# *The influence of generational differences on the integration of educational technology in higher learning institutions*

Dissertation by

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# ABSTRACT

Information and Communications Technology (ICT) influences most aspects of life and work, and the education sector, especially higher education, is not an exception to this. The higher education environment has a range of generations working in it, as it is the environment keeping and retaining lecturers up to an older age than most sectors. Under this premise, this study contributes to an understanding of the influences of generational differences amongst lecturers and how it affects the way they integrate technologies into the classroom for teaching and learning.

The main aim of this research study was to determine the influence of generational identities and how they affect different lecturers in the way they integrate technology into the classroom for teaching and learning. To explore this influence, lecturers from three higher learning institutions from two Southern African countries were engaged in how they integrate and use technology in class.

A qualitative research design was followed for this interpretive research inquiry, and data was collected through semi-structured interviews with 34 lecturers from the three higher learning institutions. Transcripts of the interviews were analysed using a computer-aided qualitative data analysis software (CAQDAS) tool called Leximancer. Actor-Network Theory (ANT) was also used as an analysis framework. Literature reviews and strategic plans of the three institutions were used as secondary data.

The findings indicate that belonging to a certain generation does not influence the way a lecturer integrates and uses technology in the classroom. Other prominent factors, such as students, use, and technology, emerged as factors of importance that influence a lecturer to integrate and use technology in the classroom. The study contributes to the body of knowledge with the findings from the empirical evidence as well as proposing the generational technology integration framework that covers aspects of technology integration based on generational identity aspects of the lecturers. The framework is based on the tenets of ANT's moments of translation and fused with the main tenets of the Generational Theory, which informs the framework on the typical features of a generation.

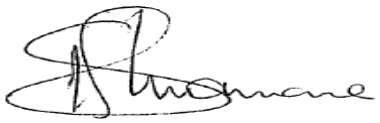


**Keywords:** Technology integration, generational differences, higher learning institutions, Actor-Network Theory (ANT), Generational Theory

# DECLARATION

I hereby declare that this thesis is my own work and has not been submitted for another degree in any other university. I have acknowledged all of the sources I have used as references.

Likeleli Letsie



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# DEDICATION

This thesis is dedicated to:

My late mother, my rock, and the person who would have been the happiest and proudest to see me finish this work. Death took you away before you could see the completion of this work. This is for you, Letebele, and I hope you are smiling down on me.

