of an examination process serving the needs of a complex set of stakeholders discussed in section 3.10, which suggests that all the partners have a common need for the examination process to be fair, effective and efficient. It was observed that each of the collaborating organizations/groups depends on the examination to prove the credibility of the certificate and have a reason for doing so. For some, that credibility guarantees student enrolment (school) into higher education; therefore, they need to protect that. For others, the credibility is what qualifies students for admission into universities. While for others the credibility ensures that the skill is learnt and guarantees upgrading and promotion by employers while guaranteeing the skill is learned and ensuring that the associated job is done efficiently and safely (have the reassurance that the person they are employing can do the job for which they are employed). The difference in motives is what retains the examination and keeps it going.

4.4.1.1 Organizational Perception of the shared object

This section reports the organizational perception of the shared object (as perceived by the organization) which is the driver that attracts extended collaborators to the relationship that they are all part. While these stakeholders have their interests, they also play a decisive role in the administration of the exams by producing different expertise needed for the exams in the form of division of labour using teams, as suggested in Figure 4.2, illustrating the relationship between the central organization and other different organizations i.e. organization A and B.

Organizations A and B provide specific services to the central organization in the form of different teams. One aspect of these teams that works well for extended relationships is the team-based service as against that of individuals discussed in section 2.2. However, the teams discussed here are specialised teams due to the specialised division of labour which makes them exceptional. An example is as discussed in section 3.8.1 where the case study organization depend on different specialised division of labour as teachers, markers, supervisors, proprietors, item generation for the examination team. This

situation described is where these teams are used in the setting to manage complexities as highlighted by a middle-level member of the staff of the case study organization: (BNSS 18)

> *"Complexity is reduced through "**Team Work**", where different people come together to make the system work and by division of labour"*

Figure 4.3 is an example of how the case study organization relates to other organizations using teams and division of labour. The extant literature that looked at division of labour described it to create the need for competitive advantage, diverse skills and different forms of expertise (Kozlowski & Bell 2003).

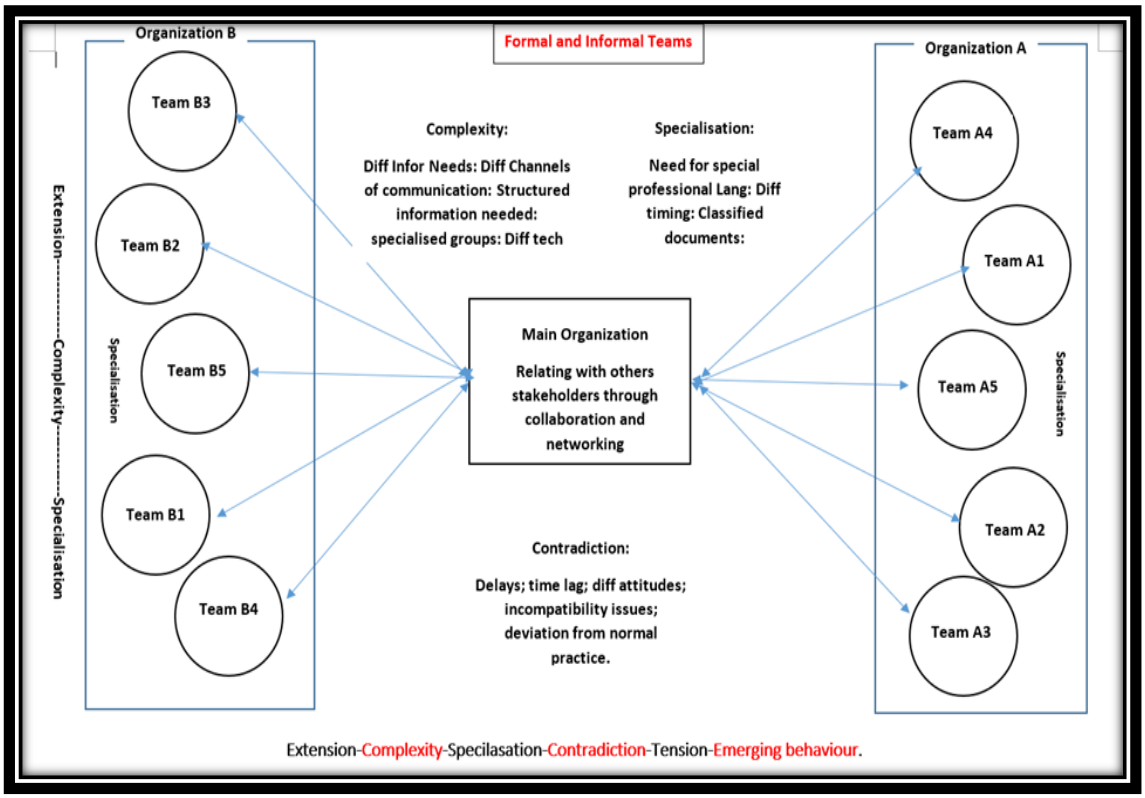

Figure 4. 3 Forms of team working in the case study organization. *Source: The author 2017*

Figure 4.3 above displays some areas of complexities that arise because of the extended relationship, particularly those caused by the teams' involvement in supplying different specialisation across its borders (as discussed under complexity in section 4.2.2). These teams are a part of the community of examination referred to as the stakeholders. Understanding the teams and how they function is discussed in the next section.

4.4.2 Teams

This section discusses teams and how they function in the context of this research. Teams are used to provide specialised services, and the way teams function provides some advantages but can also be a source of complexities (and, therefore tensions and contradictions potentially leading to information sharing failures) in some cases. This section is structured as follows; section 4.4.2.1 explains the concept of specialisation, 4.4.2.2 explains the role of leaders in the team, 4.4.2.3 highlights the role of the structure of teams,4.4.2.4 discusses the use of performance goal in aiding information sharing, and 4.4.2.5 explains how teams' mutual accountability assist in their function.

In reviewing the general idea of team, and in trying to understand more reason for the use of teams in complex and extended setting, and their information sharing behaviours. A closer look at the teams in the case study organization and the way they function is significant to the understanding of the information sharing behaviours in complex and extended settings. According to Delarue et al. (2008), although teams are a vast area of research, there is no universal definition of the concept. According to Tannenbaum et al. (2012), however, history has shown that both practitioners and researchers alike indirectly assume that teams have a few shared characteristics discussed in section 2.5.4 and Table 2.3.

Group, on the other hand are much smaller in number and may not necessarily have the complementary ability needed in a team but are considered only persons with a common purpose (Tuckman & Jensen, 1977). This section, therefore briefly discussed how teams in extended organization function and what makes the team a preferred method. However, one main distinguishing feature of the type of teams reported in this study is that they are temporary specialist teams bound up with complexity and extension and their services are time-dependent and share the same basic characteristics of a team as found in the extant literature discussed in 2.5.5 and Table 2.3.

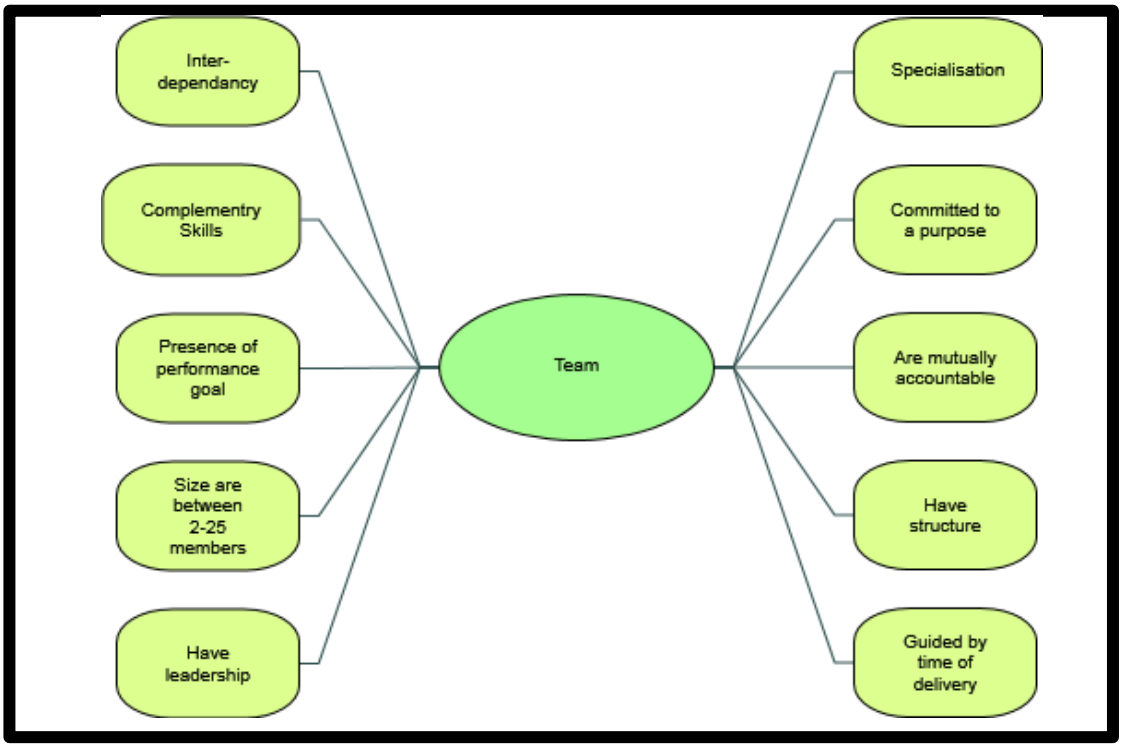

Figure 4. 4 Teams and their characteristics *Source: The author 2017*

The characteristics categorised under the ten headings in Figure 4.4 are in line with those reviewed in section 2.5. The features in each categorisation illuminate some of the behaviours which inform sharing information. However, not every categorisation from the literature was seen as significant in enabling (or hindering) information sharing in the perception of the respondents who highlighted the following features as the key distinguishing features that encourage effective information sharing; specialisation, leadership, structure, performance goals and mutual accountability. These five characteristics, featuring in the literature which have been privileged by the respondents over other features as being of significance in information sharing in such complex and extended settings are summarised in Table 4.5 and discussed in the sub-sections below, along with what gives them an advantage over the other characteristics.

Table 4. 5 characteristics of teams found in extended relationship that aid information sharing.

	Characteristic of a team discussed	**Attributes of that characteristics**	**Unique services that aids information sharing**	**Advantages to team**	**Advantage to organization**
1	Specialisation	Expertise, Dedicated service provision.	Communicate in a professional language understood by all members. Member in such team may be few and known to each other. Share information relating to work and general issue in teams. The fewer number makes communication easier. Good understanding of ethic of operation, hence strict compliance. Complementary nature of team enhances aid information sharing.	Reduced competition due to specialised service they provide.	Provision of dedicated service at reduced cost. Increase productivity and efficiency in the achievement of organizational goal.
2	leadership	Used as the contact person. Key source of information for the team.	A source of information dissemination from main organization. Ensures team achieve their goal.	Plans and coordinate the affairs of the team. Ensures that plan of action is implemented.	Source of information sharing with team. Key in the achievement of the main organization goal.

					Help case study organization to pass information to team members and communicate urgent messages that requires urgent solution.
3	Structure	Determinant of the information is shared. The use the team structure in information sharing. Direct the flow of communication. Good knowledge of who to communicate with and take information from.	Identifies who to communicate to and takes instruction from. Structure ensures that information gets to the right person. Make decision making faster and easier as the structure ensures timely achievement.	Easy of information sharing. Easy of achieving goals as clear instruction is available. Source of motivation to team members. Inspire members to achieve their goal.	Aid the achievement of organizational goals. Identify who handle what. Know who is responsible in case of non-performance.
4	Performance goal	Ensures information is shared in achieving the goal of the team.	Enhanced information pull and push as performance of members can be measured. Achieve their goal through information available to them; hence information sharing is essential to performance goal.	Ensure timely delivery of team's goal. Enhance commitment to goal achievement.	Enhance the timely organizational goal. Support with information sharing between team

					and central organization. Enhance decision making.
5	Mutual accountability	Complement each other's short fall. Fashion ways to achieve goals together.	Responsible to each other in the team. Share information to support their work. Support and inform each other and discuss issue of work. Way of easing complexities relating to team working.	Support the behaviour of information sharing.	Support the goal of the main organization and ensures delivery.

4.4.2.1 Specialisation

Specialisation in the setting is one of the factors observed that promotes certain behaviours leading to information sharing and can be attributed to the unique service the team offers. An example in the case study organization is seen in the different stages of examination and the type of organizational relationship with other collaborators which are based on expertise that will supply what is needed in a specific area of the examination.

The different stages as stated above means that at each stage, the activity is entirely different from another stage and this, therefore, requires a different type of input. The same activity requires information sharing amongst members with a view to meeting the delivery time for the output. Similarly, different disciplines see specialisation as driven by different reasons among which are; financial reasons, career motivations, increased productivity (Mauthner & Doucet, 2008).

Some of the advantages of specialisation for the main organization are given below:

1) It ensures that competition is reduced due to the specialised service they provide.

2) It is a way of providing dedicated services to the main organization at a reduced cost as the expertise becomes the best at what they do.

3) It is a way of increasing both the productivity and efficiency of the central organization.

While reduced competition helps to give an advantage to the specialised teams, the main organization uses the specialised division of labour and the repeated patronage in the teams to force them into a tightly-coupled relationship by agreeing to the controlling power of the main organization, as explained in section 2.5.2 under coupling. The disadvantage is that such collaborating partner may be pushed by way of repeated patronage to provide their service at a lower cost to keep their service provision.

4.4.2.2 Leaders

The second characteristic is that of having a leader who becomes a contact person and a principal source of information dissemination from the main organization to the specialised members. The extant literature described a leader as a problem solver and one who has the responsibility of ensuring that a group achieve its goals. He or she is responsible for planning and implementing such plans in the best interests of the group and for directing the group to achieve their goal (McGrath, 1962). This criterion is discussed in the literature as helping to ensure that organizations in extended relationships achieve the objectives of their collaboration.

One key advantage of leadership reported in the extended setting that supports information sharing is that it is perceived as a link between the central organization and the service they provide through the specialised division of labour. The leader in this context is responsible for ensuring that the services are delivered at the right time and according to plan. Thus, the presence of a leader in this context is seen as a good source of motivation and inspiration for members as they are seen as a role model.

Accordingly, a middle-level employee of the case study organization described how leadership is used in information sharing; according to him information comes from the leadership and passes down to subordinates in the organization:

(BNSS13)

> *"If within, it is through our head of Department, the divisional heads and the unit heads"*

This form of information sharing is one that results in more authoritative and strict compliance where productivity and effective delivery are ensured. Although leadership can be a good source of information sharing, it could also be a source of complexity in teams since team members may not relate well with such a leader due to the strict nature of the leader which may bring about disputes causing some form of complexity and failures.

While leadership supports effective delivery, it cannot be without structure as the type of structure a leader uses is what determines the success of the team. Therefore, the next section reports the structure and how it helps the information sharing behaviours of a team.

4.4.2.3 Structure

The structure as perceived by respondents drives a team to achieve the required success. Although this study is considering team structure and how it supports information sharing behaviours in the context of this study, it would be worth understanding the structure of the organization that gives rise to teams and their form of structure.

According to most respondents in the case study, the structure is one that comes from "top-down", and this works for the type of organization and the relationship therein. Instructions in this setting follow the structure of either the organization or team.

(BNMS 01)

> *"I can say the structure is from the top to bottom, in the sense that, instructions come down and subordinates comply with the information which also goes back to the top".*

Confirming the statement another respondent has a similar view, according to the middle level manager;

(BNSS 06)

"The information and instruction come from my boss and sharing is from top to bottom".

Thus, from the two extracts above, it is evident that structure is a determinant of the way information is shared. The reason for this, according to them, is that such instructions in the language of the respondent come with "authority and power" and this is what drives information sharing in teams as described by;

(BNMS 01)

"There are different departments and within the department there are different sections with the sectional heads, which relate to the head of the department and the same structure is used to share information".

The different sections are the teams with their unique service, and each team has a leader with a form of structure that needs to be followed to ensure the team goal is achieved. This structure supports the top-down structure which according to a management staff is needed in the setting;

(BNMS 01)

"Is that it makes decision making faster and easier due to the timely nature of the setting".

The exemplified structure as described by respondents supports the top-down approach. However, the quote below as stated by the management staff of the case study organization also suggests a vertical structure which supports inter and intra structure of relationship and information sharing.

(BNMS 01)

"There is also inter and intra relationship between one department and another because they are programme departments which must collaborate with one another to give people hope"

The quote by BNMS 01 exemplifies a vertical structure required for teams in relating between and within their communities in complementing each other. Thus, looking at the structure as reported, there is a link between structures and information sharing.

However, the different responses suggest that no particular structure is right or wrong, but some factors like objectives, size and resources available aid the type of structure and leadership and all these factors influence the information sharing behaviours found in team or organization.

4.4.2.4 Performance goal

One issue that came up under the heading 'structure' is using the right structure to achieve the team's performance goal. According to a respondent;

(BNMS 02)

> *"The team working is expected to be achieved within the expected time",*

The understanding of performance goals in a team according to respondent BNMS 02 is a *"short-term means of meeting the time for delivery";* they are also a way of *"measuring if members are really committed to achieving that goal set"*.

Here, information needs to be shared in communicating and ascertaining if such goals are achievable. According to a member of the management:

(BNMS 02)

> *"Sharing is a greater factor for information use as no one is an island, when you share you use but when you don't share the information will not be there for you to use".*

The observation is that the performance goal needs information to be shared detailing the roles and what needs to be done; moreover, the goals are set by the team leader and are in the best interests of achieving the expected outcome. Achieving the outcome, however, is what drives the need to share and use information since it is controlled by individuals that are mutually accountable to each other by way of sharing. It is therefore at this stage that the information provided is put into use, as quoted above.

4.4.2.5 Mutually accountable

It was observed in the type of team seen at work in the case study that, due to their specialisation and the complementary abilities of team members, they become mutually dedicated and accountable to each other in the discharge of their duties. They support and inform each other and discuss issues within the teams in so far as they are concerned

with the working of the team. This behaviour is a strength and supports the information sharing in the teams. It is also one of the strengths in achieving the outcome of the team.

The sections 4.4.2 presented the findings on the use of teams as a way of sharing information and getting things done for the overall organizational success. The next section presents the finding on why information sharing is essential within an extended relationship.

In summary, the perception of the shared object is seen as driving a complex extended relationship. The behaviours requiring information sharing to ease some of the complexities are seen to take place more in teams due to the characteristics teams have, which include, among others, their specialisation, having leaders that inspire, using the right structure that aids sharing and achieving the set performance goals through being mutually accountable to each other. Despite these strengths, some issues that give rise to complexities are still highlighted.

4.5 Findings: Factors that creates positive sharing behaviours

Having discussed complexity and extension in section 4.2, information sharing failure and why information is not shared adequately in section 4.3 and information sharing practice and behaviours of extended settings in section 4.4.

This section aimed at establishing a link between the three and show the need to communicate with extended partners in the overall interests of the organization. The section discusses factors that create and aid the use of teams as the ways to share information.

Accordingly, each collaborating partner in complex and extended setting has a duty to share information with the central organization and within their team or groups to ensure the success of the relationship: the perception of why information is shared according to a stakeholder to the central organization is that.

(ABSH 30)

> *"We are living in a global village, one cannot live in isolation, we need information to strive, and we need information to do our work competitively. It is, therefore, vital to share information with all stakeholders".*

The need to share and the factors that create both the atmosphere and positive information sharing behaviours are set out by the respondent above and explored in the sub-sections below as factors that drive stakeholders to share information.

4.5.1 Achievement of organizational aim (shared object):

Achieving organizational goals require information sharing about the goals and how to achieve such goals. Section 4.5 as introduced illuminates the factors that create a positive attitude toward sharing. The various responses in this chapter show an overwhelming support for information sharing as a way to reduce complexities and support the achievement of goals which in this context is the shared object. Thus, the shared object is one of the issues that keeps coming up as driving the extended relationship, but the motives for achieving the shared object differ as discussed in section 4.5.1, nevertheless, achieving both individual and the overall motives involve daily interaction by way of sharing information.

Accordingly, a middle-level member of staff of the case study organization, involved in daily interaction with stakeholders in the field, points out the importance of information sharing as.

(BNSS 18)

> *"We collaborate with stakeholders; come together, share information to fashion out ways through which we can encourage the field officers towards a better enrolment success".*

The statement above suggests a motive which is shared, and which attracts stakeholders together. The enrolment success activity in the extract is that of a division of labour, and this is discussed in section 4.2 and shown in Figure 4.3 as being the specialised form of services that extended organization provide. The division of labour here is between stakeholders in an examination setting seeking to register as many candidates for an upcoming examination as possible for different gains. Such an effort will need information to be shared across the entire coverage of the activity system to avoid concentrating information or awareness for registration in one area. Other factors that create a positive sharing attitude are discussed below.