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# TERMS AND ABBREVIATIONS

**ANT** : Actor-Network Theory

**CHE** : Council on Higher Education

**GTI** : Generational Technology Integration

**HESA** : Higher Education South Africa

**ICT** : Information and Communications Technology

**IS** : Information Systems

**OPP** : Obligatory Passage Point

**TPACK** : Technological Pedagogical Content Knowledge

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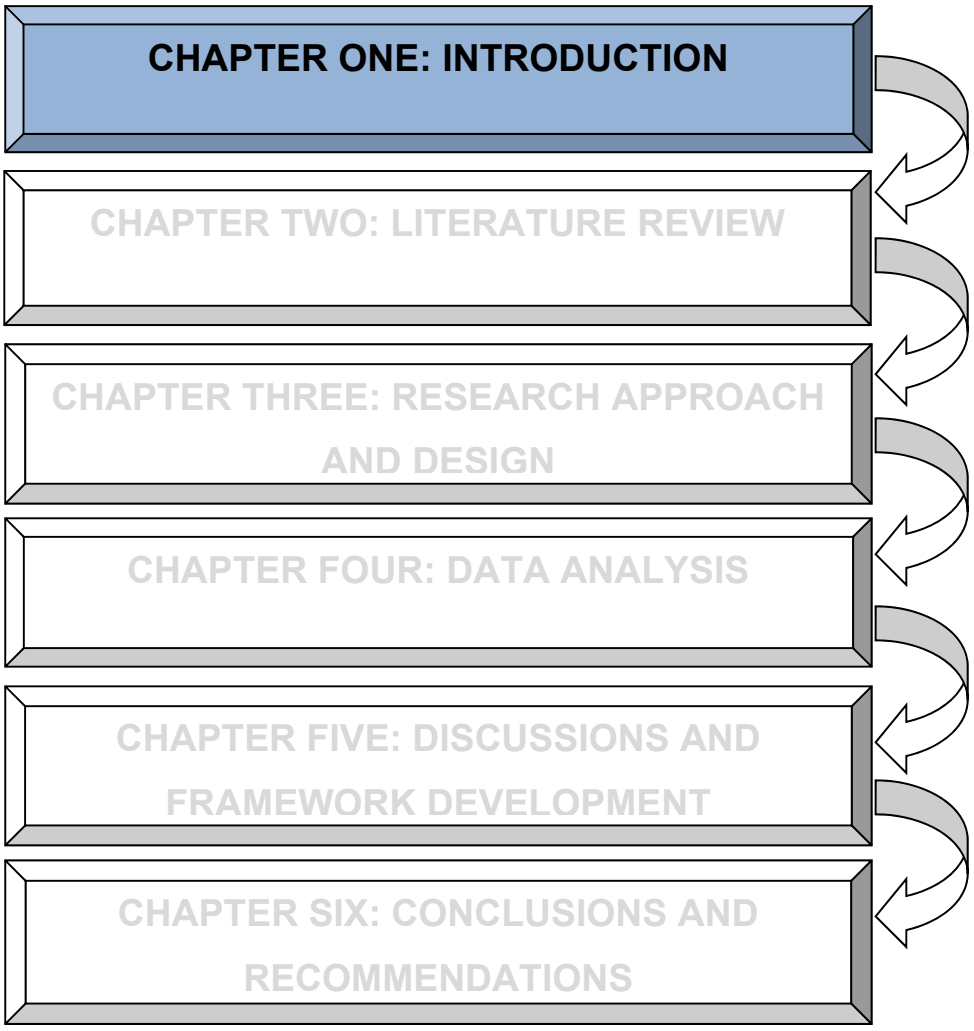
CHAPTER ONE: INTRODUCTION
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# 1 INTRODUCTION

*Teachers need to integrate technology seamlessly into the curriculum instead of viewing it as an add-on, an afterthought, or an event.* **Heidi-Hayes Jacobs – recognised education leader.**

## 1.1 BACKGROUND INFORMATION

Information and communications technologies (ICTs) have become a global concept which has transformed many aspects of life, has revolutionised work environments, communication methods and the general way to conduct any form of business (Adedoja & Abimbade, 2016; Jorgeson & Vu, 2016; Adnan & Tondeur, 2018; Gasaymeh, 2018; Soleimani & Arabloo, 2018). Education remains a significant aspect of any society that aspires to progress (Firoz & Josephp, 2018), and thus, the sector is no exception to the increasing incorporation, integration, and use of ICTs (Bøe et al., 2015; Tarus et al., 2015; Elkaseh et al., 2016). The integration of technology into the classroom environment is perceived by many scholars as one of the best ways to improve teaching and learning by enhancing quality and promoting innovation (Voogt, et al., 2013; Lee et al., 2014; Hennessy et al., 2015; Parker et al., 2015) as well as to improve scientific creativity (Firoz & Josephp, 2018). The integration into classrooms and the education system for instruction are also deemed crucial for the development of curriculum and instruction (Govender & Dhurup, 2014). According to Jang & Tsai (2013), this is important in order to enhance the process of teaching and learning.

The use of technologies in the classroom ranges across different techniques. Social or Web 2.0 media technologies have taken precedence in educational technology, and these are often in the form of wikis, blogs, and social networks (Hamid et al., 2015). Some techniques involve the use of digital mobile devices for teaching and learning (Choate et al., 2014), others are the application of online or mobile learning, course, and curriculum design, digital content production and consumption, instruction as well as electronic assessment. Social media technology platforms such as Twitter, LinkedIn, and Facebook are being

used by students for educational activities in some institutions of higher education (Elkaseh et al., 2016).

Empirical evidence shows that some of the benefits of the use of ICTs in education include the ability to access resources anywhere, anytime through mobile learning as well as the use of Web 2.0 and Web 3.0 (Hamid et al., 2015; Nguyen et al., 2015; Elkaseh et al., 2016). Hamid et al. (2015) extensively discuss the benefits of the use of social technologies in higher education. The study outlines benefits such as flexibility in terms of sharing of ideas between students, the bi-directional production of content between lecturer and students, improvement in student interaction and collaboration of skills as well as possible increase in students' participation, especially those who would normally avoid taking part in the traditional classroom environments (Hamid et al., 2015). Research indicates that the use of mobile devices for downloading educational programs and applications can help students with learning difficulties to gain independence of some sort (Preston et al., 2015; Stephenson & Lisa, 2015).

Despite the benefits seen in the literature about the use of ICTs in education, there are persistent challenges. Examples of these challenges are traditional methods of teaching and learning that continue being used despite availability and introduction of various innovative technologies (Bøe et al., 2015; Tarus et al., 2015), education policy issues (Piper et al., 2015), insufficient technical training (Islam et al., 2015) and some higher learning institutions' inability to implement some of the technology advances (Yoloye 2015). Tarus et al. (2015) point to the lack of skills and inappropriate infrastructure, as well as failure to incorporate technologies with existing pedagogy.

The scholarly debates about the transformation of the education system to incorporate ICTs show that educational technologies are essential in order to support the prospective graduates to survive in the current digital work environment (Agabi et al., 2015; Odora & Matoti, 2015; Valtonen et al., 2015; Sunita & Radhai, 2016; Tondeur et al., 2016b). This view asserts that it is no longer a choice, but a necessity for any education system to train and equip students to be digitally competent in order to survive in the workplace (Agabi et

al., 2015; Odora & Matoti, 2015; Valtonen et al., 2015; Sunita & Radhai, 2016; Tondeur et al., 2016a).

Often the instructor or lecturer assumes an important role in assisting the students to be digitally competent, and therefore they need to be able to integrate and use technologies in the classrooms (Siddiq et al., 2016; Watty et al., 2016; Soleimani & Arabloo, 2018). Some debates in the literature suggest that generational differences may influence the ability of educators to successfully integrate educational technologies into the classroom (O'Bannon & Thomas, 2014; Siddiq et al., 2016). The important role of the instructor in the classroom means that their inability to successfully integrate technology could potentially negatively impact the learner. It is against this background that this study aims to investigate the influence of generational differences of lecturers and the successful integration of educational technologies.

An important aspect highlighted in Teo et al. (2015) is that more research needs to be conducted to investigate favourable practices to use when integrating technology into the educational environment. Literature indicates that technology integration in education should not be considered in isolation but in collaboration with content and pedagogy (Mishra & Koehler, 2008; Jang & Tsai, 2013). Schmid et al. (2014) mention the importance of using technologies in the classroom for pedagogical purposes and explains that technology can be a tool that enables communication and interaction, easy exchange of information as well as being a cognitive tool provider.

Mishra and Koehler (2006) formulated the Technological Pedagogical Content Knowledge (TPACK) framework, which dealt with the lack of theoretical frameworks that address the integration of technologies in education. This framework outlines effective ways and guidelines that can be followed by teachers when integrating technology into the classrooms (Mishra & Koehler, 2008). The foundation of the framework is the integration of technology and how this interrelates with pedagogy and content (Koehler et al., 2014).