4.5.2 Policy making (planning/comparing/decision making):

Another factor that creates positive sharing behaviours is the need for policy making; whether for planning, comparing different alternatives or for decision making, as described by an end user of the case study organization, who is a member of staff at a university involved in using the case study certificate.

(OENU 41)

> *"I understand that we are living in a society that is complex and extended, that requires an adequate improvement regarding infrastructures, improvement relating to the utilisation of human and natural resources……. The way out is through sharing information and making use of it in polices, by so doing we make not only our world a better place, but a positive place to live."*

Information sharing is reported here as crucial for the utilisation of both human and natural resources which, according to the quote are achieved by way of information sharing. It also makes use of the information available to improve the application/distribution of resources with stakeholders. Examples here are how the case study organization works within a timeframe to deliver the expected outcome to its stakeholder. This requires timely decisions on matters affecting the examination and for policy making on matters of collaboration. This, in turn, requires information to be available to compare different alternatives to taking that important decision. While this factor is seen as essential for organizations in the collaboration, the complexities attached to the relationships make it difficult to achieve or sustain, although its importance cannot be over-emphasised.

The same factor is also established by another stakeholder and a manager with many years of working experience in the studied organization:

(BNMS 14)

> *"Information sharing is used for planning, decision-making and comparison. There are many reasons why information is shared. If it is not shared, people will feel alienated and feel they don't belong. So, organizations should be open as Information is knowledge and it is power".*

The grouping of the three factors together under policy-making can be seen in the way that the quotes are directed at activities that anticipate different sources of action in respect to making an informed decision. This informed decision is one of the reasons seen as creating an atmosphere for information sharing in extended organizations.

4.5.3. For knowledge acquisition:

The need to accrue knowledge about a partner before and while in a relationship is essential for the extended relationship to be successful. Information, in this case, is seen as an ingredient of knowledge acquisition about a partner. Information can help in understanding the culture and the type of innovation needed for the extended relationship. Thus, information can directly be linked to the growth of both individual and organization.

While the importance of sharing is vital for knowledge acquisition, the danger of lack of knowledge is far higher in extended relationships as issues that may have a potentially adverse impact on both the relationship and individuals in the relationship may arise, resulting in a complex situation. The confirmation of the importance of information sharing for knowledge is retraced by another respondent and a stakeholder to the case study organization.

(OENU 41)

> *"We do not share information for sharing purposes only, we refine our knowledge based through sharing of information".*

The above quote illustrates the general views of respondents on information sharing for knowledge, especially where such knowledge helps in learning about each other's capabilities and short-comings.

4.5.4 Mutual benefit for collaborating partners

Mutual benefit is one of the expectations of entering an extended relationship since each collaborator is expected to derive specific benefits from the relationship. These benefits can range from the use of physical resources, making plans to avoid a clash of interests and making financial savings and others. According to a middle-level manager and a stakeholder in an extended collaborating organization, this mutual benefit is gained when information is shared.

(ABSH 37)

> *"When you share information, you can share logistics and you are assisted in reducing the cost of those logistics".*

Correspondingly, a manager at the case study organization further highlighted the benefit attached to information sharing for mutual benefit

(BNMS 09)

> *"Yes, sharing information is mutually beneficial, I will give an instance: our examination timetable for candidates used to clash, but through information sharing, we were able to resolve this occurrence. Such that the timetables are now arranged in such a way that there are no longer clashes in the calendar".*

Another respondent, a middle-level member of the staff of the case study organization, says that the benefits cannot be itemised as they are numerous.

(BNSS 18)

> *"We cannot quantify the mutual benefit of information sharing to each other, but it helps. It may guide you on better ways of doing things".*

There seems to be a general agreement on the mutual benefit of information sharing across the three different categories of the respondents surveyed. This agreement is reflected in the codes and nodes table in section 4.1 where 21 various sources make 37 references to the benefit of information sharing with shareholders. Whereas information sharing for mutual benefits is significant, the lack of it can be responsible for complexities in extended organizations resulting in the lack of development of new areas of innovation. It also affects trust, thereby putting the extended relationship at risk.

Another essential element of information sharing is for understanding the perspectives of the other shareholders, as discussed in section 4.4.1.

4.5.5 Understanding other stakeholder's perspectives

Understanding the perspectives of different stakeholders is vital in an extended relationship, where multiple different relationships come together based on a shared object. Considering that the various organizations have different organizational strengths and capabilities, such is best understood if the information is shared about the partners'

strengths and weaknesses. These perspectives are made known to the other parties in an extended relationship through information sharing, thus helping in the understanding of the strengths, weaknesses and potential areas of further collaboration, as well as in the understanding of other aspects of the relationship that need to be managed. A good example is in the application of rules: rules applied in bigger organizations may differ from the way a similar rule is implemented in smaller organizations, however, with information sharing in such situations, the stronger organization may appreciate and render help where they feel necessary to the smaller collaborating partners. The concept of understanding others' perspectives may be of help in resolving some limitations that may hinder the actualisation of a goal. A manager within the case study organization puts it this way.

(BNMS 12)

> *"When we get information from other people, we study it to understand the perspectives they are coming from, look at it very well to see if it is adaptable".*

Questions can be answered on extended relationships before going into such collaboration if information about the other side's perspectives is shared and understood. The questions can relate to what similarities exist; what the likely differences in the relationship are, and where common ground can be found.

4.5.6 Prevention of information lost

As discussed in section 4.2, complex extended organizations are involved in multiple relationships, the practice of which cuts across organizational boundaries. Such organizations cannot afford to lose information, especially information that affects the actualisation of goals. The implications of information loss can affect the entire operation of the organization or put the organization at a severe disadvantage, i.e. jeopardising the conduct of examinations and affecting the credibility of the certificate. An example of information loss in the case study organization is where vital information meant to be an instruction for examination to be conducted on that day was sent via email to all schools. However, due to some factors discussed as complexities, some of the schools could not retrieve their emails, while others did not do so at the right time creating that information loss. The consequence of that is, the question that the information was meant to correct was not marked, and that puts some students who answered that particular question at a disadvantage. Another example of information loss is where the information is not put

into use even when it is received, i.e. the 9/11 incident happened where several records and relevant information and files were lost to the disaster and were never known (CBC, 2011).

In summarising this section, positive information sharing behaviours have been linked to a reduction in the complexities seen in complex and extended settings. Different factors are outlined as being responsible for creating positive sharing behaviours in the achievement of organizational goals. If not managed well, however, these factors can give rise to complexities and a lack of understanding among collaborators.

4.6 Discussion on collaborative information sharing behaviours in complex and extended organizations

In this section, the two objectives 1) explore how complexity and extension influence collaborative information sharing in complex and extended organizations, and 2) explore why information is not adequately shared in complex extended settings and how organizations/individuals react, or cope is discussed in the light of the above findings. The structure of this section discusses the three significant findings concerning the identified gaps in the literature, presents the way this study differs from other studies in the information science research, gives the implication of the study to theory and practice and answers the first research question. Three significant findings are reported:

1. Findings related to the nature of the complexities driven by extension which provides evidence to suggest that complexities influence information sharing in complex settings and shape the direction organizations react to such complexities. The influence of such complexities seen in the setting is said to affect the ability of collaborators to share the information needed to achieve the required efficiency and productivity. The finding has also established a link between complexities of interpretation and implementation of the rule, the lack of congruence between technological tools and the way culture and norms impact on extended relationships and the ability to share information for decision making and use. These findings are in line with the first and part of second objectives of this chapter and in line with the identified gap in the literatures on the need to understand the “how and why” of complexities in extended settings (Provan et al., 2007; Provan & Lemaire, 2012; IRM, 2014).

2. Findings on the information sharing behaviour and practice in some extended organizations are as stated by the respondents and observed in the setting. This finding, therefore, may apply not only to the setting but can also impact on other settings with similar characteristics as discussed in this research. The finding suggests that the shared object is seen as a driver for a complex extended relationship with behaviours requiring information sharing to ease some of the complexities and thus, the behaviours discussed in this study are seen to take place more in teams due to some favourable characteristics as discussed in the third findings. This finding has attempted to fill the identified gap on team that shows a limited amount of work which examined information-sharing behaviours of temporary teams and especially that of complex and extended organizational contexts (Provan & Lemaire, 2012). This study attempts to cross-reference information behaviour literature from researchers in the information science like, Simon (2006); Yang & Maxwell (2011); Chengalur-Smith (2012); Pilerot (2014); Allen et al. (2014); Mervyn et al. (2014) and ideas on information behaviour in complex and extended settings especially using teams.

3. Findings on factors that create a positive sharing behaviour are their specialisation, having leaders that inspire, using the right structure, having performance goals and being mutually accountable to each other. These factors create a positive sharing behaviour and enhance the achievement of organizational goals in complex and extended settings. However, if the factors highlighted are not managed well, it leaves room for some form of deficiencies in extended relationships that need to be corrected to ensure the useful and productive outcome of extended relationship (Provan & Lemaire, 2012).

The three findings in this chapter inform the on-going debate in the literature relating to information science and information sharing behaviours as discussed in different setting by different researchers (Simon, 2006; Yang & Maxwell, 2011; Chengalur-Smith, 2012; Pilerot, 2014; Allen et al., 2014; Mervyn et al., 2014) as stated in section 2.6. In particular, the studies of Provan & Lemaire, (2012) illuminate the challenges associated with extended relationships which remain an understudied area. In demonstrating how people need, seek, exchange and make use of information in the research context, the

work of Wilson (1997) and that of Robson & Robinson (2013) are studied Specifically, in respect to factors discussed in the first finding that impede the ability of extended members to share information.

The factors reported in this chapter are considered as operational and environmental as in the two studies of Wilson (1997) and Robinson (2013) and seen as causing complexity in extended organizations that influences information sharing and shapes the direction in which organizations react.

On the other hand, the extant literature emphasises the need for organizations to collaborate in meeting the challenges they face in today's rapidly changing work environment (Dunning, 2014; Fullan, 2014). The cross-fertilisation of ideas between the extant information science literature and findings on information sharing behaviours in complex and extended settings will increase our understanding in information science firmly in the setting of this research with a view to increasing both efficiency and productivity (Mauthner & Doucet, 2008 and Proven & Lemaire, 2012). More so, this chapter provides a fundamental contribution in explaining the ways complexities and extension drive information sharing and particularly failures in information sharing in complex and extended settings.

This chapter has provided evidence in the findings to suggest that these complexities influence information sharing causing failure. One area of common agreement between the extant literature and the findings of this study is the connection between extension and complexity (Provan et al., 2007; Provan & Lemaire, 2012; IRM, 2014). Also, a distinguishing difference is that this study has demonstrated by way of a contribution that the complexity in the research context influences and shapes the way organizations react and share information as in sections 4.3 and 4.4.

The implication of the first finding suggests that complexities influence information sharing in complex settings and direct the way organizations react. Several factors are found to hamper the ability to share information between the different components which are required to fit in both operations and environment as informed by the findings and discussed by Bilal & Kirby (2002); Chowdhury et al. (2011); Mulligan et al. (2003);

Robson & Robinson (2013); Wilson (1997); and Yang & Maxwell (2011). The implication therefore affects.

1) The different components in the extended relationship.
2) The operational technicalities involved in the relationship.
3) The direction of decision making in an organization.

These implications impact on theory and practice. At this stage, the issues reported illuminate how complexity and extension influence collaborative information sharing in the setting and highlight why information is not properly shared. The factors responsible are those of 1) rules, 2) technology and 3) cultural norms which serve as intervening variables as in the studies of Wilson (1997) and Robson & Robinson (2013). The factors are also established as a source of complexity in extended settings. These complexities are inevitable as the new ways of working drives extended relationships. Therefore, for organizations/individuals to react or cope with complexities of the nature found in complex and extended setting, the factors need to be understood for the different setting and managing them will provide new insights and increase the efficiency and productivity. The findings are as asserted by Provan et al. (2007, p. 479) and Provan & Lemaire (2012, p. 368). Therefore, this study dwells on these points.

The implication of the second finding which is to information sharing is seen to ease some of the complexities that take place more in teams due to some favourable characteristics found in specialised teams. Therefore, in understanding the operational nature of the extended relationships, the behaviours in this research context are described based on specialisation and the use of special teams by the central organization to provide services that the main organizations cannot provide on their own (section 4.2). This finding supports the extant literature on the use of teams where the understanding of what drives a successful achievement in the team is required. The characteristics discussed are the factors that aid information sharing and what teams can achieve, among which are reducing the extended gap caused between team boundaries. The characteristics discussed in the second finding are of specialised teams and are a supportive way of achieving a “shared goal” (Frey et al., 2006). The implication of the second finding impact on;

1. Team relationships
2. The connection between extended relationships with other collaborators as the extended divide is reduced through teams (impact is on cross-boundary relationships and operations).
3. Nature of operations in extended organizations including the tools deployed.

The third finding implication is that it discloses factors that create positive sharing behaviours of teams and, these complexities influence the information sharing behaviours in organizations and shape the way organizations react in mitigating the complexities caused by extension. This part will be discussed extensively in chapter five to suggest how complex and extended organizations mitigate shortcomings that cause failures.

Despite the similarities recorded with the extant literature in information sharing behaviour, two fundamental differences are seen from the three major findings. These are:

1. The use of teams also serves as a way of reducing the divide in extended relationships which cuts across boundaries. While a significant proportion of the existing literature discusses teams (Cohen & Bailey, 1997; Richards et al., 2012; Landy & Conte, 2016), the literature is silent on the use of teams for reducing extension divide. This study has established a link between teams and extension (cross-boundary relationships) and behaviours which can serve as a way of reducing the divide in extended relationships. It is also a demonstration of the ways organizations in extended settings react to deficiencies in the environment, and the resolution could be attributed to the structure of teams having a leader, where information needs to be passed to the leader and in turn disseminated to his team members. Thus, the argument on the cross-fertilisation of literature on teams (Delarue et al., 2008; Katzenbach & Smith, 1993; Lund, 2015; Tannenbaum et al., 2012 and Tuckman & Jensen, 1977) and information sharing literatures (Allen et al., 2014; Chengalur-Smith, 2012; Mervyn et al., 2014; Pilerot, 2014; Simon, 2006 and Yang & Maxwell, 2011) as put forward in this study is hoped to contribute to the growing body of research in general and to information sharing behaviour literature.

2. The specialised nature of the teams, their complementary nature and the features that support their achieving success is the push and initiative in supplying that service needed by the central or central organization (Could be argued as the features that support extended relationships). The push and initiative are innovation and ways of ensuring that team members are all accountable for their actions, as well as that of their teams. It also ensures that they take responsibility for their actions in case of underperformance.

In answering the first research question of how complexity and extension influences collaborative information sharing, this research concludes that complexity influences information sharing which in this context could be either positive or in a negative way and shape the way organizations behave and react to mitigate the impact of these complexities caused by extension.

Thus, understanding the behaviours of teams in complex and extended organization remains open to more research to achieve a better understanding of different sectors and contexts to supporting the information science sector and the literature on efficient information sharing behaviours. It also requires the understanding of the required specialised skills that are mandatory for becoming a member of the team.

Another way complex and extended organization mitigate deficiencies of complexities is through knots as introduced in section 4.4 as ways of solving specifically identified problems which in the context of this study are caused by complexities and extension and which teams and groups are unable to solve. However, the knots reported in this study are different from other knots reported in the literature, and this is discussed in chapter 5 of this report

4.7 Contribution

The contribution of this chapter is in developing an understanding of information sharing behaviours in complex and extended settings. The understanding becomes necessary due to the complexities involving an extended relationship which is an understudied area (Provan et al., 2007, p. 479; Provan & Lemaire, 2012, p. 368). The specific area of contribution of this research is the understanding of the information sharing behaviours in the setting considered as both complex and extended and requiring an inter-

dependency relationship. The way an organization reacts to extended complexities, shape and influence the way they share information and affects their decision-making process. This finding is different and is a contribution.

The difference of this study with others in the literature is that this study uses existing literature on information sharing behaviours and combines that with the literature on teams and cross-fertilise the ideas in a complex and extended setting which is an understudied area. Thus, the behaviour reported is that of using specialised teams which reinforces the extant literature; but also seen as a way of information sharing and a means of reducing the extended divide. The mentioned finding is assisted by the characterisation of the teams which makes them unique. The understanding of these reported behaviours in complex and extended setting, which suggests that some differences exist, especially with that of specialised teams and groups within the setting, is what gives this work value.

The chapter has implications for theory by reinforcing the existing literature around information sharing and information science in general. It also has implications for both policy and practice in that issues around rules that can impact decision making are discussed. While relationships matter in complex and extended settings, the findings offered here suggest that they could be better coordinated.

4.8 Conclusion

The theme for this chapter is based on the merger of the six themes arrived at in Table 4.2 and discussed in section 3.6. The setting investigated is both complex and extended. This complexity is because of necessity such as globalisation and other contemporary changes. Reacting to the way the world works has forced many institutions to rethink the opportunities available to them by extending beyond their boundaries. Two primary reasons are reported for information sharing in complex settings. These are reacting to complexity related to extension which has the potential to cause failures in information sharing between extended members. 2) for providing services which are central to the shared object.

The significance attached to information sharing in general, and particularly for decision making (Mishra, 2012), is seen as a strategy to increase both efficiencies and

performance in organizations (Yang & Maxwell, 2011). Although there has been increasing attention devoted to the research of complex and extended settings, there are still no definitive conclusions on many issues regarding organizational extension and how it operates (Provan et al., 2007, p. 479; Provan & Lemaire, 2012, p. 368). The two findings are in line with the existing literature on extended organizations and teams but with additional information on the sharing behaviours in complex and extended settings which is an understudied area (Provan and Lemaire, 2012) and makes the work novel.

Despite the findings that extend our understanding of what is already in the literature, there are some differences which may be attributed to the complexities and challenges, which suggest some reasons why this area is understudied (Provan and Lemaire, 2012). These are,

1) The use of teams as a way of reducing the extended divide in extended relationships. This finding could perhaps be attributed to the cross-boundary situation that complex and extended organizations are involved in, and the structure of teams as having a leader where information needs to be passed to the leader so that s/he, in turn, will disseminate this to team members.

2) The specialised nature of the teams and groups that supply a service needed by the central organization. Although they remain teams, as discussed by Egolf & Chester (2013), they are a specialised type of team, different also from high-performance teams, as discussed by Richards et al. (2012); in that they lack the clear rules needed for high-performance teams and having that autonomy to discharge their duties without interference. Table 4.6 summarised the content of the chapter.

Table 4. 6 summary of literature /complex and extended settings

	Extant literature settings	Complex and extended settings
1	Emphasis is on the need for organizations to collaborate in meeting the challenges they face in today's rapidly changing work environment (Dunning, 2014; Fullan, 2014)	Emphasis is on understanding the type of challenges and complexities brought about by extension (Provan et al., 2007; Provan & Lemaire, 2012; IRM, 2014)
2	Increasing attention is on specific settings which are work related, yet, there are still no definitive conclusions on many issues regarding complexities and how these setting operate (Provan et al., 2007, p. 479; Provan & Lemaire, 2012, p. 368)	The call is for the understanding of extension variables, the structures involved and the ways of operation (IRM, 2014) including the drives of complexities that causes inability of extended organizations to share the information needed for operational purpose.
3	There is a significant number of literatures in information sharing and uses which discussed various topic with reference to different discipline like that of, Allen et al. (2014); Chengalur-Smith (2012); Pilerot (2014); Yang & Maxwell (2011).	There is a limited amount of work which has examined information sharing behaviours of temporary teams and especially that of complex and extended organizational contexts
4	Teams with a growing trend on the use of specialisation for financial reasons, career motivations, increased productivity; easy of travel; growth of disciplines and information technology (Mauthner & Doucet, 2008).	Focus is to examine the role of the temporary specialised teams that are a part of the way that extended organizations, and those within them share information, mitigate and deal with issues resulting from deficits in information sharing. (Camarinha-Matos, 2004; Chae et al., 2015; Maciejovsky et al., 2013 and Mankin et al., 1996).
5	Teams have some few shared characteristics centred on individuals with complementary skills who complement other members' short fall in skills and are accountable for their actions (Katzenbach, & Smith, 1993; Tannenbaum et al., 2012 and Tuckman & Jensen, 1977)	In addition to basic characteristics of a team. some differentiating characteristics observed in these teams are that they services are time dependent and they create a positive information sharing behaviour which also serves to bridge the extended divide created by both the nature of the setting and complexity. and share the same

This chapter has illuminated the collaborative information sharing behaviours and discussed how complexities influence information sharing and shape the way organizations react and behave. The complexities are identified using tensions and contradictions in the different activity systems and are observed in the different activities involving tools, subjects, object, the rules/ norms, communities and division of labour

which affect the extended relationships whereas, the nature of the setting and the information sharing failures therein identified need to be managed. One of the ways extended organizations deal with the situation is by the use of teams as a way of working which provides specialised services for the central organization and serves as a way of reducing the divide among the extended members. Thus, some characteristics observed in these teams create a positive information sharing behaviour which also serves to bridge the extended divide created by both the nature of the setting and complexity. The chapter makes a contribution to complex and extended settings by uncovering how complexity and extension influence collaborative information sharing in complex and extended organizations, and also enhanced our understanding of why information is not properly shared in complex extended settings. This study reinforces the existing literature and provides explanations for the differences reported. How complex and extended organizations respond to deficiencies, are discussed in chapter 5.