Technology integration and use occur in all areas of education, such as basic education, middle to higher learning, and the focus of this study is on technology

integration in higher learning education. Literature cautions that higher learning institutions face a challenge with some educators who are not enthusiastic about integrating technology into the classrooms despite recommendations and policy directives to do so (Watty et al., 2016). It is suggested that one of the reasons for this is the problem of aging educators who are not willing to embrace the change in the education landscape (Watty et al., 2016). Sadaf et al. (2016) dispute this by indicating that even the current generation teachers who are assumed to be knowledgeable and competent in the use of ICTs are often ill-prepared to integrate technologies into their classrooms.

With all of these aspects about the integration of technology in education, this research study focuses on whether different generational identities of lecturers influence the successful integration of technology into the education system. The study carries out an empirical investigation and questions whether these generational identities influence lecturers on the integration of different technologies, some of which may be specific and specialised for a particular course or even complex.

The empirical investigation resulted in several findings (discussed in chapter 5) about lecturers' generational identities and the integration of educational technologies. Furthermore, the investigation proposes the generational technology integration (GTI) framework, which was developed by adapting Actor-Network Theory's (ANT) moments of translation in collaboration with Mannheim's (1952) Generational Theory as well as being informed by the empirical evidence. The investigation, therefore, aimed to achieve theoretical significance with the use of ANT. ANT is used as an underpinning theory on the premise of the associations that can be established between human and non-human elements. This study also refers to the TPACK framework as well as Prensky's digital natives and immigrants dichotomy because of their significance to technology integration in education and generational aspects respectively. Their relevance and how they inform the current study are discussed in detail in chapter 2 (literature review). The following section introduces the problem that underlies this study.

## 1.2 PROBLEM STATEMENT

Despite the growth in technology use in other sectors, adoption and use of technology initiatives in the education sector still lag behind. This could potentially impact the growth of the sector, and how it operates, and in some cases, the sector could uphold old methods of teaching and learning (Mishra & Koehler, 2006; Teo et al., 2015). The potential impact on the students can be unfavourable and therefore affect their progress, especially in the current digitised global environment.

The education system through teachers and lecturers has the mandate to produce the prospective workforce, and today's work environment requires creative and innovative knowledge workers (Voogt et al., 2013; Agabi et al., 2015; Odora & Matoti, 2015; Valtonen et al., 2015; Sunita & Radhai, 2016; Tondeur et al., 2016b). In order for this transition to take effect, teachers and lecturers of different generations have to adapt to changes brought about by technology, some of which are new and advanced (Anderson et al., 2013). These educators have the responsibility to effectively and successfully integrate technologies into the classrooms, not only the simple components, but even those that are complex, advanced, and challenging, and some of which may be specialised for certain subjects.

Literature attributes some of the challenges of technology integration to the lack of sufficient knowledge by some educators on technology initiatives (Anderson et al., 2013). Other studies specify the separateness of technology from the components of pedagogy and content (Koehler et al., 2014; Pouezevara et al., 2014) and the lack of theoretical frameworks to address the technology integration into the system (Mishra & Koehler, 2006; Tummons et al., 2016).

A review of some of these challenges provides motivation to propose a framework. It is intended that the framework can be applicable to studies of generations and subsequent integration of educational technologies in education.

The framework and main findings from the empirical work would be a way to develop a comprehensible study that seeks to investigate ***the influence that generational identities can have on lecturers to successfully integrate and***

***use different educational technologies in the classroom, some of which may be complex and specialised for particular subjects.***

Studies about the integration of technology in the education sector abound. However, the integration of educational technology, content, and pedagogy (Koehler et al., 2014), combined with differences in generational identity (Lyons & Kuron, 2014), needs further investigation. Content and pedagogy are key elements in teaching and learning (Teo et al., 2015) and therefore have to be considered when integrating technology.

The disconnection and challenges with ICTs and education are numerous. However, the disconnection of technology integration with pedagogy and content remain persistent (Bøe et al., 2015; Islam et al., 2015; Piper et al., 2015; Tarus et al., 2015). Other studies assert that the generational differences can potentially result in digital divides mentioned by Prensky (2001). According to Prensky (2001: 2), the distinct nature in which the older generation and the current generations view and interact with technological advances is a concern, especially whereby the older generation “digital immigrants” have to teach the younger generation of “digital natives”. Prensky’s solution to this is that methods of teaching should be changed and that the older generation digital immigrants should adopt the new “future” digital content and new ways of thinking.