Chapter 5 Findings and Discussion: How complex and extended organizations respond to deficiencies

5.1 Introduction

This chapter brings together a set of the themes from data analysis, emerging from the use of AT and merging organizational culture, rules/norm and teams, groups, knot and knot-working as discussed in section 3.6. It reports the findings on the use of knots as a way of responding to deficiencies and shortcomings in information sharing in complex and extended settings which is the first objective of this chapter. The chapter is a logical follow-on to chapter four where information sharing behaviours and particularly the drivers of failures in information sharing were reported, as observed in a complex and extended setting. Among the behaviours reported in section 4.4, is that of using teams and groups as ways of coping with information sharing failures, resulting from /made more likely in part at least as a result of complexities caused by extension and affecting both organizations and individuals (primarily organizational-level). Such teams and groups are used as a way of reducing the extended divide (cross-boundary distance) among extended members in relationships.

The chapter is structured as follows, sections 5.2 to 5.4 are primarily (although not exclusively) addressing the first of the chapter's objectives – highlighting areas of knot formation and process. Sections 5.5 to 5.6 address the issue, raised in the secondary objectives, of the mechanisms driving such difference in the nature of the knots. Section 5.7 further considers the framework used for the understanding of the knots and the use of 4GAT in this study. Sections 5.8 and 5.9 respectively provide discussion of the contribution and draw this chapter together in conclusion.

A further breakdown of the structure above has, section 5.2 presents findings of the setting where knots are observed to form and does so within the context of two scenarios. Section 5.3 provides the discussion of the scenarios and introduces the concepts of ‘crafted’ and ‘emergency crafted’ knots (‘spread’ and ‘reach’ knots). Section 5.4 highlights the difference between crafted spread and reach knots, and the extant literature about knots. Section 5.5 discusses the second research question, of how do complex and

extended organizations respond to deficiencies in information sharing. Section 5.6 is about the framework used in understanding knots in complex and extended settings. 4GAT is considered and discussed as part of section 5.6. Though it was initially proposed for discussion as chapter 6, considering the framework was used to complement 3GAT, it is therefore discussed in section 5.7 and used for understanding innovation and what happened at the background in knots formation, use and dissolution. The change became apparent after writing the first part of the chapter, to marge chapter 5 and 6 for better understanding of how it was used. The rest of the section 5.8 is the chapter contribution, and section 5.9 is the conclusion.

Although knots are a known concept, the concept, according to Bleakley (2013, p.25) remains an area of research that is still, "under theorised" regarding its application and the concept is still open to empirical testing and different applications in different areas of study. The phenomenon of knots reported in this chapter contributes to meeting the following research objectives:

a) To explore the nature and types of knots found in the setting.
b) To explore how and where and why these knots are different from the knots articulated in other literature.

The two objectives will help in answering the second research question of how complex and extended organizations respond to deficiencies in information sharing. The findings are presented in two different scenarios –exemplars of knot-forming situations - linked to how the knots were observed based on the complexities which drive information sharing failures in extended settings. The lens used in this chapter is 3GAT, used as a way to understand the areas of tensions and contradictions which drive knots to form and impact on their behaviours in the context.

The stages of knots, as described in the extant literature, are as shown in Figure 5.1 as, issues arise knots form, they solve the problem and disband which returns the organizational setting to its original status (Engeström et al., 1999).

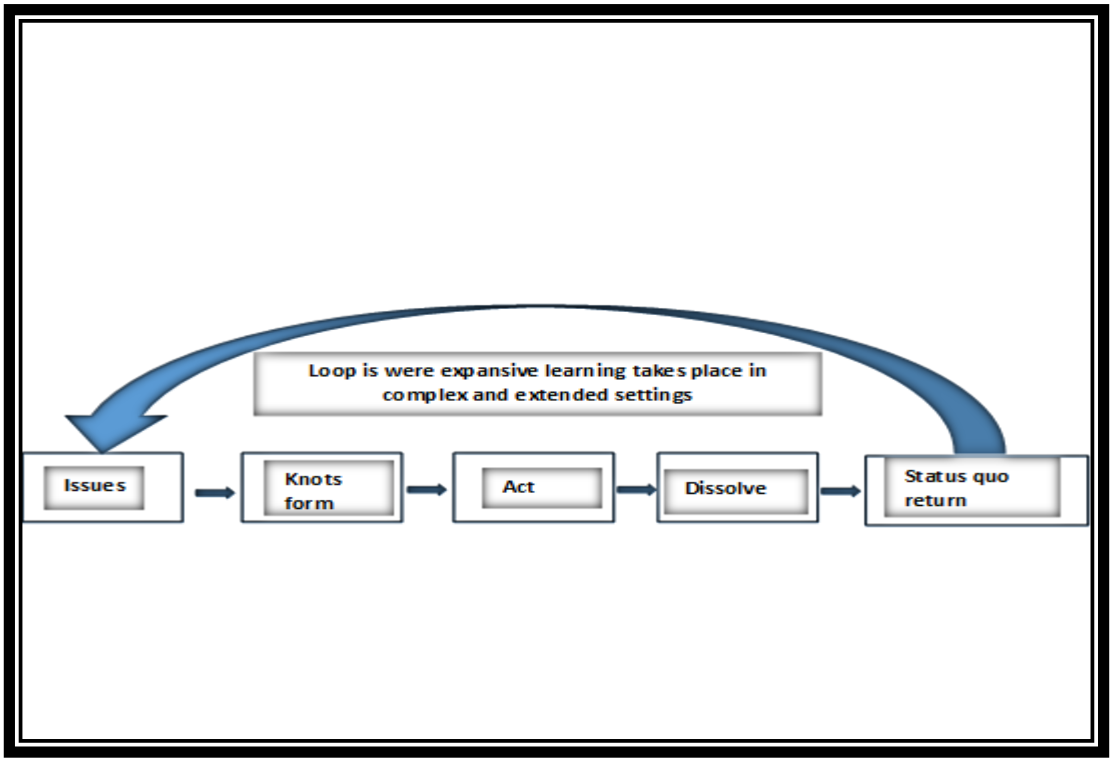

Figure 5. 1 Model of Knot as described in the literature: ***Source: The author 2017***

The knots observed forming in this study are one of the behaviours which mitigate deficiencies resulting from complexities caused by extension as discussed in section 4.6. The formation of knots is not, in itself, a new finding since a significant body of research exists in this area. Knots are of interest to this study because those observed in this complex and extended setting are, in some aspects, different from knots as discussed in the literature to date. It is the contention of this thesis that the nature of knots is affected by complex and extended setting in which they were observed and that this complexity and extension of the setting has both (1) driven the potential for failures in information sharing and (2) impacted on the nature of the response to such failures and that it has done so specifically in the case of the knots that form to deal with information sharing failures in such settings. This chapter highlights the differences and similarities in detail below. In brief, the concepts which are introduced in section 5.3 are “crafted” “spread” and “reach and emergency crafted” knots.

In conceptualisation of the knots discussed, the ‘heart attack’ scenario used in the illustration in Figure 5.2, is a shorthand for that swift development often seen in simple-

setting emergencies where knots form, as against the more time-consuming crafted process as discussed in this chapter. Figure 5.2 highlights similarities and differences between the literature knots, and the crafted knots (spread & reach) and emergency crafted knots discussed in this chapter.

A narrative of the 'heart attack' scenario in terms of AT considered the heart attack as the motivation which attracts a central actor who discovers the heart attack, working with the group (which is the heart attack victim and with those within range of the victim). The tools in such case are primarily simple and, importantly, immediate - asking questions and people volunteering. Culture in such a setting differs according to place but will overwhelmingly be one of 'helping', and the setting and community are mostly geographic - those around the incident. Division of labour in this situation is ad-hoc with roles played by different volunteers, and the outcome is the resolution of passing the victim to the appropriate authority as soon as possible. In such a situation there are relatively few tensions and contradictions - often resolved very rapidly in terms of asking questions and finding who knows what, or who can do what. (if anyone has a mobile phone to call the ambulance or where is the best access for paramedics). Thus, T&C in such scenarios are resolved at the level of operation rather than action and have to do with immediacy as much as qualification. So, actors will volunteer into what they can do (I will call an Ambulance, I am a First Aider, let's put them in recovery position….). This heart attack activity scenario provides a useful counterpoint to the activity system of the knot in complex and extended settings as discussed in this chapter.

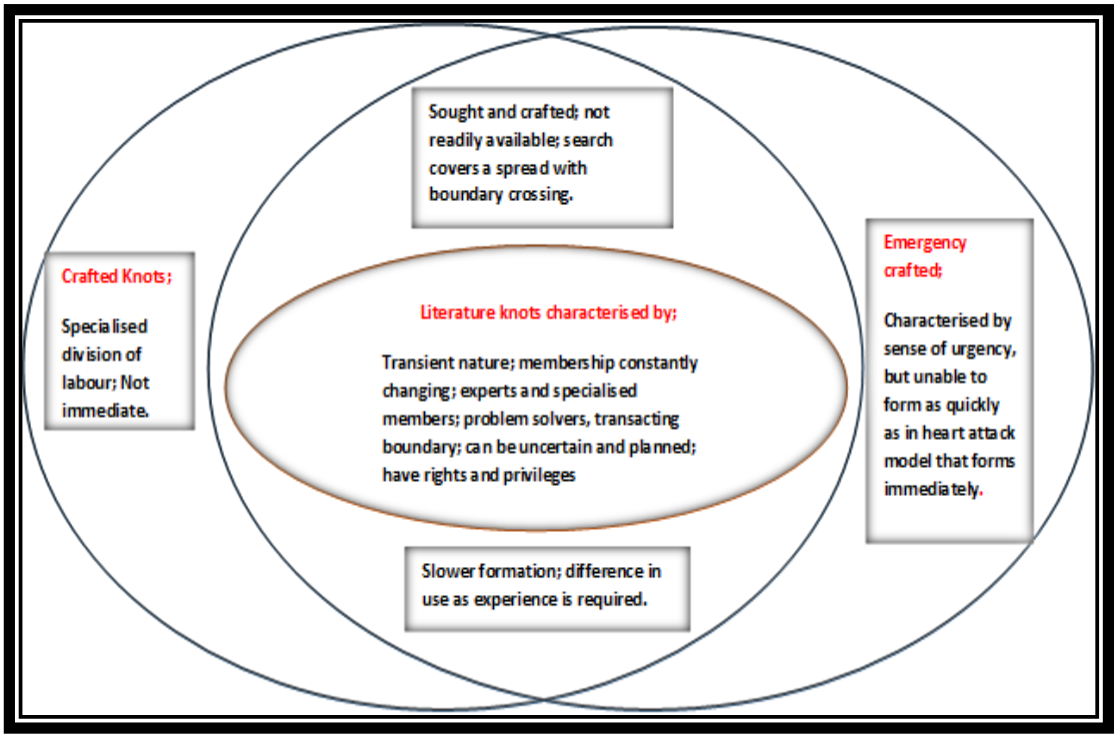

Figure 5. 2 Contextualisation of knots discussed in this chapter: *Source: The author 2017.*

Figure 5.2 shows different knots including; literature knots (based on extant literature) and the *crafted* knots (*spread* and *reach*) and *emergency crafted* knots which are discussed and differentiated further on in the chapter. Crafted and emergency-crafted both have intersections which are congruent with literature knots as areas of commonality and they then extend or build on that as a variant of the process / characteristics. That is to say that such knots are variants of the currently conceptualised form. The ideas of spread and reach in this context refer to the area covered by the knot as it forms to address the information sharing failure; these are based on specialisation (*spread*) and where it is hard to find the required expertise; limited availability exists which needs to be *reached*.

The characteristics of literature knots are also seen in crafted and emergency crafted knots in that; they are transient in nature, their membership constantly changes as knots change, they use experts and specialised individuals, they transcend boundaries, they have rights and privileges and they can be formed under uncertain circumstance or can be planned (anticipated as to need, not as to form/event) knots. There are however, nuanced differences between planned and anticipated knots; in some the problem is

expected, so plans are put in place but crucially not put into action until needed, while other anticipate that there could be a problem but the nature of it is less clear; in such cases there may be a general level of preparedness but little specific thinking around what to do in the event of such a problem.

The knots shown in Figure 5.2 as crafted and emergency crafted are differentiated by how urgently the knots need to be put in place. Both are underpinned by areas of commonality with knots as previously observed and by difference, with a specific characteristic of slower formation, and their uses are affected by the conditions, as shown in Figure 5.4, due to complexity caused by extension.

Figure 5.3, below, outlines the frame work that summarised the content of chapter 4 and sets the scene for chapter 5 which is considered as a reaction stage to complexity caused by extension.

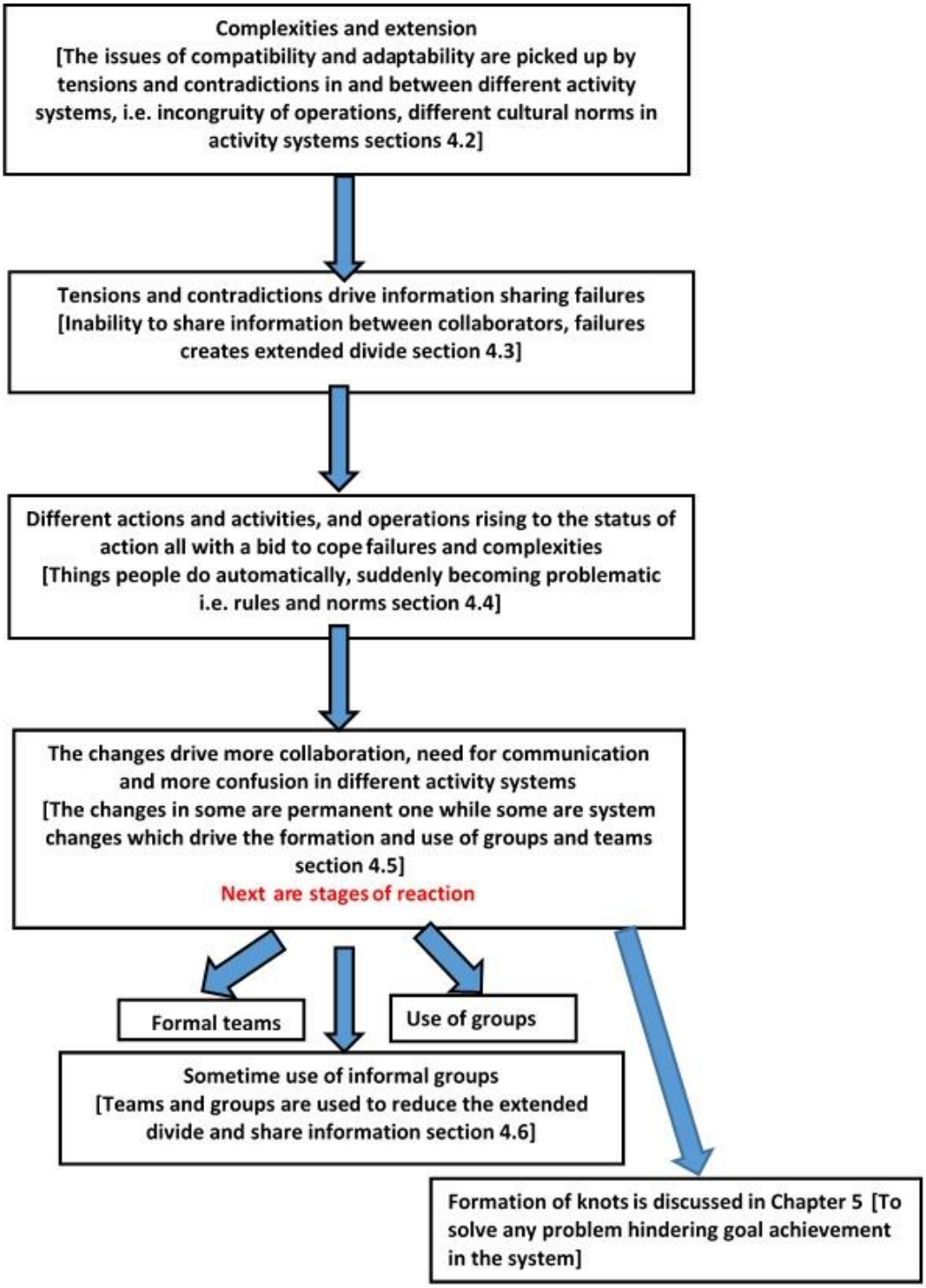

Figure 5. 3 Summary of framework of the chapter 4 and Intro to chapter 5.

Source: The author 2017.

5.2 Scenarios observed where knots form

In this section, two scenarios, based on two different problems observed in the case study organization, are discussed and used to illustrate the issues. The section focusses on the complex relationships of the examination organization as described in section 3.7 and characterised by division of labour both within organizations and between collaborators based on a shared object – the delivery of a 'credible certificate', as reported in chapter four. The division of labour is done in such a way that the examination (leading to the expected outcome of the shared object) becomes the issue of internal and external interaction. This type of situation is described, according to Nardi (1996), as needing proper coordination among several entities/people.

The aspect of the division of labour is seen as necessary due to the need for specialised services in the various components of the examination process and for the particular problem-solving that is necessary to meet the expected outcome of the overall activity system. The actions described in the scenarios are of parallel systems of activities; for example, the distribution of examination questions alongside other activities such as co-ordinating invigilation arrangements, before the next sequential operation commences. Activity theory is used as the theoretical lens of this chapter because it considers the system of activity as a collaborative process which serves as the generator for a continually emerging context (Engeström, 1989). Thus, the framework is used to understand this type of relationship, i.e. a relationship that is a continuous activity with a mutual exchange between the stakeholders and organization. The process is object-oriented and mediated by different signs and tools, as stated by Kerosuo et al. (2013).

The scenarios depicted in this chapter are illustrative of a collaborative relationship between the case study organization and its stakeholders. This is as described above, where social systems are used as tools to coordinate both intra and inter-firm relationships to (or "intending to") safeguard exchange by way of either legally binding, contractual agreements/formal partnerships, or socially binding albeit less formal arrangements.

Information sharing behaviours observed in teams (as described in section 4.4) and those of stakeholders proceed in a multi-dimensional way where actions are all channelled

towards the examination to achieve an outcome - the shared object. However, complexities, caused by extension and observable in a specialised division of labour by specialised teams (as discussed in sections 4.3.1, 4.3.2 and 4.3.3), drives the potential for failure to share the needed information to achieve the expected outcome. Where this potential is realised, then information sharing failures occur and do so across organizational boundaries and stakeholder activity systems. Thus, the specialised nature of teams and the setting enable a specialised form of problem-solving to occur, which necessitates special professional teams to form as knots. According to a manager with years of working experience with extended stakeholders.

(BNMS 02)

> *"Where there is the need for a special team to form in solving unique problems, such team is formed within the collaborative members"*

The concept described may not be known to them as a 'knot', but the characteristics as stated; of being a specialised team, requiring such team for a special problem solving, and cutting across collaborative members, are those of a knot as defined in literature to date (Kerosuo et al. 2015). The specialised problem solving described is not only confined to a particular group within their activity systems but involves collaborative members who cut across different team/organizational boundaries. This form of problem-solving is widely accepted as a way of involving different expertise in various collaboration groups and is found in knots (Kerosuo et al., 2013). The quote by 'BNMS 02' above recognises and described them as 'special teams' as they are not just groups or teams that solve the general problem. They are knots sharing characteristics with literature but also exhibiting membership changes continuously according to the specialised requirements of the problem (Kerosuo et al. 2015) which makes them a special type of knot – requiring crafting of the formation process.