This study, therefore, seeks to make an inquiry of the influence of such generational differences and the ability of lecturers to integrate educational technologies, some of which may be specialised for the courses and therefore have a complexity element in them.

To better understand the influence of the different generational educators and the inclination towards disconnecting technology as a separate entity when integrating it into education, the GTI framework was developed and is proposed to clarify the relationship between generational aspects and the successful integration of technology. The framework was created on the foundation of ANT’s moments of translation in collaboration with the Generational Theory. The framework is based on the concept of looking at the education system as a

network comprising human and non-human actors, with their interconnectedness and relationships.

This research study contributes to knowledge by conducting original research (Olivier, 2004) and the discovery of main findings related to generational differences and technology integration, as well as the development of the framework which has its foundations on the empirical work and the tenets of ANT and Generational Theory. To seek answers to the posed problem, the research study answers the research questions that follow in the next section.

## 1.3 RESEARCH QUESTIONS

This research study seeks to answer this main research question:

> ***"What is the influence of the generational identity elements on a lecturer's ability to successfully integrate technology into higher learning education?"***

### 1.3.1 Sub Questions

The following sub-questions were addressed to aid the researcher in answering the main research question:

- *Why do lecturers integrate technology differently?*
- *What individual preferences cause differences in integrating technology into the classroom?*
- *What other factors are responsible for technology acceptance in the education environment?*
- *What are the differences in perception and use of technological advances by lecturers of different generations across the different faculties or departments?*
- *How can ANT explain the generational identity aspects and technology integration in education?*

The research questions are addressed by aligning them to the objectives, which are discussed in the following section.

## 1.4 RESEARCH AIMS AND OBJECTIVES

This research aims to make informed opinions about the influence of generational identities of lecturers and their ability to successfully integrate technology in higher learning. This is achieved through the arguments made on the empirical evidence as well as the literature. The study furthermore aims to develop a framework from the empirical evidence and literature which is proposed to inform educators, practitioners, scholars, and management about the relationship between different generational lecturers in higher learning and the intended successful integration of technology, a technology which may be specialised and have some complex features. The framework clarifies the relationship between generational aspects, which are addressed by the tenets of Generational Theory, which indicate how an individual can be classified into a particular generation or cohort. These generational aspects signify the generational identity elements that categorise the different lecturers within the education network.

In order to achieve the aim, the study proposes the following objectives:

- To explore if generational differences influence the way the lecturers engage and interact with educational technology.
- To understand the different tenets of generational identities that can influence the ability to explore and integrate specialised and complex components of a technological initiative.
- To explore the different ways used by lecturers of different ages to integrate technology into classrooms for teaching and learning.
- To determine the effective way that lecturers of different generations use to integrate technologies with existing pedagogy and content.
- To determine the influence of perceptions of different generational lecturers and their ability and willingness to integrate technology into the classroom.

- To explore the education system as a network that comprises lecturers of different generations, on the foundations of the Actor-Network Theory (ANT) moments of translation.

The study focuses on the debate around the integration of technologies with consideration of existing pedagogy and content. The study, therefore, uses ANT and defines the education system as a network that comprises different and varying human and non-human actors. The study uses the socio-technical aspect of ANT to explore the interactions of the different actors and their actions within the network.

The framework formulation considers the aspects of theory development discussed in Whetten (1989). He asserts that the basis of theory development is measured on the '*what*', '*how*' and '*why*'. The '*what*' determines all relevant and accurate elements of explaining a social phenomenon, the '*how*' defines the relationships between the factors and then the '*why*' is an explanation of the justification for the selection of the factors used in describing the phenomenon being investigated (Whetten, 1989).