Two examples are given below as instances where knots were formed to handle information sharing failures, 1) a specific professional problem during one of the practical examinations of the case study organization, 2) a problem of non-acceptance of the shared object. In both cases, knots form which meet the definition of 'knot' in literature but have characteristics which make them different, and which link to the complexity and extension of the setting.

5.1.1 Scenario 1:

During one of the practical examinations of the case study organization, the monitoring officer discovered a case of information sharing failure where a practical examiner was not adequately informed about what constitutes appropriate practice in practical examinations. This situation is one of the cases of tension and contradiction in information sharing tools (as well as organizational norms and their impact on extended relationships as discussed in section 4.3.2), where different stakeholders access information and process it differently via the physical tools and different information sources available to them.

The practical examiner, who is one of the stakeholders that do not check email, was sent, an invitation for briefing by email, which he missed, but instead asked one of his superiors what the duties of practical examiners are. He misunderstood the level acceptable and appropriate in assisting in setting students up for the practical examination and, because he is a specialist in that subject, was effectively (if unwittingly and through good intentions) potentially helping students gain undue advantage in his examination centres. This action is caused due to the lack of proper information as to how this examination process works. Equally, the action can compromise the integrity of the examination, therefore, potentially undermining the integrity of the credible certificate.

There is a procedure in place for handling abnormal practices, but this is something that needs a quick reaction as such issues need to be handled before they get out of hand. The first thing on discovering this problem was for the monitoring officer to recognise that a range of expertise and organizations involvement would be required to address the issue and that this is not a straight forward situation. The identified problem may require an expert in that particular area who has the knowledge, authority, technical ability, and experience to draft in to form a special team (knot) to deal with the issues. The monitoring officer identified a person in a nearby institution (who is one of the central organization's stakeholders) with knowledge of the subject being examined and got in touch with the individual (unlike the heart attack example which shows knot form by volunteering). The person was then drafted-which is a slower process to the heart attack example, to join the other examination team (as others are managing other aspects of the

examination) in administrating of the examination and solve the problem created by the practical examiner. The situation explained requires a professional to join other professionals in tackling the issue created due to the lack of information which can be attributed to different culture (discussed under complexities in section 4.2 and information sharing failures in 4.3) of administering examination known to him or different norms where a practice in A can be prohibited in B. The practical examiner did not see anything wrong in his action as he understood assisting the student as going beyond the minimum set-up of the standard needed to a point where it could be seen as aiding malpractice.

The issue here is that of the information sharing failure driven by complexity and extension which can be attributed to the factors discussed in chapter four as causing information-sharing failure. The information failure, in this case, is what prevented the practical examiner from attending the examiners briefing, consequently causing unacceptable practice and undermining the integrity of the examination. This problem needed to be resolved immediately in the overall interest of the extended partners and the best way is by (forming a knot) bringing in professionals to join in solving the problem. The consequences of not resolving the problem immediately will mean that the acceptability of the certificate will be questioned.

The scenario suggests that it is a case of information sharing failure which has resulted in a knot forming. The knot that forms share the literature characteristics as given in table 2.4 on knots, and Figure 5.1. Such knots form as a way of working as a group to accomplish a critical task or solve a particular problem, and the duration is only for a short period (Korpela & Kerosuo, 2014). The knot that forms involved a nearby institution, as well as the case study organization thus cutting across-boundaries,and drawing on the expert status of the entire examination team, (Kerosuo, 2015), the knot that forms is what is characterised as a multi-professional team (Payne, 2006).

The knots observed (crafted and emergency crafted) are because of complexity-driven by information-sharing failure. This can further be analysed into three stages as shown in Figure 5.3 which explains the difference between the proposed knots and the literature knots. The categorisation is under; 1) formation 2) use and 3) dissolution. These main

areas of categorisation are discussed in knot literature (Kerosuo, 2015; Korpela & Kerosuo, 2014; Payne, 2006), though they are not directly referred to as the stages of knots. Therefore, this study recommends viewing them as the life cycle of knots. The three stages in crafted and emergency crafted are shown in Figure 5.4 with detail differences from the literature knots as discussed in Table 2.4. Thus, the literature on knots as studied did not extensively discuss the processes in the uses of knots nor did it discuss the process involved in the dissolution of knots. These gaps identified are issues that will be discussed as part of this study but not in detail as part of them are outside the scope of this work.

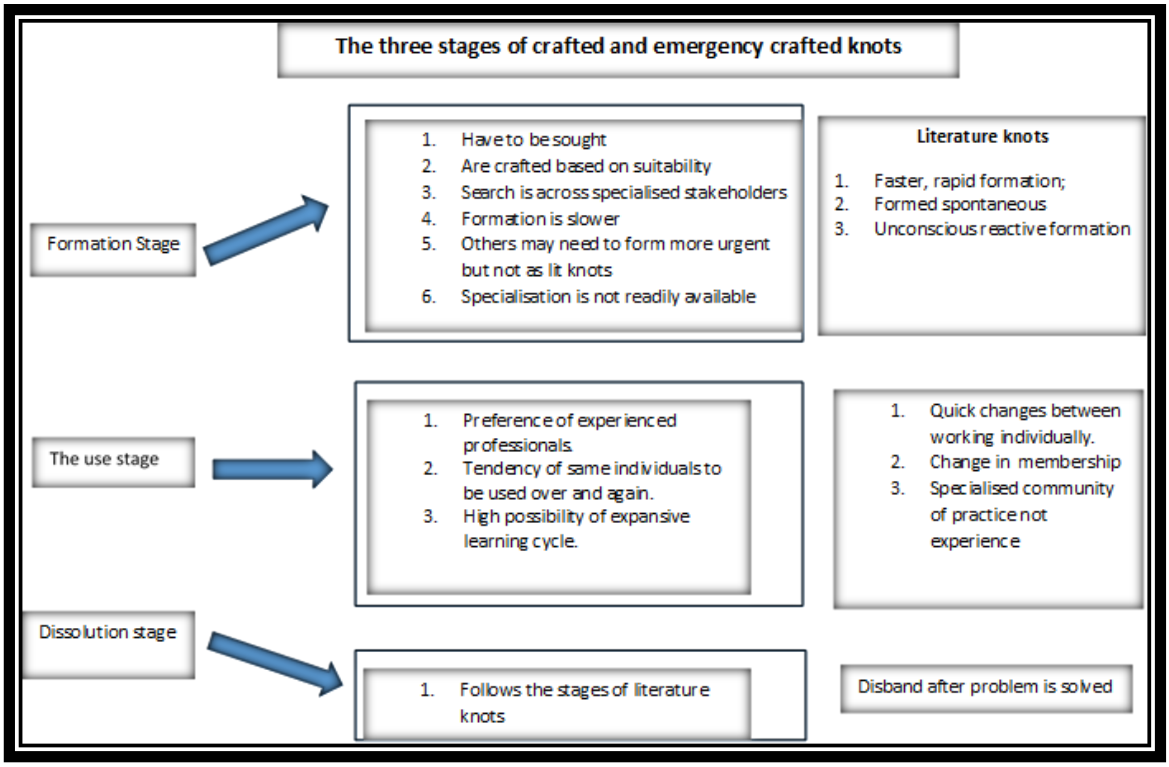

Figure 5. 4 Showing the stages of crafted and emergency crafted knots and the difference.

The formation stage is slower, when compared to the literature knots and is one of the major differences seen which can be attributed to the nature of the setting (complex and extended). Drawing from scenario 1, the study sees a knot which has to form due to complexity-driven information-sharing failure. This is visible in the activity system reacting to the complexities by way of forming a knot (requiring a different specialised division of labour during the examination stage) and forming the knot requires reaching out to all collaborators within the locality and even beyond who share that common

object of examination-leading-to-credible-certificate. Thus, the reasons why specialised labour are not immediately available are founded in the fact that not all the examination administered have teachers in all the schools, therefore, this means this specialised teacher will need to be searched for and brought into the division of labour when the need arises. The process does not just mean who is available, but who (and where) the right person for this job is (suitability), hence the crafting is slowed as the right person will need to be sought. However, as stated in Figure 5.2 this type of knot is rapidly-formed but not as that of the literature / heart-attack knots. Therefore, it is termed as an emergency crafted knot.

The second stage is the area of knot use which was observed to be an area requiring more studies. Whereas most literature on knots is silent on how knots are used, the general understanding from the extant literatures indicates that as long as one is a professional (not in terms of qualification, i.e. Dr/Arch/Acct but appropriate knowledge and expertise) in that area he meets the requirement of becoming a member of a knot. However, such membership changes continuously with little possibility of same members forming another knot (Kerosuo et al., 2015). However, this study has observed that due to the nature of the setting, there is a preference of not only the characteristics of knot discussed in the extant literature but the need for experience gained by a professional through a similar process of work. There is a preference for experience in crafting a knot. This preference has to do with the nature of the setting and the need to meet the high standard of the shared object (credible certificate). Therefore, preference is vital to the integrity of the examination as the person's ability to deliver must be known. Also, at the use stage, the examination organization learns from the working of the knots, and changes implemented or incorporated into plans to avoid such reoccurrence as a way of being pro-active in meeting the expected outcome of the examination which is the credible certificates.

The third stage - the dissolution stage - is not basically different from that of the literature knots, such knots as stated in Engeström et al., (2012) are dissolved as the object gets configured to what it is expected. As mentioned earlier, this area of study in the extant literature lacks details as to what happens during the process of dissolution. A phenomenon observed in the context of the setting studied is that where failures in

information sharing occur, the system automatically kick-starts the process of another crafting which privileges the expertise of an individual that has just gone through a knot-cycle due to their experience. The other characteristics required in stage one of the three stages of the life cycle of knots are discussed below as seen in scenario 1 and 2.

5.1.1.1 Right professional with right knowledge

Going back to the description of the nature of the setting discussed in chapter four (section 4.2), one will recall that the setting as described is complex due to issues of extension and requires specialised teams to provide a set of services to the central organization. The same setting is described as time-bound due to the requirement to deliver their services at the right time. This specialised nature is what makes a professional with the right knowledge the best candidate for a knot as seen in the scenario 1 and given in the literature by Engeström et al. (1999).

Though knot formation in some areas is described as planned (where the arrangement to form a knot takes place as the –expected- problem develops) (Kerosuo et al., 2015), the situation described in scenario 1 could be similar where a professional is sought after and brought in to act in that capacity due to having the right characteristics. The complexity here is one caused by information sharing failure, nature of the task and the setting within different activity systems and such complexity is best resolved with the right professional with the right knowledge of the problem. Not only does the right person for the knot need to be a professional, but it may also require a person that has that autonomy and seniority to decide without reference to the office or authority as described in next section. An example is that of the monitoring officer in scenario 1. This officer set out to 'craft' a knot in response to a problem and did so following processes familiar from literature. These processes are, however, slowed by the need to identify and recruit appropriate actors rather than (as in a heart-attack scenario) soliciting volunteering with skills then established and deployed (You're a First Aider, great can you do X?, You know the area? Great, Can you guide the paramedics in from the entrance to the building? Etc).

5.1.1.2 Autonomy and seniority to take decision

Autonomy is needed as proof that the person is indeed a professional; this is about making decisions that will benefit all the extended members. This is also one of the requirements of a knot. According to Korpela (2015), knots members should have that

inventiveness and the ability to negotiate intending to provide an instantaneous solution to a problem; this characteristic is present both for knots and in knot-working. The candidate here does not need to refer issues to the authority but should handle problems as s/he sees them. That person must, therefore, be autonomous and possibly a senior person with the authority to be able to choose between alternative actions and to ensure that the right decision is implemented. The choice of a person that is not able to take a decision in this circumstance will only add to the complexity by way of delay when consulting with the authority or his superiors. An example is having a subordinate in a school taking to be part of a knot due to his partial expertise in an area needing problem solution because he is a subordinate with partial expertise, he needs to be checking with a more higher-ranking staff if he is doing the right thing. This action will not only jeopardise finding a solution to that problem but also result in a wrong decision as a result of the lack of autonomy and seniority.

5.1.1.3 Experience is needed

One of the qualities of the person who forms a knot (which is a form of team that collaborates closely) is having the right experience of the situation. The knots discussed here can be formed, disbanded, and reconstructed as part of the object configuration which can happen time and time again, creating a form of continuity relating to the shared object (Engeström et al., 2012). This suggests that knots have the tendencies to form and re-form, which give members that experience acquired in this research context as that person has the tendency of being used in the formation of a knot considering that the record of that person is outstanding.

5.1.1.4 Technical ability to handle the situation

The technical ability here is referring to the ability to use the right tools to help to take decision on issues affecting extended relationships. Such tools are the types that create the ability to manage the unexpected problems when the need arises and where most critical. This is in line with a reactive plan to managing problems where the process is both rapid and planned (Korpela, 2015).

5.1.1.5 Cutting across boundaries

The right person to form knot in scenario one is sought for beyond the boundary of the organization but within the extended collaboration, which is one of the characteristics of the literature on knots as given by Kerosuo et al. (2015). According to them, knots enable

the crossing of organizational and expert boundaries that otherwise prevent collaboration; which means to say that such an expert can come from a different entity provided he or she meets the other four criteria above.

Given the five factors as observed above, it can be said that the process described in scenario 1 is that of a knot that meets all the conditions of the literature knot but with areas of difference. It should also be noted that the formation of the proposed knot is responsive but not as spontaneous as described in respect to the literature knots (Engeström et al., 1999; Engeström et al., 2012). The scale of the problem in this research context is same as that of emergency but affected by the complex and extended nature which drives the potential for failures in information sharing and impacted on the nature of the response to such failures. The response, in this case, considering the activities performed has to be immediately, and solution needs to be found to resolve the issue identified, but the formation of the right people with the solution is slower but immediate which makes it an emergency crafted knot and failure to manage the problem immediately it will have implications for extended members.

5.1.2 Scenario 2

This is where a knot was observed to form to solve a problem where one of the universities was not accepting the certificate (the result of the shared object) of the case study organization as being valid for admitting students. The problem here is that the university lacks the awareness regarding the mutual benefit both organizations stand to gain in the event of collaboration. There is also the misinterpretation of rules regarding the right to admit students with deficiencies and prepare them to take NABTEB exams after which their admission can be rectified if they pass their examination. The issue was reported by some candidates that took the examination wanting to gain admission into the university. On getting the report and considering the time constraint before admission window closed, the central organization needed to take immediate action by looking for professionals among its stakeholders who are experts in examination administration and very much conversant with the enabling act of the organization. They form part of a knot to discuss with the university and pointing out the benefits of collaborating with each other. Two stakeholders were identified and drafted to form part of the knot, another professional from the organization was also drafted in. The knot was formed, and the situation was resolved by enlightening the university by way of information of the benefit

and possible areas of collaboration. On the aspect of the rules the knots that form draws the university's attention on the right interpretation of the rules as it affects both sides. They specify that universities can admit students with deficiencies and present them to take an external examination to rectify such deficiency and not an internal exam.

Here the knot needed to be created by the central authority of the case study organization, and it has to be fast due to the time pressure of admission process closing, this situation is that of a knot but not as responsive as that of scenario 1 and rapid as reported in the extant literature. Membership has to be sought and drafted in. This situation is not a case of emergency as in the event of the monitoring officer in scenario one but needs an immediate response which takes longer than the usual knots. This issue reported in scenario 2 is a case of information sharing failure caused by the lack of awareness and complexities of rules and norms where the university ignore the rules and carry on with the norms due to the benefit they drive from their action.

Scenario 2 further illustrates that in both situations, knots are formed as a way of responding to a problem requiring a solution. Moreover, the study sees the following characteristics deduced as further proof of how complex and extended organization can solve the problem of complexities using knots. Some other basic characteristics not discussed in scenario one but observed in both scenarios are discussed in the following sub-sections.

5.1.2.1 Recognition of complexity and uncertainty

The complexity in the setting is recognised by the central organization as well as the fact that the situation requires timely action. This situation could mean that students taking that exam will not have the chance to gain admission in that particular university, even though that could be a primary choice for some of them. A manager of the case study organization described the situation as;

(BMNS 03)

> *"The truth is that you cannot win everybody over. Even when government want people to collaborate with us so that we can achieve our mandate, it is certain that sometimes everybody cannot cooperate."*

On the side of the university, the situation is that of promoting their internal product and not recognising the law approving the acceptability of the examination and its outcome the shared object. Whilst both parties can negotiate and come to an agreed form of compromise for the benefit of all, the different motives and complexities in the extension settings hindered the achievement of that until the knot that was crafted by central organization was able to bring a resolution. A similar situation was described by Bleakley (2013) wherein knots are needed to recognise the complexity and the uncertainty in the environment and rise up to the challenges posed by these.

5.1.2.2 Responsiveness

Not only do knots recognise the complexity and uncertainty, there is the need to react to situations, as seen in scenarios 1 and 2 which makes both cases responsive to the situation. This criterion is in line with the study of Korpela & Kerosuo (2014), who described one of the characteristics of a knot as being the ability to respond to a challenge. Not only are knots responsive, they can be proactive in anticipation of problems as stated by Korpela (2015), where changes are said to be rapid and the process is planned. Accordingly, a management staff of the case study organization states;
(BNMS 15)

> *"We don't wait for something to happen before taking action……. I don't know how to say it, it is like waiting for a problem to crop up before taking action on something."*

The responsiveness could be that plans are put in place to manage problems and can do so either as a reactive measure where organizations respond to emergencies or planned action where organizations put measures in place to be pro-active in managing some of the problems.

5.1.2.3 Improvising

Improvising is getting the right people to form the knots. This requires crafting the members that make up the knots in a given context which is always different for different situations. The situation described in scenario 2 is where members are not readily available to pick from and this requires improvising the members by way of crafting them. Members need to be sought and drafted in to form the knots as described in scenario 2. An example is where that specialisation is not readily available but needs to

be searched and incorporated due to the specialisation required. The concept of improvising has been discussed by Kaatrakoski & Lahikainen (2016) in their study of managing change by developing a knot-working culture, but the process of looking and drafting in is a distinguishing factor in this study.

5.1.2.4 Right quality and knowledge

The formation of knots and knot-working observed in this research context is one of the ways different specialisations react to deficiency and attempt to solve problems of extension so as to (or "intending to") achieve a stated goal for the organization. This is achieved with the right quality of knot as experts apply their dedicated knowledge to solve the problems identified in the organization. This quality is as stated by Korpela & Kerosuo (2014), which confirms the quality seen in both scenarios 1 and 2 of this chapter and discussed above.

Analysing scenario 2, this study sees a similar categorisation of formation, use and dissolution and the same behaviours were observed. The use of knots as reported in the setting is to mitigate the deficiencies that teams have failed to solve (specialised division of labour). The 2 examples are that of problems needing immediate solutions and are both problems associated with areas where expertise is required. The challenges reported are as a result of information sharing failures caused by the nature of the setting which is complex and extended as a result of using inappropriate tools which have caused the failure to communicate between divisions of labour and the examination organization. The other challenges reported are those of interpretation of rules and norms and the inability to communicate with stakeholders collaborating in the different divisions of labour. The knots observed in the case study organization are not teams, as they tick all the boxes of a knot which are;

1. Right professional with right knowledge (Engeström et al., 1999);
2. The formation of the knot can be planned with the arrangement taking place as the problem develops (Kerosuo et al., 2015);
3. Authority and seniority are needed to help with inventing and improvising (which includes getting the right people by sourcing and crafting) and the ability to negotiate with others with a view to providing an instantaneous solution to a problem (Kaatrakoski & Lahikainen, 2016; Korpela, 2015;)

4. Experience is needed in creating a form of continuity relating to the problem at hand and in the overall interest of the shared object (Engeström et al., 2012);
5. The required technical ability in managing an unexpected problem when the need arises and where most critical during their membership of a knot (Korpela, 2015);
6. They cut across organizational boundaries but within extended members in such relationships as described by Kerosuo et al. (2015).

The knots observed are responsive and meet all the conditions of a knot given above, like any other knot in the literature however, their behaviours are distinct from the other knots discussed in the literature. The major differences for the behaviours of knots in this setting are;

1. Their speed and nature of their formation, which is different from what is explained in the existing literature as these knots observed are sourced and crafted which makes them much slower than the literature knots of instantaneous formation;
2. The setting where these knots are observed are different from the other literature knots;
3. The use of knots which observed in the required experience of member may not be readily available as in the case of the literature knots hence the spread and reach take place where sourcing and crafting are slower.

Key characteristics of the literature knots were discussed in table 2.4, including their mode of formation; how they are treated and their classification. The table then is a summary of the literature, which gives some key aspects of knots, as discussed in the literature review, section 2.5.8.

In summary, this section presented two different problem scenarios where two different knots are observed to form. The two observed knots are emergency and crafted knots whose needs for a solution are more pressing and may be located locally, whereas, crafted knots are not as urgent as the extant literature knots, the problem identified needs a solution but not as instantaneously as the literature knots. Instances where there is limited availability of required qualities, the knots go through spread and reach, a process where the lack may constitute a problem to the operation of such organization if the right

person is not found, hence spread and reach. However, this knots as discussed expensively are different from the extant literature knots though they incorporate the characteristics of the existing literature knots. They are also different from teams and groups as discussed in the review section.

5.3 Discussion

The concept of knots as discussed in the literature section 2.5.8 is not new and its application is seen to cut across various inter-organizational studies and disciplines (Kerosuo et al., 2013). The same concept of knots according to Bleakley (2013, p.25) is still open to empirical testing and practical application in different fields like that of complex and extended setting. This area of study is considered as an area that remains, "under-theorized and still under-researched" as there is no general formulation on the concept that is universal, which means the application is open to different settings and sectors that may have need for specialised problem solving. Another area of study that remains under studied involving knots is that of process involved in use and their dissolution, which is an area that is open to further research as little is done in that area.

This discussion section therefore, is aimed at supporting the observed scenarios with the interview findings in explaining how this chapter meets the two objectives stated at the beginning of the chapter for the need to explore the nature and types of knots found in the setting and how and where theses knots are different from the other literature knots. In explaining this, the section is structured into three sections with 5.3.1 looking at general discussion on knots and fuse the interviewees side of the story. Section 5.3.2 discussed the concept of crafted knots which covers the spread and reach of collaborators and section 5.3.3 discusses the concept of emergency crafted knots.

5.3.1 General discussion

Whilst the area of knots remains under-researched (Bleakley, ibid), the practice is fast becoming an area of interest to many scholars due to its wide acceptance as a way of involving different expertise in various inter-organizational studies and collaboration (Kerosuo et al., 2013: Kerosuo, 2015). The acceptance can also be attributed to its problem-solving ability involving experts and professionals (Engeström et al., 1999). This type of relationship and practice is as described by a middle-level manager when asked what collaboration means to their type of organization.

(BNSS 17)

> *"Our organization and other examination bodies enjoy good relationship under the umbrella body of examination association and are ever ready to form a combine team in solving a common problem of the whole bodies".*

The extract above suggests extended relationships that enjoy sharing and collective problem solving where the need arises. It also suggests a cross-boundary common problem solving and specialisation in their area of communal existence. Analysing this extract alone side the observed scenarios one and two, the term *"combine team form to solve a common problem*" is a further indication of knots as a way of problem-solving found between NABTEB and it extended partners. Similarly, one of the end users when asked to describe information sharing with other bodies in carrying out the function of NABTEB as an organization. Have this to say,

(OENU 44)

> *"The way to describe the relationship from what I have seen so far is that of organization that relates very well with its agents, where sharing information aid their activity and help them in solving their common problems. Most times you think the school teachers are employed by NABTEB as they form part of all committees in performing special task".*

The extract above is indicative of relationships that are mutually beneficial and dependent on information sharing. It recognised the existence of problems in the setting and the use of "*committees in performing a special task"*. The extract supports what has already been said concerning the problems of information sharing caused by the complex nature of the setting (see section 4.3) where information sharing failures in key areas of different activity systems as discussed can be solved using knots as in this case "s*pecial task committees"*. The extant literature also suggests that not only do knots solve problems, they solve problems requiring rapid instantaneous solutions (Mizushima et al., 2012).

Both interviewees BNSS 17 and OENU 44 suggests the formation of "*special teams"* considered in this study as knots as a way of problem-solving. However, the speed of responsiveness by way of formation of these knots is the area which this study has shown

a difference. Another vital area is that of use of knots which depend on characteristics of the observed knots discussed in section 5.2.1 and 5.2.2 and their sub-section mostly found in complex and extended settings. The knots seen in the setting (complex and extended) are mostly motivated by information sharing (especially where it involves failures) which may not be the case with other knots in the literature.

According to the management staff in the case study organization when asked how they handle problems or issues needing attention, this is what he has to say,
(BNMS 21)

> *"Because our business covers our extended partners, we recognise and value the relationship and even when there are problems we still recognise and value their contribution by involving them, though the process of involving them may take longer, we enjoy the best of their expertise in solving non-conventional problems".*

Using AT in analysing the areas of problems and issues needing attention, Figure 5.5 discuss this in terms of information sharing failures in complex and extended settings and relating it with the two scenarios and the heart attack scenario used in section 5.1.

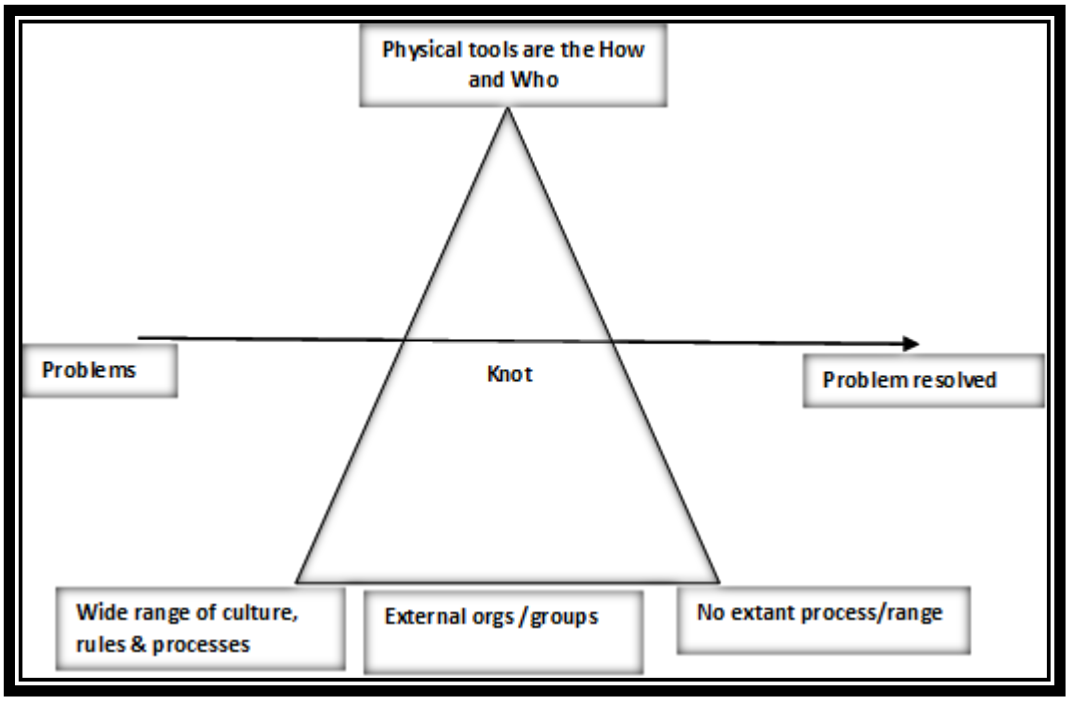

Figure 5. 5 Analysis of Information sharing failure in complex and extended settings: *Source: The author 2017*

The physical tools are the ‘how and who’ as against the immediate and volunteering. The who is about who is available and how to get them, this activity set up primary and secondary tensions & contradictions with a wide range of culture, rules and processes making it impossible to determine what to expect. Because the activity system is unexpected, there is no existing process in place to deal with such.

The two scenarios discussed in this chapter describe instances where knots form as a way of reacting to deficits and shortcomings in extended organizations in line with Figure 5.1, where the lack of information or the failure of sharing the right information has created a problem. The problems are driven through tensions and contradictions in the activity system of examinations, which drives a set of reactions of which the formation of knots is one (another action discussed in section 4.4 and 4.5 of this study is the use of groups and teams). An example is if the information sharing failure through tension and contradictions exposes a training need then a forum for coordination of training across partners may be the formal team reaction to the longer term (short term is the formation of knot) driven out of the need to respond to the issue the knots have to deal with. The areas of tensions and contradiction create and drive the changes in the situation of examination and the changes are the types that require response as shown in the framework diagram in Figure 5.2 refers to as stages of reaction in line with the studies of Engeström et al., (1999) where knots are discussed to handle such problems.

The knots reported in this chapter, however, while clearly and demonstrably meeting the characteristics of knots as discussed in literature (Bleakley, 2013; Engeström et al., 1999; Engeström et al, 2012; Kaatrakoski & Lahikainen, 2016; Kerosuo et al., 2015; Kerosuo, 2015; Korpela & Kerosuo, 2014; Korpela, 2015 and Payne, 2006), are different in some key aspects, as described in the scenarios, and shown in Figures 5.1 and 5.3 from the knots in existing literatures. The knots are sought and crafted, which is an indication of expert boundary crossing in solving the institutional conflict caused by complexity and extension as in accordance to the study of Kerosuo et al. (2015). The process of crafting knot membership as reported is based on meeting all the conditions listed in the two scenarios such as being professional in that area; being sufficiently independent to make an informed decision and having been identified as the right person for the job (as discussed in sections 5.2.1 and 5.2.2).

Although seniority was mentioned here, it is only qualifying the characteristic of being the right person and having the authority to be able to make decisions. The knots reported are temporary, supporting Kerosuo et al. (2015) who described knots as constantly changing according to the requirements of the task. There are no fixed memberships or rules or procedures for handling situations in knots.

This research has identified the qualitative differences in knot formation and behaviour as 'crafting' of the knots and takes this as the key differentiator from knots as seen in the literature to date. Also, there are subdivisions/variants of the basic knot-type; these include 'emergency crafted' knots and this study has also identified the use of 'spread' and 'reach' as forms of knot/knot formation in complex and extended setting. The names are selected based on nature and the way the knots form where members are sought and brought in according to their specialisation and the need to meet the urgent requirements of the time-bound nature of the setting. The context and the nature knots form in this setting is categorised into three key stages (formation, use and dissolution as shown in Figure 5.1) and two of the stages are observably different from the way other knots are formed and used in the literature and become, as such, of interest to this study. Thus, the circumstance does not mean that the knots are by any means not a way of problem-solving, but rather a specific practical application in a setting that is different from the others as stated by Bleakley (2013).

The situation described in the first instance (scenario 1) is that of creating an emergency knot based on the problem in the practical examination which needs immediate action and expertise in the subject area to be able to communicate the requirement and expectations of the examination; this is in line with Bleakley (2013). The situation here is that of a knot since the person needed does not have to be from the central organization, but someone that cuts across its boundary, as stated by Engeström et al. (2012). That person must be able to decide for the examination without depending on anyone or making reference to the central organization. This implies that anyone chosen has that quality to manage the situation and no leadership is needed. It also implies the task needed is not a regular job that requires a daily routine, as in the study of Katzenbach & Smith (1993). Moreover, the problem requires an immediate solution and efficient

accomplishment of the problem in line with Korpela (2015) and the process as observed is only for that particular challenge.

The scenario described in the second case is also based on the conditions as mentioned above in line with the literature, which also makes it a crafted knot which may involve spread and reach where there is limited availability. The results see three types of knots under crafted, as described, and these knots behave differently from the knots in the literature, as set out in table 5.1.

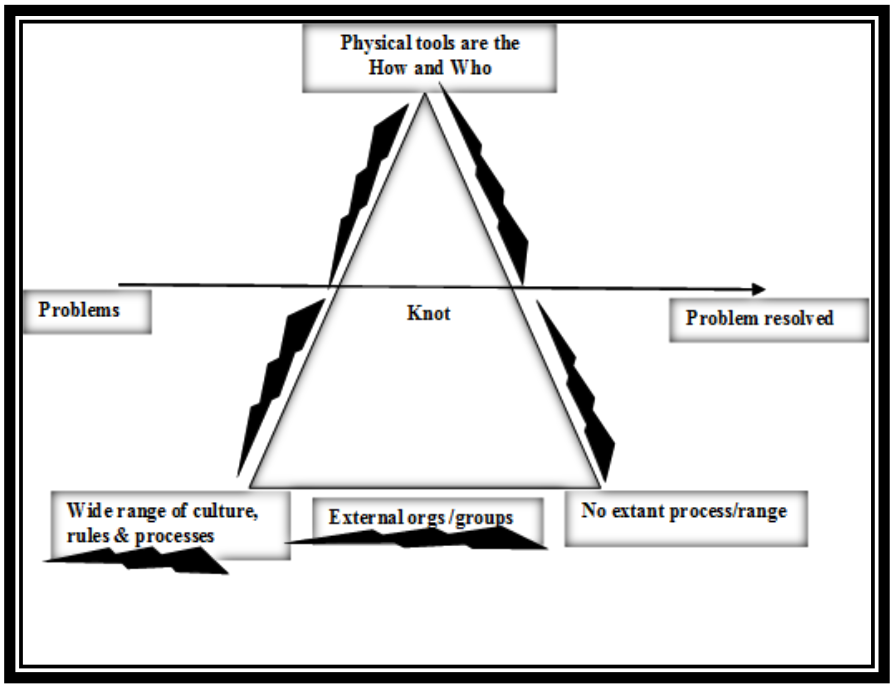

Figure 5. 6 Areas of tensions and contradictions in complex and extended setting:

Source: The author 2017

Figure 5.6 showcase the areas of tensions and contradictions in information sharing in complex and extended settings with potential for failures. This activity system suggests a constant change in the nature of the problem and in the wider range of actors due to the involvement of external organizations and group. The T & C are seen both at primary and secondary level as when compared with less complex and extended settings which will have the initial primary tensions, and a constantly changing actors due to the external involvement and level of operation rising to the level of action with no extend process involved.

Table 5. 1 Difference between existing knots and the enacted new knots:

S/N	Features of Knots	Nature of Literature	Congruence of case with literature	Difference/similarities from literature Knots
1	Problem solving in organizations (Engeström et al., 1999)	Knots described as a way of solving immediate problems	High congruence as it is observed to be a way of solving extension complexities caused due to the lack of information sharing	Both are similar as they possess the characteristics of problem solving ability
2	Transacting boundary-crossing (Engeström et al., 2012)	Knots' membership cut across different work boundaries	High congruence as they recognise membership from different divisions and organizations, the same with specialisation	Both share the characteristics of boundary-crossing
3	Speed of formation is rapid and spontaneous (Engeström et al., 1999; Bleakley, 2013)	Formation is rapid and spontaneous as members are readily available	Low congruence as formation is slow due to crafting nature of membership	Some differences are noticed as literature is rapid but the observed is slower in formation due to the crating nature
4	They can be both uncertain and planned (like Slipknots and hitch knots) (Bleakley, 2013).	Either planned or unplanned	Low congruence as knots in the observed are mostly not planned but can be expected.	Some differences are seen as the observed are mostly not planned but expected while literature has both characteristics.
5	Knots are transient in nature (Spinuzzi, 2014)	They are short lived and disband after achieving their aim	High congruence as they are observed to disband after meeting the objective of being constituted	Both similar as they do the work and disband
6	The process of use of knots see membership changes constantly with no possibility of same members making another knot (Kerosuo et al., 2015)	The extant literature described the use as anyone that meets the professional quality (expertise)	Low congruence as knots use observed are based on experience and a way of expansive learning	Some differences observed in preference as preference has to do with the nature of the setting and the need to meet the high standard of the shared object. As such experience is needed in crafting
7	Rights and privileges of each member (Kerosuo et al., 2015)	Described as no single actor with fixed authority	High congruence as each member has the same rights and privileges to act and take decisions	Each are professionals in the same specialisation with equal rights and privileges

8	Comprise expertise and specialised members of a specific community of working practice (Payne, 2006; Korpela, 2015)	They are seen as having expertise in their various field practised in the same work setting	High congruence as they are observed to be experts in a particular area brought together under an umbrella.	Both similar as expertise and specialisation is the keyword that drives membership of that knot.
9	Actors constantly change according to the requirements of the task. And highly unlikely to make another (Kerosuo et al., 2015).	Changing actors as tasks change and don't have a tendency of making a similar knot	Low congruence as actions change with task but highly likely to make a similar knot due to the crafting nature of the observed as they are sought and crafted.	Observed are not readily available but changes with task and has tendency of making a similar knot over again.

5.3.2 Crafted Knots

Crafted knots as the name suggests, are crafted. These types of knots are sought after among collaborators who are stakeholders. The knots are crafted which means that availability is found within the locality. Whereas, if there is limited availability the crafting will involve the process of "spread" and/or "reach": where the "spread" is the area covered by the knot, based on specialisation and the "reach" is where limited availability exists and where it is hard to find the required expertise within the problem locality. (By limited availability, the study is referring to the available workforce, where this is lacking to the extent that it constitutes a problem to the operation of such organization). It would not be out of place, therefore, to argue that where availability of suitable specialised members exists, crafted knots will be formed without going through an explicit process of spread and reach.

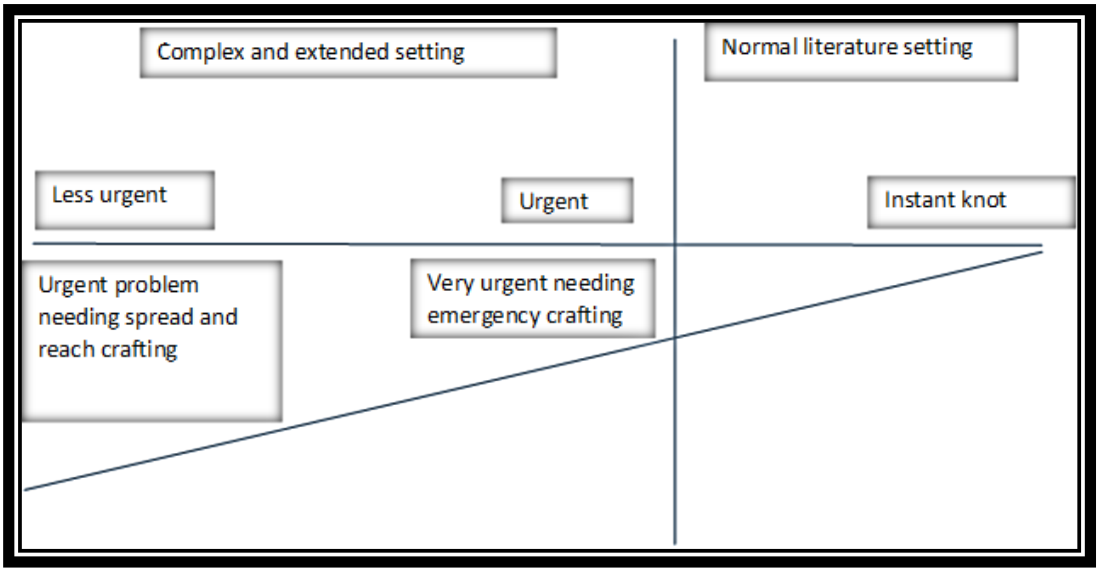

Figure 5. 7 Degree of crafting from urgent to instant knots: *Source: The author 2017.*

Figure 5.7 illustrates the degree of crafting form urgent as in scenario 2 to very urgent as in scenario 1, but all require the right persons to be crafted. The process of crafting involves searching for the right person with the right expertise and knowledge of the problem to make up the knot. The manner of searching is a much slower formation process due to the extension involved. Thus, the search in some cases covers a widespread where collaborators are available, and reach indicates extend to which the right person is not just readily available, hence search will stretch cutting across boundaries due to limited availability. This process visibly is slow as compared to where there is availability, i.e. volunteering as in the heart attack narrative or where there is pooled membership. This type of knot is improvised and not planned, however, in some cases, such knots may be expected at some level – the exact nature of the issue is not known, but it is expected that 'something could crop up' and generate the need for a knot to form.

5.3.3 Emergency crafted

As explained above, this research context classified emergency crafted knots as a product of unplanned events; unexpected and requiring action to address the issue to be sourced and implemented. The issue of specialisation is topmost, and membership is sourced across stakeholders but within the locality as described by,

(BNSS 27)

> *"During the process of forming a committee for unanticipated special task, management considers skills, who is available and if they actually can perform the task".*

The extract above gave an idea of what is needed in forming a special task committee as stated by middle-level manager which is here referred to as knots and particularly emergency crafted knot. The term unanticipated indicate that is something requiring urgent solution. However, where limited availability also exists in this situation, an emergency spread, and reach will be used. The process of sourcing is what makes these knots take longer than the usual knots and has to be implemented to avoid the negative impact of the problem. The emphases here is on the timely nature of the solution needed but certainly not as rapid as the knots that form in medical emergencies where we see a spontaneous reaction to the situation.

5.4 Difference between crafted (spread and reach) knots and literature knots and teams

This section highlights the difference between crafted in some case spread and reach knots as discussed in section 5.3.2 and the existing literature. The review section 2.5.8 highlights three main features of knots as 1) rapid and immediate (Engeström et al., 1999). 2) Membership changes with a task (Kerosuo, 2015) and 3) Knots support new ways of working (Kaatrakoski & Lahikainen, 2016). The knots described in the two cases exhibit all of the characteristics discussed but rapid and immediate responses.

The knots proposed can be seen as a continuum which is differentiated by their breadth and depth, where crafted knots are both high in breadth of the expertise needed and in the depth of expertise. The emergency knots are the type that requires quick action which may require using the spread and depth. Spread knots are the type that acts more slowly due to the range of action required as in scenario 2. However, all the knots are reactive to problems, but the quick response is one of the significant differences.

Their membership changes as tasks change, but the experience is a preference and needed as a way of bringing quick change (expansive learning). Therefore, the history of serving in similar knots makes the person being crafted more acceptable. The knots observed in

this context should not, however, be confused with groups, teams and high-performance teams which share some similar characteristics with knots. The knots observed in this context are exclusively different from groups studied and work teams, however, like the other knots some characteristics of a team are found in them (Richards et al., 2012). The characteristics of teams and that of knots are discussed in 2.5.4 and 2.5.5.

Some of the key differences of teams in this research are that they are mostly seen as task interdependent, having routines (Cohen & Bailey, 1997; Van Der Vegt & Bunderson, 2005). Having leadership. Teams are dependent on the leader's ability to set clear goals, and the leaders are responsible for telling how best a team can achieve them (Katzenbach & Smith, 1993). Teams known as high-performance team also complement skills of other team members which can result in common accountability and not individual effort (Richards et al., 2012). Teams are known for needing a leader for some form of control and being reliant on workflow sequences (Zaccaro et al., 2001). All these characteristics of teams and groups are as shown in Table 2.3 and Table 5.1.

In summarising this section, the knots observed in this study share much with the extant literature on knots, in that they are transitory, take care of that particular problem and disband in line with literatures (Bleakley, 2013; Engeström et al., 2012; Kerosuo et al., 2015; Payne, 2006). The knots observed in complex and extended settings are not also congruent with teams but shares some features of team's, i.e. high-performance teams. The knots observed serve to mitigate deficiencies and are differentiated as a result of the extended /specialised nature of the setting and act as a way of filling the need for expertise cutting across organizational boundaries. Some other differences include the deliberate choice of membership which informs crafting as the name implies and the lack of availability when and where required. The tools are centred on who and the how in meeting the requirement as against who is available in the literature knot. Crafted knots don't just form; they are sought after based on availability and the specialisation needed to solve that particular problem. These knots are characterised as 'crafted' (to acquire the special skill needed for that particular problem), and thus their formation can be slow as when compared to the instant in the literature knots.

5.5 The second research question

The second research question of how complex and extended organizations respond to deficiencies in information sharing can now be addressed based on evidence presented in this chapter, which clearly suggests instances of knots forming to handle problems requiring immediate solutions (Bleakley 2013; Engeström et al., 1999; Kaatrakoski & Lahikainen, 2016; Kerosuo et al., 2013; Kerosuo, 2015). Though the knots, as discussed above, are different from the literature knots, they remain a way of problem-solving for specialised problems that cut across different collaborators. The finding reinforced the existing literature but with some differences in that;

1. The setting is different from the other settings studied as this is complex and extended and the complexities in the setting are analysed using tensions and contradictions in activity theory which reveals some interesting findings that are different from the setting that are non-complex and non-extended.
2. The knots are ways of mitigating deficiencies in general, but deficiencies suggest that knots in complex and extended setting are caused by the reduced abilities of collaborators to share information using different information tools that would have enhanced the achievement of their objectives but instead became an obstacle to information sharing. The rules in different activity systems which was meant to guide their operations have turn out to be a source of the problem and cause anxiety for collaborators as the issues of implementation and application become a problem.
3. That because of the extended relationship and cross-boundary coverage, the formation of these knots become different from the other knots as discussed in the literature.
4. That the circumstance of the settings makes forming of knots more slowly due to the process of seeking out members and crafting the knots.
5. The deliberate choice of membership and the lack of availability are some of the reasons for the slow formation.
6. The knots proposed are responsible for solving immediate problems, which specialised teams in the setting cannot solve.

5.6 Framework used in understanding knots in complex and extended settings

In understanding complexities, the study used Activity Theory (AT) as discussed in the methodology section 3.8 for the understanding of the way the communities involved in such relationships use different tools in getting things done and identifying the deficiencies arising from such multiple relationships.

These reported failures are best understood using AT as a framework for the investigation of the way the communities are involved in complex relationships using different tools to get things done and identifying the deficiencies arising from such multiple relationships. The framework provides a holistic view of the settings and exposes the processes leading to problems that affect sharing and the level of awareness in the exchange of information in such complex and extended environments. These results are achieved by identifying the areas of tensions and contradictions as discussed in chapter 4 which are detectable where there is a deviation from established norms or practice. The framework also provides a way of looking at the relationship of the knots activity system with the overall activity system in the examination setting, thereby giving an understanding of some differences from the existing literature, and thus contributing to knowledge.

Third generation activity theory, in particular, was used in this chapter as a tool for the understanding of dialogue in a network of multiple events (Engeström, 1995; Wertsch, 1991). Considering that knot-working is seen as a phenomenon that explains ways of handling complexity and uncertainty in today's work environment. AT gives a level of insight regarding the tensions, contradictions and drivers for the formation of knots. However, 3GAT may be perceived as limited or incomplete since there are some gaps in understanding how and why the knots reported form more slowly as explained in the two scenarios in section 5.2.

Therefore, fourth generation activity theory (4GAT) is embraced. It was initially planned as chapter six of this study. However, the part played by the approach complements third-generation activity theory (3GAT) in understanding the actions and innovation that 3GAT encountered limitations in explaining, as highlighted below;

1. 3GAT which is the approach used in this research gives a level of insight in terms of tensions and contradictions which bring about changes, but the approach fails to explain the type of innovation that concerns the 'why and how' of these changes emanating due to the identified deficiencies caused by tensions and contradictions (Jarzabowski, 2003). The reason is that the approach (3GAT) has reduced flexibility that allows the examination of other allied activity systems and other settings.
2. 3GAT is based on cultural historic activity theory (CHAT) which may have considered some factors relating to the environment. However, these factors are not considered an innovation that allows the overall activity system to find an immediate solution which will allow the outcome to reach its expected completion. An example is shown in Figure 5.9 where barriers to goal achievement need solutions. This is similar with the study of Khayyat (2016) which considered how the business environmental factors affect the different activity systems in collaborative relationships, their surroundings and barriers see Figure 5.8 (Khayyat, 2016). The factors discussed here are both internal and external factors that may hinder actualisation of extended relationship goal and the achievement of the overall goal.
3. 3GAT fails to give room for improvement by way of not allowing other elements to be introduced to aid or enhance the achievement of organizational goals (Khayyat, 2016). The reason is that different settings need different circumstance with different elements needed to be introduced to help explain the circumstance inherent in that setting and how that setting mitigates its failures or react to such failures.

4GAT discussed as the next section is a good means to provide a better understanding of information sharing failures in modern organizations that are characterised by both complexity and extension (Spinuzzi, 2014). It also addresses issues of the modern-day type of organization that are transient (temporary like that of knots) giving the shift and a step change in the ways knots are perceived (Kaatrakoski & Lahikainen, 2016; Korpela & Kerosuo, 2014). It also helps in explaining the poly-contextual nature which allows the consideration of different circumstance leading to innovations as in the case of this study which necessitates extended relationships (Spinuzzi, 2014).

5.7 Fourth generation activity theory

Whilst 3GAT which is the approach used for this study provided insight into extended relationships and their complexities, there are limitations in some areas in explaining reasons for some changes and behaviours. These limitations correspond with the setting for this work. Thus, 4GAT was used to help address some of the 3GAT limitations, and the approach can potentially add value to address the following key areas.

A. Increasing the understanding of the application of AT to different settings and models (Christiansen's, 1996; Holland and Reeve, 1996; Khayyat, 2016; Spinuzzi, 2014) including other areas of work design and analysis (Marchigsiani et al., 1997).

B. Understanding the complexity and innovations in coping with stakeholders' difference (Khayyat, 2016; Spinuzzi, 2014).

The flexibility to consider other settings, i.e. activity systems of other stakeholders and to recognise the difference between them is what 4GAT has brought with regard to understanding other elements. The effect, therefore, of 4GAT is to give a broader scope to examine an activity system not just as an item in itself but as a part of an interlocking pattern of a set of activities and context. This flexibility as explained using 4GAT helps to address reality in a complex and extended setting where different rules & norm and different tools are in operation. 4GAT also gives that ability to reflect on and bring elements of that into understanding with the ability to look beyond an activity system to see why complexity and extension are driving this potential failure. An example is an innovation that takes place in the process of knot formation which makes it different from the literature knots. These changes are not discussed, and why the knots are different could not be explained using just 3GAT as it did not look beyond the activities in understanding the different behaviours reported that drives complexities. Therefore, 4GAT is an evolution that is useful in helping to understand actions taking place in the background.

The debate and development around 4GAT are on-going, and scholars have described it as a tool for understanding multiple relationships which are based on shared objects (Sannino et al., 2009). This approach and its implementation were used by scholars like Khayyat (2016) and Spinuzzi (2014) with the objectives of considering multiple perspectives in different contexts that are fundamentally transient. The approach is

characterised by multiple-boundary crossing and supports an understanding/ accommodation/analysis of the new ways of working found in today's organizations which deal with interactions across different activity systems. Thus, 4GAT takes into account several factors that have not been adequately considered within 3GAT such as:

1. Innovations needed for the process (activity system to reach a logical completion) to achieve its expected outcome,
2. Introduction of elements to understand the achievement of goals in different activity systems (this has more similarities to the element used by Khayyat (2016) model and has some difference in terms of some elements due to the difference in setting),
3. Barriers and solutions for extended relationships.

The suitability of AT in general, and particularly the significance that 4GAT approach (which is considered an emerging development) brings to understanding complexities can be argued to add more insight into how AT in general is understood and operationalised in teams of investigating natural behaviours in organizations and information sharing behaviours. This argument supports the study of Nardi (1999) who described using AT as a methodology and a unifying framework that can be applied to different areas of study. Thus, the approach can be customised to accommodate different purposes and disciplines, with the capability to be tailored for different purpose as seen in this study where knots are theorised in complex and extended setting. The new insight into the operationalisation of extended organizations with their complexities supports the argument in the study of Rogers (2008), who described the customisation of AT to fit different settings as a welcome development. Similarly, the study of Diaper (2008), advocates that AT is a durable tool that can be used in different domains and are subject to the interpretation of experts in the area of operationalization. The argument here related to the acceptability of AT as a tool that fits the different context and 4GAT has something to offer around its development rather than about the existence of AT.

Thus, Spinuzzi, (2014) illuminates how modern-day organizations especially firms with no employees take on client's responsibilities and manage the complexities involved by using 4GAT at the backstage through extended collaboration and monitoring performance. This implied that 4GAT is used as a tool for coordination, managing collaboration and controlling performance of extended organizations. Similarly, the

study of Khayyat (2016) reveals in Figure 5.8 how different elements are introduced for the understanding and explanation of different situations and different activity systems which bring coordination within a bigger activity system in smart cities. The idea is for people to have that impetus for a well-planned environment with all the necessary infrastructure available. 4GAT with its flexibility of introducing new element different from the 3GAT elements helped in explaining how communities affected by people who are motivated by the need to make some factors in the environment their priority by way of division of labour to achieve good health, infrastructure, recreation and waste service accessible to all.

Therefore, some of the elements in Khayyat's model will apply to complex and extended settings, which is the context investigated.

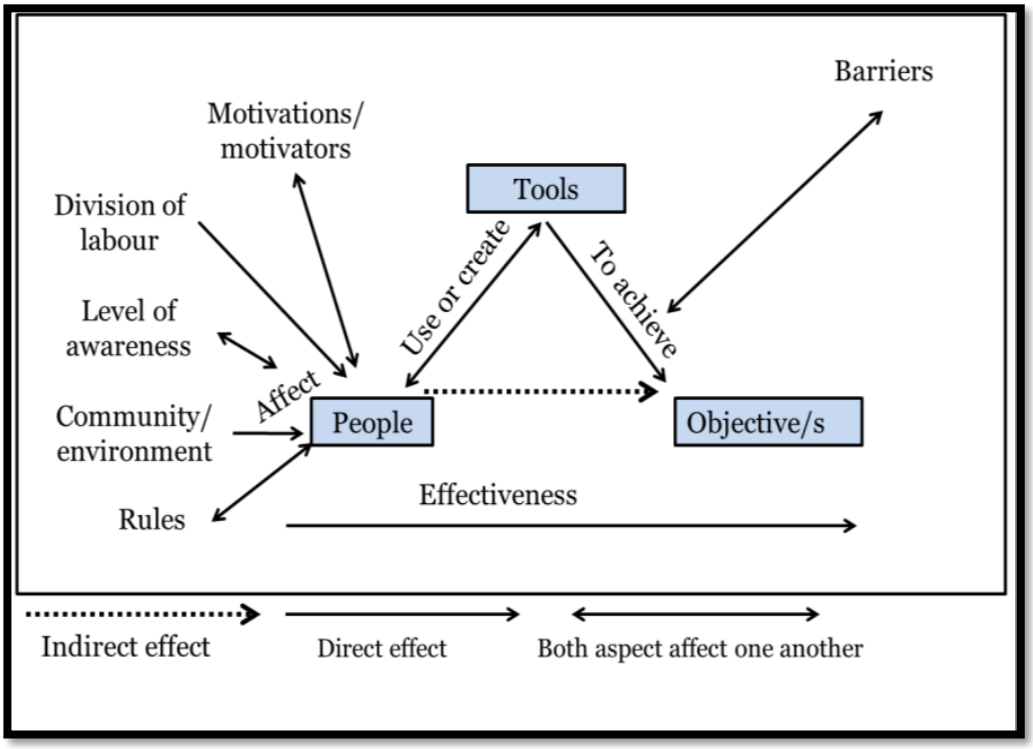

Figure 5. 8 Khayyat's 4GAT model for smart cities: Sources Khayyat 2016

In the next sub-section, some elements are introduced to help explain actions and innovations for goal achievement.

5.7.1 Understanding the innovations to goal achievement in extended relationships

Six elements are introduced in understanding the actions and innovations using 4GAT which are; 1) barriers and solution, 2) awareness, 3) performance, 4) effectiveness, 5) professional standard and 6) knots. The elements awareness, performance and effectiveness, are the elements used to guide the entire process of ensuring goals are achieved. Whereas barriers/solution and professional standard are elements used to check environmental problems and ensure standards are followed. Knot is as discussed in sections 5.2 and 5.3 as the element that ensures the system to reach its expected outcome where there are potential failures. Figure 5.9 shows where these elements are located, and the next section explains how they are used.

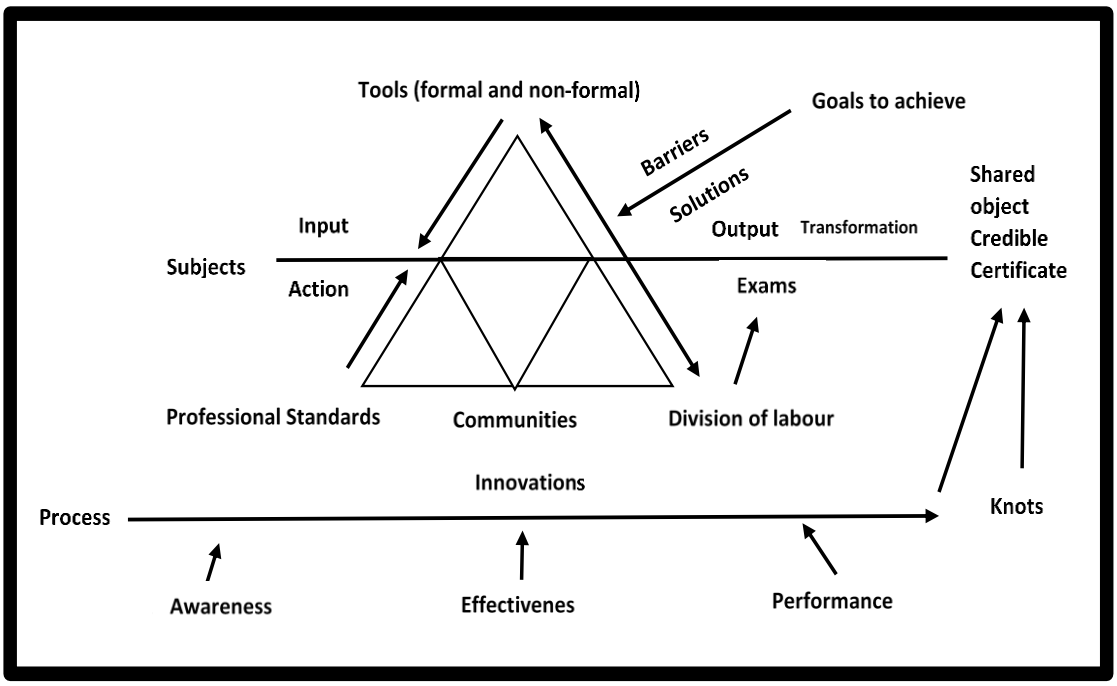

Figure 5. 9 Proposed 4GAT model for complex and extended settings: ***Source: the author, 2017***

5.7.1.1 Managing extended groups

The three key aspects of global extension as reviewed in section 2.2.2 are those of capital, people and information (Kanter, 1999) under extended enterprises. Managing different groups requires managing people with information to achieve specific benefits as seen in complex and extended setting through case study example. Some of the benefits are discussed extensively in the review, methodology and finding sections. The introduction

of elements of awareness, performance and effectiveness is an innovation targeted at managing tools, subjects, division of labour and outcome which are products of information, people and capital (investment). The elements are aimed at creating that awareness need among the different artefacts found in an activity system, monitoring their performance and checking the effectiveness of operations and actions. This innovation is needed in managing extended groups as in the case study organization.

5.7.1.2 Understanding of different challenges

Extended organizations have different challenges, likewise workgroups or team. According to Katzenbach & Smith (1993), the existence of the group is dependent on the availability of performance challenges, and the existence of an organization depends on a difficult challenge confronting the organization. AT in general is a useful framework for understanding these challenges involving dialogue between different communities, networks of interrelated activities and division of labour (Engeström, 1999). The introduction of elements like barriers/solution is an innovation aimed at understanding the challenges with a view to managing them. Example, the use of the professional standard is aimed at ensuring that the action of subjects, communities and division of labour are regulated and standardised in achieving the expected outcome using tools targeted at the shared object. Not only are the elements barrier/solution and professional standard used in understanding and managing challenges, but they are also ways of making an organization pro-active in anticipating environmental and operational problems in extended relationships.

5.7.1.3 Creating opportunities through learning

Kotter (1995) outlined some factors as to why transformation is hampered in the organization which include among other things the inability of organizations to learn from different phases in the change process and even when they make a costly mistake, they also don't learn from it. The consequences of changes in today's organization are said to be on the increase which requires understanding the transformations taking place in both businesses and the application of technology (Tapscott & Caston, 1993). 4GAT can be used in explaining the innovations in extended relationships that aid the achievement of organizational goals through creating opportunities for the understanding of the transformation of the object to its expected outcome which also explains why knots form in the event of failure to share information in achieving the stated objectives.

To summarise this section 4GAT in this study was used to address the weakness in 3GAT and help in understanding the new behaviours which are needed in the new ways of working in complex and extended settings. More particularly, 4GAT provides an understanding of:

1. The need to identify the problematic areas that are likely to hinder the collaborative relationship from achieving its objectives.
2. The need to be proactive in providing a solution to 1 above.
3. The need for professional standards to take care of the rules and norms of collaborating partners.
4. The need to understand the innovativeness in the overall activity system towards achieving goals by way of awareness, efficiency and performance. The contributions here is that 4GAT provides an excellent lens through which to understand this type of setting (complex and extended), the problematic issues and the needs and the abilities to collaborate with partners. The section objectives are to explain the innovations in extended relationships that aid the achievement of organizational goals and why the knots formed in chapter five are different.

5.8 Contribution:

The contribution in this chapter is the understanding of how complex and extended settings manage and mitigate deficiencies and shortcomings inherent within them when knots form. The speed of the formation of knots in complex and extended setting is slow due to the need to craft those required in the setting, which is the opposite of the instant configuration seen in the literature (Bleakley 2013; Engeström et al., 1999; Kaatrakoski & Lahikainen, 2016; Kerosuo et al., 2013; Kerosuo, 2015). The understanding of the phenomena studied have implications for the following areas:

1) Implications for theory especially in the area of organizational studies,
2) Implications for policy in terms of decision making involving the ways extended organization solve their problems;
3) Implications for practice for the case study organization and similar organizations.

Another contribution of chapter 5 is that 3GAT is used as providing the tool for exposing the nature of the setting investigated and the difference therein. However, 4GAT, as explained, has added explanatory power as to how and why certain behaviours are observed as reported in chapters 4 and 5 of this study. The two approaches together gave

this study a basis to understand and explore in more depth the nature of the phenomenon under investigation. 4GAT is analysed as a tool which provides an additional understanding of the innovations needed in extended relationships to support the achievement of collaborative goals. Specifically, 4GAT extends our understanding of the ways the limitations identified with 3GAT are addressed, particularly in extended organizations where relationships are transient, time-pressured and cut across boundaries.

5.9 Conclusion

The arguments in this chapter (chapter 5) which is a product of two themes merging (as discussed in the methodology chapter) centred on information sharing failures which are responsible for deficiencies and shortcomings in complex and extended settings as a result of the extended nature that cuts across boundaries. It is reported that extension drives complexities with an associated adverse influence on the way information is shared among members involved in those extended relationships and that this shapes the way organizations react. This complexity, driven in part by the fact of extension, can lead to misplaced proceedings in achieving organizational success – evidenced by failures in information sharing. Where such failures are observed (and analysed/exposed by way of tensions and contradictions in the activity system, or deviation from fundamental norms and practice) knots may be formed as one of the ways organizations handle such deficiencies and shortcomings. This finding answered the second research question which suggests that these knots are a form of problem-solving.

The knots reported in this chapter share much with the existing literature on knots, which are transitory, take care of that particular problem and then disband (Bleakley, 2013; Engeström et al., 2012; Kerosuo et al., 2015; Payne, 2006). These knots are differentiated, however, by being a result of the extended /specialised nature of the setting, which acts as a way of filling the need for expertise by cutting across organizational boundaries. There is also a deliberate choice of membership and a lack of availability when and where required. The knots reported do not just form; they are sought after based on availability and the specialisation needed to solve the problem at hand. These knots are ‘crafted’, which explains that their membership is based on the acquisition of the special skills needed for that particular problem, which equally suggests that they can be slow to form.

Chapter 6 Conclusion and Implications of study

6.1 Introduction

This chapter starts with the two research questions and their responses based on the findings outlined in the gaps as discussed in the literature and section 6.2. This is followed by the contribution and implications of the study with regard to theory, practice and policy. Then followed by the limitations of the study and areas of further studies and a conclusion section. The structure, therefore, is as follows: section 6.2 discusses gaps identified in this study. Section 6.3 discusses the implications for theory regarding the study contributions. Section 6.4 discussed the implication of this study regarding practice and policy based on AT analysis of tools, rules and roles. Section 6.5 discussed the limitations encounter during the study. Areas needing further study are discussed in section 6.6 and section 6.7 concluding the entire thesis

Two research questions were investigated in this research:

1) How does complexity and extension influence collaborative information sharing? The study highlights some issues and complexities related to extensions in collaborative relationships which are identified as potentials for information sharing failures. These challenges are responsible for organizations needing to find the best way of mitigation and in so doing increase the productivity and efficiency of the organizations according to Provan and Lemaire (2012). Thus, complexity, in the context of this study, influences information sharing, and the way organizations react to extended complexities shape and influence the decision-making process in such settings, e.g. some organizations influenced by complexities, use teams, while others use groups for information sharing. Thus, reasons are outlined as to why organizations in extended and complex relationships share information as discussed in section 4.2. Therefore, the complexities reported are due to extension and influence sharing of information in the setting.

2) How do complex and extended organizations respond to deficiencies in information sharing? The behaviour observed in extended relationships is that organizations respond in part through knots. These knots are not the same as the ‘literature knots’ as studied by Bleakley, (2013); Engeström et al., 1999; Engeström et al., (2012); Kaatrakoski, & Lahikainen, (2016); Kerosuo et al., (2015) and Payne, 2006, and there are some material

differences. The knots reported are used as a way of solving immediate problems caused by information sharing failures, and the knots disband afterwards in line with the characteristics of knots. These areas of difference mean that, often, knots in the case study organization share characteristics with 'literature knots' and have their specific characteristics.

6.2 The gaps identified in the study

The area of complex and extended relationships is reported to have received increased attention in the past decades (Provan and Lemaire, 2012). However, the issues regarding organizational extension and how they operate are still understudied as there are still no definitive conclusions on the matter (Provan et al., 2007, p. 479; Provan and Lemaire, 2012, p. 368). Researchers have established the importance of sharing information as a strategy to increase collaborative efficiency and as a means to achieve organizational productivity (Lee et al., 2000; Yang and Maxwell, 2011). However, despite this call, one particular area that has been overlooked in the information sharing behaviours literature, is the information sharing behaviours of complex and extended settings (Provan and Lemaire, 2012) attributed to the complexities and challenges of the setting and still remains understudied (Provan and Lemaire, 2012).

Although the primary focus of the research is information sharing behaviours in complex and extended organizations at the organizational level. The focus has been specifically to examine the role of the temporary specialised teams that are a part of the way that extended organizations, and those within them, share information, mitigate and deal with issues resulting from deficits in information sharing (Camarinha-Matos, 2004; Chae et al., 2015; Maciejovsky et al., 2013; Mankin et al, 1996). Thus, the literature which focuses on teams and especially on the way they work, i.e. Belbin, (2012a, b, c); Camarinha-Matos, (2004); Cohen & Bailey, (1997); and Mankin et al., (1996), makes reference to the importance of information in passing but not in depth. Whereas, reference is made to information as an important aspect. The review identifies the following shortfalls: 1) there is a lack of cross-referencing of information behaviour literature with that of information sharing behaviour in complex and extended settings. 2) In collaborative teamwork and teams, it is clear that literature makes reference to information as an important aspect, but little is known about the information behaviours of teams.

The difficulties associated with complex and extended settings have the potential for information sharing failure which may lead to misplaced priority in achieving the organizational success, with consequences of organizational failure in achieving its objective. Where such failures are observed by way of tensions and contradictions in AT or a deviation from fundamental norms and practice, knots may be formed to handle such deficiencies and shortcomings. Knots are not new; however, the concept remains an area of research that is, "under theorised" regarding its application and is still open to empirical testing and practical application in a different area of study (Bleakley 2013, p.25).

Understanding why and how these knots form becomes vital due to the increasing practice and importance attached to knot-working (Bleakley, 2013; Engeström et al., 1999; Engeström et al., 2012; Payne, 2006). As a way of better understanding the complexities of organizations in multiple relationships, in the context of this study 4GAT was proposed by way of a model to provide that insight and fill the identified gap left by 3GAT. This approach has helped to increase the understanding of the difficulties in complex and extended settings and the innovations needed in extended relationships that aid the accomplishment of organizational goals.

The approach (4GAT) proposed and used according to Khayyat (2016), is a positive means for a better understanding of organizations dependent on shared objects that are transient, such as that of the case study organization. Therefore, 4GAT in this study is used to increase our understanding of behaviours in the setting, especially issues around information sharing failures in extended organizations where tensions and contradictions drive these behaviours in organizations, which react by the forming of knots. 4GAT supplement the areas of limitation in 3GAT and the two approaches are used together in this study.

This research was undertaken with the aim of filling these identified gaps from the literature, and it has implications for theory and practice which are outlined in the next section.

6.3 Implication of the study to theory

The setting for this research is driven by extension and with extension comes the possibility of complexity and potential of information sharing failures, which also has the tendencies to reduce organizational' effectiveness, leading to loss of productivity and efficiency. This study based on the findings and discussion in chapters 4 and 5 contributes to theory as stated in section 4.7 and section 5.8. The contributions which have implications for theory are summarised in the next section.

6.3.1 Contribution number 1 to theory on information sharing behaviour of complex and extended organizations

Collaborative information sharing behaviour in complex and extended organizations is becoming increasingly more common in today's contemporary communities, and its complexities and challenges remain understudied in work-related information science areas (Provan and Lemaire, 2012). The complexities trigger information-sharing failure in extended relationships and its dependencies due to the lack of congruence between information deliveries involving rules and norms, and tools and roles, amongst all collaborating partners. These failures are apparent through tensions and contradictions in the activity system which help in identifying failures in the formal systems and emergent behaviours to resolve them by way of information sharing behaviours. The behaviours in this contribution, which are common to extended organizations, are those of the use of dedicated specialised teams and groups. The behaviours allow the exchange of ideas and information between collaborating partners due to the complementing needs of services and the nature of sharing, used to address productivity problems, increase the quality and quantity of products, and reduce the divide between extended organizations (Landy & Conte, 2016). Thus, the contribution here includes:

1) Developing an understanding of the nature of inter-dependency, observed in the complex and extended organization with its complexity which drives the need for information sharing.

2) An understanding of how collaborative relationships require specialised teams and groups with a complementary nature as a way of sharing information needed for such a collaborative operation, reducing the extended divide.

The setting therein which is complex and extended is different from other settings that are non-extended, making this work of value.

6.3.2 Contribution number 2 to theory on knots as a way of responding to deficiencies in complex and extended organizations

The concept of knots is not a new contribution. However, the concept remains an area of research that is "undertheorized" regarding its application and is still open to empirical testing and practical application in the different area of study (Bleakley 2013, p.25). Therefore, in filling the identified gap above, this study conceptualized knot-working using a functional case study organization (examination organization) considered complex due to the extension and its shared object dependency.

The extension driven complexities, with adverse influence on the way information is shared among members involved in extended relationships is reported and driven in part by the fact of extension. This can lead to misplaced precedence in achieving organizational success, evidenced by failures in information sharing. However, such failures as analysed and exposed by way of tensions and contradictions in the activity system as shown in Figure 4.2 or deviation from fundamental norms and practice necessitates the formation of knots. The knots formed to handle such deficiencies and shortcomings driven by these extensions. The knots share much with the extant literature on knots, which are transitory, that take care of that problem and disband in line with literature and reinforce the findings of Bleakley (2013); Engeström et al. (2012); Kerosuo et al. (2015) and Payne (2006).

However, the knots observed in complex and extended settings are not entirely congruent with the knots that have been described and analysed in other contexts as reviewed in the academic literature (which mitigate deficiencies as discussed in Table 2.4). The knots observed should not, however, be confused with groups, teams and high-performance teams who share some similar characteristics with knots. The knots are differentiated because of the extended /specialised nature of the setting and act as a way of filling the expertise need of members cutting across organizational boundaries. Another difference is that of deliberate choice of membership and the lack of availability as to when and where required. Such knots do not just form, and they are sought after based on

availability and the specialisation needed to solve that particular problem. These knots are ‘crafted’ (for acquiring particular skill needed for that particular problem), which suggests that members are picked based on specific skills needed and formation is slow as compared to the extant literature knots. Thus, the contributions here are:

1) The understanding that the speed of formation of these knots is slow due to the crafting nature as against the instant configuration, planned and expected as against unplanned but expected as reported by other literature on knots (Bleakley, 2013; Engeström et al., 2012; Kerosuo et al., 2015; Payne, 2006).

2) The setting where these kinds of knots are available (complex and extended settings) makes the observed knots different.

The understanding of the phenomena of crafted knots, as discussed in 5.3.2, the speed of formation and operation as discussed in 5.8, is the second contribution reported in this study.

6.3.3 Contribution number 3 to theory is on the use of fourth generation activity theory

The formation of knots, reported in contribution 2, is in response to information sharing failures which are (at least in part) driven by complexity and extension of the organizational setting. These knots have material differences, as described in chapter 5 and section 5.3, particularly with regard to the considered choice of membership and the speed of formation in part, as a result of this need for a considered choice of the constitution. This is also a result of the need to reconcile differences in rules and norms in communities as a result of extensions and complexities and the lack of congruency of tools which affects roles. Third Generation Activity theory (3GAT) is a valuable tool and a useful approach for looking at multiple relationships in general to understand such phenomena. It also gives a level of insight in terms of tensions and contradictions and drivers for the formation of knots. However, the approach (3GAT) was perceived as limited or incomplete as there are boundaries, as discussed in section 5.7. The limitation reported leaves some gaps in understanding how and why the knots reported in chapter 5 form more slowly than the literature knots.

These limitations, as suggested, have at least a partial basis in the specific and characteristic types of failures that can occur in complex and extended settings. It,

therefore, becomes vital to find something that can help address these issues that engender complexities.

1. Issues of the modern-day work environment with its more fluid ways of working.
2. Issues of shared objects that are transient.
3. Issues of extended organizations that extended beyond their boundaries.
4. The tools used in moving away from more traditional tools found in 3GAT.

Fourth Generation Activity Theory (4GAT) was proposed and used to help understand and address the issues highlighted above, as it provided further insight and a positive means of better understanding information sharing failures in modern organizations characterised by both complexity and extension. The finding is in line with the studies of Khayyat (2016) and Spinuzzi, (2014).

1) The use of 4GAT has something to offer in understanding complex settings and can be considered as a contribution especially in explaining the behaviours found in knots (set out in chapter 5) and why the knots are different. These differences, as suggested, are driven at least in part by the complexity and extension of the organizational setting, which is an almost inevitable consequence of globalisation and more modern work practices (Provan and Lemaire 2012). The behaviours of knots also explain why they are different.

2) The other area 4GAT may have something to offer is in understanding and explaining the innovations which enhance the achievement of collaborative goals which, according to Kotter (1995), drives transformation by way of learning from the change process (which goes through different phases) and from past mistakes. The same innovation also helps in explaining the behaviours reported in section 5.7 of this study, where knots are suggested to form differently from that normally reported.

The areas suggest the links between the transient nature of collaboration and complexity, between expertise boundary crossing and information sharing failure and the lack of information sharing and its effects.

6.4 Implication of study to practice and policy

The key findings in chapters 4 and 5 are all based on activity theory analysis which reports the difference in norms and culture, difference in technology use, and how these

differences affect roles where relationship is time bound and transient in nature with possibilities of lack of sharing and use of information.

The factors reported are discussed in this study highlighting their implication on practice and policies.

6.4.1 Implication on the use of tools

This study reports the use of both formal and non-formal tools for information sharing with collaborating partners (section 4.3). The tools as grouped in Table 4.1, are described as what aids communication and are categorised as analysed in this study into four different categories as; 1) physical tools which are hardware tools used in communication, 2) software tools which can consist of computer instructions or data used to communicate, 3) traditional tools more of pen and paper tools of communication, and 4) mental tools which are used for understanding and doing mental maps.

6.4.1.1 Formal tools

The use of technological applications are characterised as formal tools and used in sharing information with other collaborating partners. The tools must be in congruence with each other for the goal to be achieved. However, this study reports the lack of congruence of tools as a problem of extension which can be responsible for the lack of information sharing. Section 2.3.5 describes the mode by which information is shared as of great importance in achieving the goals of the collaborative organization (Loebbecke et al., 2016). Similarly, Young and Finger (2014) describe communication tools as vital to achieving and maintaining relationships and for achieving organizational success.

Thus, technology among extended organizations (different collaborating partners) needs to be congruent to achieve perfect communication. This way organizations can achieve increased efficiency and performance (Yang and Maxwell, 2011) and reduce the possibilities of information sharing failures. Therefore, this form of the tool has implications for the success of extended relationships in both a positive and a negative way (as described in section 4.3.2) which need to be understood.

6.4.1.2 Non-formal tools

The non-formal tools are non-technological tools, mostly used within an organization and are considered old-fashioned but an effective way of passing information. Though their coverage is limited, they are considered an effective way of communication within an organization. They enable the achievement of the expected outcome in extended relationships that are complex.

The use of both the formal and non-formal tools are intertwined to mitigate factors that are responsible for information sharing failures within extended organizations that are complex. Therefore, tools for use in this type of setting must be of the same or a similar standard to those of collaborating partners and considered vital for information sharing. This, therefore, can be argued to have implications for practice as the wrong use or the lack of congruency can cause failure.

6.4.2 Professional standards

In this study, rules and norms are reported as one of the possible 'misfits' areas as identified through tensions and contradiction (Figure 5.6) due to different collaborating partners having different rules and norms that guide their operations. Professional standards can mitigate the issue of rules and norms for extended organizations as a guide needed to be adhered to by all collaborating partners in solving problems of extended relationships especially when it has to do with boundaries crossing as in complex and extended settings. The findings discussed here is in line with Loebbecke et al. (2016) who argue for some form of new reliance that will reconcile both intra and inter-organization information sharing process and reduce failures.

Therefore, the element proposed through 4GAT in Figure 5.9 has implications for practice. It inform the need to have a concept to guide the performance and operations of all collaborating partners in extended relationships in achieving the common shared goal.

6.4.3 The nature of relationships

The transient nature of extended relationships is acknowledged in this study and the need to identify the various problems in the different activity systems and making plans to

avoid time wasting. These factors, according to Allen (1978), can be systematic and logical and need to be identified within the shortest period possible. This study, therefore, impacts on the nature of relationships where organizations are advised to be pro-active in anticipating problems and putting plans in place. Understanding the nature of a relationship and how it can help or become a hindrance is essential to the long-term goal achievement of the organizations. This aspect has implications for practice to identify all factors that will hinder information sharing and manage them well in such a way that it becomes advantageous to the relationship.

6.5 Study limitations

In conducting this research, plans were put in place to achieve perfection, but this was impossible to accomplish as there were some limitations. The limitations are discussed in this section.

1) The data collected is from 4 different categories of respondents. However, the representation is not equal as it becomes difficult to get a good number of respondents from the end-users group. This limitation may have had an impact on the data as the data may not reflect the exact position of that group.
2) Part of the data collection involved observation of how respondents handle the issue of information sharing failures. However, the observation involving stakeholders became difficult as permission to be embedded within the various offices of stakeholders especially that of end-users, was a big issue. Most offices when approached will ask the researcher to get permission from management before conducting observations and interviews. This is time-consuming and impractical. The problem was resolved by interviewing the group with no observation of the group. This problem may have limited a better understanding of how such groups mitigate their side of the problem of information sharing failure and also the analysis of this research.
3) The nodes identified in Nvivo as shown in Table 4.1, could not all be used in this research as the less common nodes may not have been included in the main themes identified. It became impossible to include all the nodes generated in Nvivo.
4) The time limits inherent in the PhD programme placed some constraints on the ability to explore new angles as the research progressed.

5) Getting ethical approval to conduct the research in Nigeria was difficult due to the insecurity of the country. However, this was resolved with an assurance that the data collection was within the safe areas and not war-zone areas.

6.6 Summary and areas of further studies

Two objectives were identified for this study:

1. To explore how complexity and extension influence collaborative information sharing in complex and extended organizations.
2. To explore why information is not properly shared in complex extended networked organizations.

This thesis is based on a qualitative piece of work grounded in the data collected and analysed using activity theory that expresses the personal experience of respondents within their work environment and is an individual's perception of their reality, which varies between individuals. The data and its interpretation are based on four different categories of respondents which reveal and satisfy the objectives of what reality is in the setting studied (complex and extended). This setting is different from other settings where similar studies were carried out, and conclusions are drawn based on the different settings.

The major contributions are based on the objectives discussed in chapter 1, and the research questions put forward in chapter 1 are discussed in the empirical chapters (4 and 5) where the analysis and understanding of the behaviours involving information sharing failures are reported.

In particular, chapter 4 is where information sharing behaviours associated with extended organizations were identified which centred on the use of teams and groups due to the complementary abilities of members in the area of division of labour through the use of different tools. This division of labour is based upon specialised services provided by these teams and groups, with the specialised nature of the task of reducing the extended divide. This extended relationship is needed to keep organizations in business. However, it is complicated and qualitatively different between the different teams, groups and organizations that are involved in the relationship (Farrel, 2008; Landy & Conte, 2016; Richards et al., 2012). The data in this study suggests that the behaviours of using

specialised groups and teams are only a way of sharing information needed for effective and productive team and group performance.

Objective 2 explores why information is not properly shared in complex extended organizations and outlines the various problems as identified through tensions and contradictions which are attributed to the non-realisation of congruence between tools and subjects using the tools. The difference in rules and norms are reported to also affects the achievement of goals and the lack of innovation is needed to achieve the identified objectives (chapter 4).

Despite the use of teams and groups in this setting, complications were reported due to the identified problems hindering information sharing amongst the group and team members persisting. The reported complications have caused relationships to alter, forming knots to mitigate the problems (chapter 5). Understanding the actions and innovation that takes place in the knot formation and why the knots reported are different was achieved using 4GAT as a tool for understanding complexities.

6.6.1 Proposed further studies

Two areas are proposed for further studies:

1. The use of knots in different areas of application explained in chapter 5 is an area lacking research. Though knots have received some attention, little is known about the application in different areas. Theorising knots in different areas is therefore proposed as a further area of study.
2. The process and ways of the dissolution of knots is another area that needs further study as little is known about the process of knots dissolution.

6.7 Conclusion

This research started with the aim of exploring two objectives: 1) How complexity and extension influence collaborative information sharing in a complex and extended organization: 2) The reason information is not properly shared in complex extended settings and how organizations/individuals react or cope. As the research progressed, it became clear that other areas of analysis and theoretical contribution were worth inclusion. Therefore, the original objectives were expanded to include: The nature and

types of knots found in the setting which is one of the ways organizations react to information sharing failures. Other objectives include exploring how, where and why these knots are different from the knots articulated in other literature. The study also explains the innovations in extended relationships that help to achieve organizational goals and guarantee the needed productivity, effectiveness and performance in the extended relationship. The themes for the study have been generated based on the analysis using the AT mechanical process guided by the literature, information behaviour models and sense-making process during the analysis stage.

Two research questions were asked, how does complexity and extension influence collaborative information sharing and how do complex and extended organizations respond to deficiencies in information sharing? The first question is discussed extensively in section 4.6 and summarised here as:

The information sharing behaviours, as reported in this study, are influenced by complexities driven by extension which has the potential to impact on information sharing and the achievement of organizational objectives and goal achievement. Complexities found in complex and extended settings influence the way organizations react in responding to the reported complexities. The reason for the extension as reported, is the inability of organizations to provide all the services needed to meet their stated objectives. While the relationships are necessary, they also create a need for information sharing among the different stakeholders, ensuring they inform collaborators and are informed of the expectations in respect to the extended arrangement. This finding is a contribution to theory.

Despite the finding that the areas of information sharing, and behaviours have been well studied, little is known about the information sharing behaviours of extended organizations that are complex and necessitate the need for sharing. These needs are hampered, according to the findings, due to reduced ability by way of complications in the relationships. In responding to these complexities, this study reports the use of specialised teams and groups (with a complementary nature) as ways of getting things done and sharing information needed for successful collaborative operation and reducing

the extended divide. The two findings above answered to the first research question and becomes a contribution to theory.

The second research question addresses how complex and extended organizations react to complexities and the findings report that, where complexities persist, it has been observed and reported that knots form as one of the ways to alleviate such deficiencies in the setting. The knots reported are, however, different from the other literature knots and this study has provided evidence to suggest how these knots are different. This finding is another contribution to theory.

In explaining why these knots are different, 3GAT was used (through tensions and contradiction) and complemented by 4GAT to help in explaining the reason why the knots reported are different. 4GAT in this study has been used to understand the actions and innovations at the back ground during the formation of knots. Innovations in the settings are responsible for making a system that is time pressured, transient and that cuts across different boundaries to reach its logical end in times of deficiencies. This study therefore is relevant to both theory and practice and different from other studies as the setting of this research is different from the non-complex and extended setting as opposed to other settings in similar studies.

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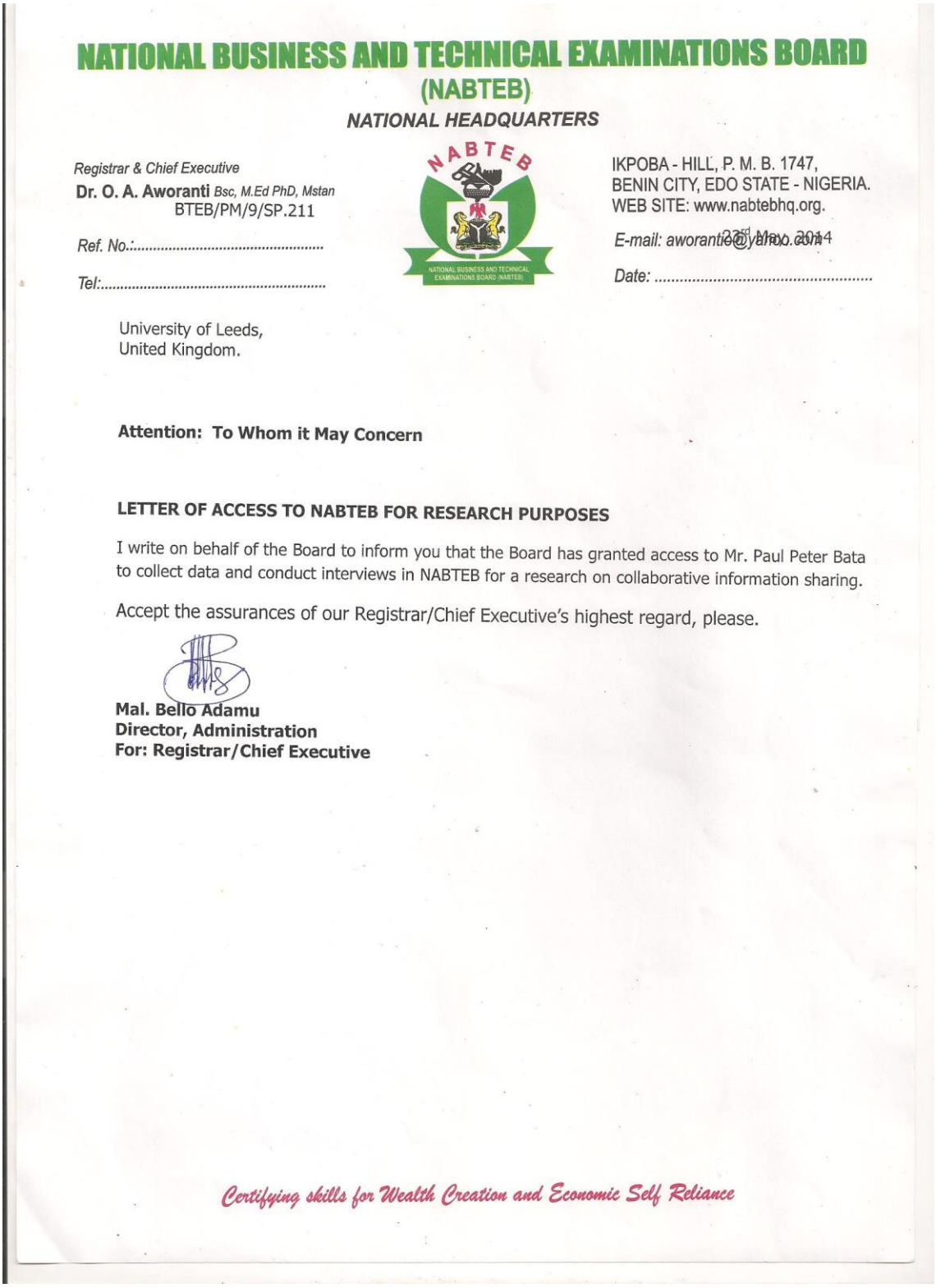
Appendices

Appendix 1 Letter of permission for research to be conducted in NABTEB



NATIONAL BUSINESS AND TECHNICAL EXAMINATIONS BOARD
(NABTEB)
NATIONAL HEADQUARTERS

Registrar & Chief Executive
Dr. O. A. Aworanti *Bsc, M.Ed PhD, Mstan*
BTEB/PM/9/SP.211

Ref. No.:.....
Tel:.....

IKPOBA - HILL, P. M. B. 1747,
BENIN CITY, EDO STATE - NIGERIA.
WEB SITE: www.nabtebhq.org.
E-mail: aworantie@yahoo.com

Date: 23rd May, 2014

University of Leeds,
United Kingdom.

Attention: To Whom it May Concern

LETTER OF ACCESS TO NABTEB FOR RESEARCH PURPOSES

I write on behalf of the Board to inform you that the Board has granted access to Mr. Paul Peter Bata to collect data and conduct interviews in NABTEB for a research on collaborative information sharing.

Accept the assurances of our Registrar/Chief Executive's highest regard, please.

Mal. Bello Adamu
Director, Administration
For: Registrar/Chief Executive

Certifying skills for Wealth Creation and Economic Self Reliance

Appendix 2 Ethical approval

Performance, Governance and Operations
Research & Innovation Service
Level 11 Houldsworth Building
10 Clarendon Road
Leeds LS2 9LJ Tel: 0113 343 4873
Email: ResearchEthics@leeds.ac.uk

UNIVERSITY OF LEEDS

Paul Bata
Management Division
University of Leeds
Leeds, LS2 9JT

ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee
University of Leeds

29 June 2017

Dear Paul

Title of study: **Information sharing and use in complex collaborative organisations with extended networks**
Ethics reference: **AREA 13-170, response 2**

I am pleased to inform you that the above research application has been reviewed by the ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee and following receipt of your response to the Committee's comments, I can confirm a favourable ethical opinion as of the date of this letter. The following documentation was considered:

Document	Version	Date
AREA 13-170 Response 2 to Ethics.docx	1	09/06/14
AREA 13-170 Second ethical form.pdf	1	17/06/14
AREA 13-170 Second medium risk form.pdf	1	11/06/14
AREA 13-170 Ethical form.pdf	1	28/07/14
AREA 13-170 2 Access letter.pdf	1	28/07/14
AREA 13 170 Information sheet.pdf	1	28/07/14
AREA 13-170 1 Consent form.pdf	1	28/07/14
AREA 13-170 Risk form.pdf	1	28/07/14

Committee members made the following comments about your application:

- If you that no one who has not consented will be observed because of their interactions with consenting individuals -- for example because you are observing someone and they talk with someone who hasn't given consent -- then this is fine.

- Please change "confidential" to "anonymous" in the consent form if you intend to publish quotes, as this would break confidentiality, and it would be useful to guarantee that anonymity means not only that they will be anonymised by not giving the name, but that the content will not reveal their identity.

Please notify the committee if you intend to make any amendments to the original research as submitted at date of this approval, including changes to recruitment methodology. All changes must receive ethical approval prior to implementation. The amendment form is available at http://ris.leeds.ac.uk/EthicsAmendment.

Appendix 3 Copy of consent letter

Title of Research Project: Information Sharing and Use in Complex Collaborative Organizations with Extended Networks

Name of Researcher: Paul P. Bata (contact number: 07979747974)

*Please **initial the box** if you agree with the statement to the left*

1 I confirm that I have read and understand the letter dated *[insert date]* explaining the above research project and I have had the opportunity to ask questions about the project. ☐

2 I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline. ☐

3 I understand that my responses will be kept strictly anonymous. I give permission for members of the research team to have access to my anonymised responses. I understand that whilst direct quotes may be used my name will not be linked with the research materials, and I will not be identified or identifiable in the report, reports or articles that result from the research. ☐

4 I agree for the data collected from me to be used in future research ☐

5 I agree to take part in the above research project and will inform the researcher should my contact details change. ☐

_____	_____	_____
Name of participant (*or legal representative*)	Date	Signature
Paul P. Bata Lead researcher	_____ Date	_____ Signature

To be signed and dated in presence of the participant

After the form has been signed you will receive a copy of the consent form along with a copy of the letter and any other written information required in advance of the initial interview, observation or document access.

Appendix 4 Semi-structure interview guide

Research Interview guide and questions for Nigeria

- **From AT (set A questions)**
- Explore who are the community that the organizations relate with.
- How do they impact on the running of the organization
    - What is the aim of the system?
    - What shows it is working well?
    - How do problems and issues manifest?
    - Who are the main actors in the system?
    - How important is information handling and sharing seen?
    - What tools do you use for handling information
    - Are there formal rules on handling information?
    - What about informal rules?
    - How do things really work here?
    - Are there any organizational cultures in place that you know?
    - Are there shortcuts or people change system to get things done? How and Why?
    - Who are the different groups involved here? Who has an interest in this (staff, gov't, candidates, centres, parents)
    - How is information shared with the groups involved?
- **From Situation (Set B)**
- Explore how Information sharing in complex and extended organizations is done.
- Explore how collaboration contributes to the functioning of the organizations.
        - How does the information you handle come from?
        - What format does it come to you in?
        - In handling information who do you interact with (acquiring, seeking, sending, manipulating, storing)
        - Where do you pass information on to?

- How do you handle (acquire, store, disseminate) information you have to work with?
- Do you consider the system complex?
- How do you relate with co-staff in discharging your duty?
- What is the role of collaboration between staff?
- How does the action of individual affect collaboration?

- **From Literature (Set C)**
- What are the key drivers for information sharing?
- What do you consider the key barriers to information sharing?
    - How is Inter/Intra information sharing done?
    - How is information shared between organizations?
    - What is the possibility of similar organizations sharing information that will bring about sharing of resources
    - What will be the benefits of such share information

Five Different Setting initial modelling of the AS looking at the subjects and community.

Top Level management (Set A and Set C)

Middle level staff (Set A and Set B)

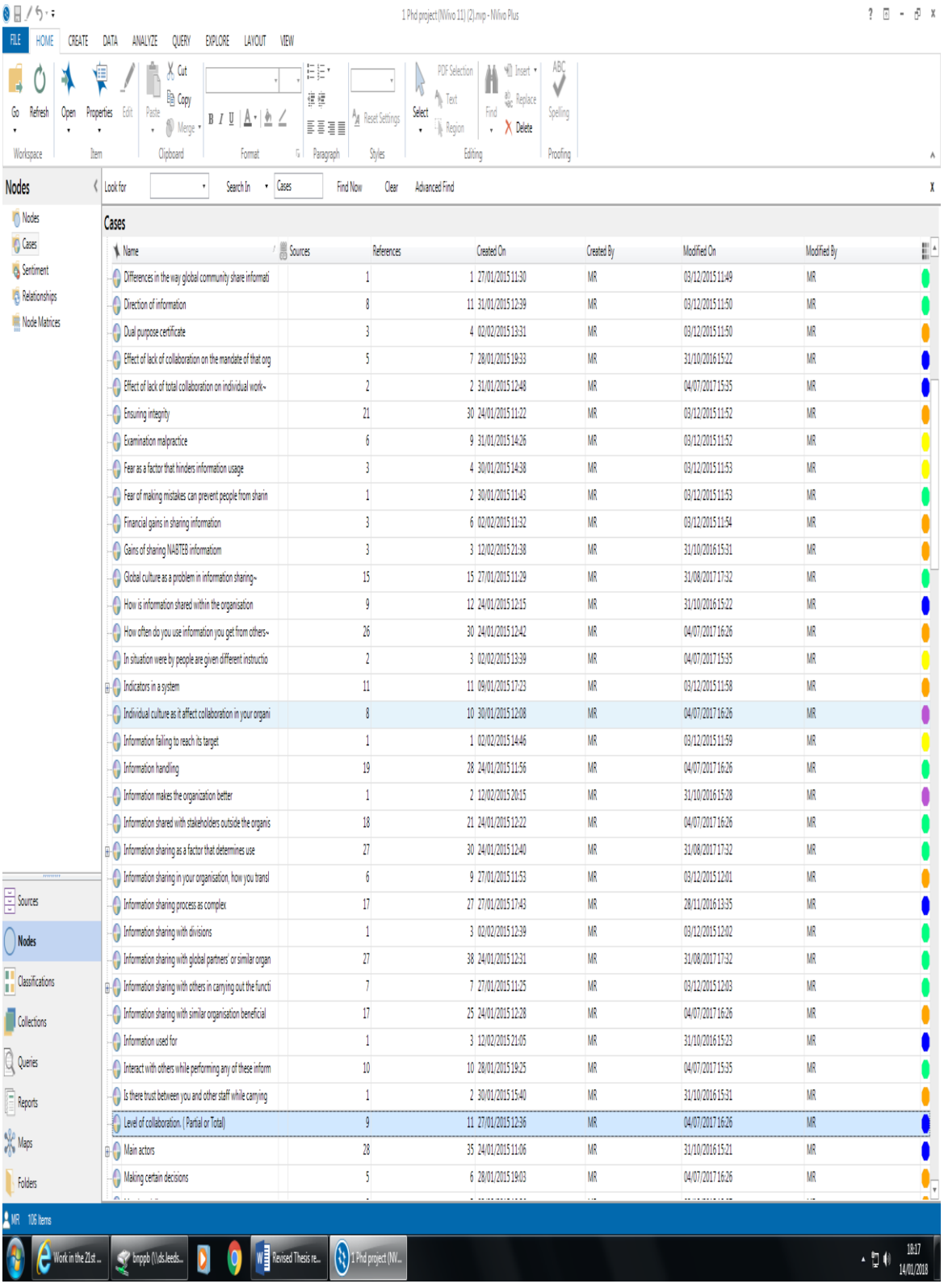
End users of certificate (Set B and Set C)

Communities Set (B and set C)

Ministry of Education (Set A and Set C)

	Questions		
	Set A	Set B	Set C
Respondents			
Top Level managers	x		x
Middle level staff	x	x	
End users of certificates		x	x
Communities Schools, teachers,		x	x
Ministry officials	x		x

Appendix 5 Screen shot of Nvivo showing colours classification



Appendix 6 Showing 6 themes with different number of nodes under them.

1) Teams, Knots and Knot-working

1 : Body higher than your organisation or is your organisation the overall body
2 : Collaborating with the office and officers sent by the Board.
3 : Collaboration as a necessary tool for staff with common goals
4 : Collaboration as a necessary tool in meeting NABTEB mandate
5 : Effect of lack of collaboration on the mandate of that organisation~
6 : Effect of lack of total collaboration on individual work~
7 : How is information shared within the organisation
8 : Information sharing process as complex
9 : Information used for
10 : Level of collaboration. (Partial or Total)
11 : Main actors
12 : NABTEB as an organisation depend solely on its stakeholders to achieve its own mandate
13 : Relationship that exists between you as the zone and the other stakeholders
14 : Team work and collaboration
15 : Things that encourage the sharing of information in your organisation~ (2)
16 : Tools used within the organisation for information sharing
17 : Ways you pass information;
18 : What benefit are there for the two organisations
19 : Working as a Unit or Whole department in organisation

2) Tensions and contradictions

1 : Competition
2 : Competition and the mandate of NABTEB
3 : Examination malpractice
4 : Fear as a factor that hinders information usage
5 : In situation were by people are given different instructions
6 : Information failing to reach its target
7 : Non credible examinations
8 : Problems or issues that need attention
9 : Shortcuts to getting things done in organisations

3) Organisational culture, rules and norms

1 : Individual culture as it affect collaboration in your organisation
2 : Information makes the organization better
3 : Organisational culture
4 : Rules in respect to information handling

4) Complex extended organisations

1 : Classify NABTEB Pls according to type
2 : Relate with NABTEB
3 : Relationship with them collaborative or official~
4 : Relationships with group of stakeholders
5 : Sanctions for Making mistakes
6 : Sending information through other means
7 : What will you say about information volume

5) Means of achieving organisational objectives

1 : Acceptability of NABTEB certificates for admission
2 : Aims of your Organisation
3 : Articulating and vetting of memo by the Director,
4 : Concurrent list of both the federal and state
5 : Contribution to organisation
6 : Credibility
7 : Dual purpose certificate
8 : Ensuring integrity
9 : Financial gains in sharing information
10 : Gains of sharing NABTEB informatiom
11 : How often do you use information you get from others~
12 : Indicators in a system
13 : Information sharing in your organisation, how you translate this in the mandate of your organisation…
14 : Information sharing with similar organisation beneficial
15 : Is there trust between you and other staff while carrying out your duties
16 : Making certain decisions
17 : Mandate delivery
18 : Minimizing overhead and maximizing outputs
19 : Organisation manadates and other effects
20 : Supervision
21 : Use of relevant information
22 : Ways of improving the system

6) Means of Information sharing

1 : Difference in the way information is shared with the global community~
2 : Differences in the way global community share information(2)
3 : Direction of information
4 : Fear of making mistakes can prevent people from sharing information
5 : Global culture as a problem in information sharing~
6 : Information handling
7 : Information shared with stakeholders outside the organisation
8 : Information sharing as a factor that determines use
9 : Information sharing with divisions
10 : Information sharing with global partners' or similar organisation globally
11 : Information sharing with others in carrying out the function of the organisation~ (2)
12 : Interact with others while performing any of these information sharing roles~
13 : Necessary for NABTEB to share information with this other sister organizations
14 : Organisation use the information
15 : Passing information from the headquarters to the zones
16 : Positive information
17 : Problems that hinder information sharing
18 : Seeking for information
19 : Sharing information with group of stakeholders
20 : Things that encourage the sharing of information in your organisation~
21 : Tools with which you use for information handling
22 : What do you do with information you have no need for at that particular time
23 : What format does information come to you
24 : Where does the information you handle for your role comes from.