The decision to conduct this study using a qualitative approach is based on the identified gap that was identified in the literature that indicated there is a shortage of qualitative studies that investigate the issues around technology integration with pedagogy and content (Wang & Vásquez, 2012). More studies are required on this foundation in order to address some of the aspects of technology integration challenges, especially with the aspect of generational issues. The next section gives an outline of the possible limitations of this study.

## 1.5 DELINEATION AND LIMITATIONS

This section outlines some of the possible limitations of this study. One of the limitations is that the research did not include the aspect of gender and its possible influence on technology integration in education. The study instead only focuses on the aspect of age and the different generations in higher learning.

The study is also limited to three higher learning institutions, one is in a different country, while the other two are located in the same country. These countries are

located in the Southern African region. The location of these institutions may present a possible limitation as to the one location where two of the institutions are located in a big economy in its region and in Africa and the other location, where one of the institutions is found in the economic hub of that particular country. This is a possible limitation because institutions located elsewhere in Southern Africa, where there are lower economic activities, may present different results. The sample population of this study only included lecturers, other stakeholders who form the education system were not included.

The following section outlines the significance of this study and how it contributes to knowledge in the field of information systems (IS) research.

## 1.6 SIGNIFICANCE OF THE STUDY

The study contributes to knowledge by presenting an argument on the influence of generational identities and the integration of technology in higher education. This was achieved by carrying out the empirical work using qualitative inquiry to get to the findings of generational identities and technology integration. The study also contributes by proposing the GTI framework that can assist institutions of higher learning in understanding the aspects of generational identities and their subsequent relationship to the successful integration of technologies into classrooms. The framework covers crucial tenets of what comprises generational identities on the foundation of the tenets of Generational Theory. The identities of a generation are fused with aspects of problematisation, especially the feature of OPP to demonstrate the possible successful technology integration.

The significance of investigating generations and the possible influence on aspects related to the work setting in the Southern African region is on the premise that the HIV/AIDS epidemic has affected the generational structure in the region (Heuveline, 2004) which has resulted in some alterations in the make-up of the generational groupings.

To achieve the significance and contribution in this study, the thesis was undertaken using the following chapters, as outlined in the following section.

## 1.7 BRIEF CHAPTER OVERVIEW

The thesis has the following structure:

**Chapter 1 – Introduction**

This chapter introduces the study with the background information, the purpose of the study, the problem statement, research questions that guide the study, assumptions, and limitations of the study.

**Chapter 2 – Literature Review**

This chapter reviews previous literature based on the themes that guide the study. The following are discussed: the integration of technology in education, Technological Pedagogical Content Knowledge (TPACK) framework, generational debates in the workplace with reference to Prensky's (2001) dichotomy debate of "digital natives and digital immigrants" as well as Mannheim's (1952) Generational Theory and generational studies related to Southern Africa as well as a discussion of Actor-Network Theory (ANT).

**Chapter 3 – Research Design and Methods**

This chapter discusses the methods that were used to address the validity of the problem statement. The chapter is structured on the foundation of Saunders et al.'s (2012) research "onion". The chapter introduces the methods used, and the research design followed. The chapter further outlines the research philosophy, research approaches, strategy as well as the data collection and analysis methods.

**Chapter 4 – Analysis of Findings**

This chapter looks at the analysis of data using computer-aided qualitative data analysis software (CAQDAS) called Leximancer, as well as ANT to analyse some aspects of the data.

**Chapter 5 – Discussions and Framework Development**

This chapter discusses the findings from the data of the study. It also discusses the development of the generational technology integration framework, on the foundations of the empirical evidence, ANT, and the Generational Theory.

**Chapter 6 –Conclusions, Contribution and Recommendations**

This chapter summaries the study and makes conclusions on whether the research questions were answered or not. The chapter discusses the framework and its theoretical contribution to knowledge and concludes by highlighting recommendations and suggestions for future research.

Figure 1.1 below outlines the roadmap of the thesis structure and the different chapters thereof:

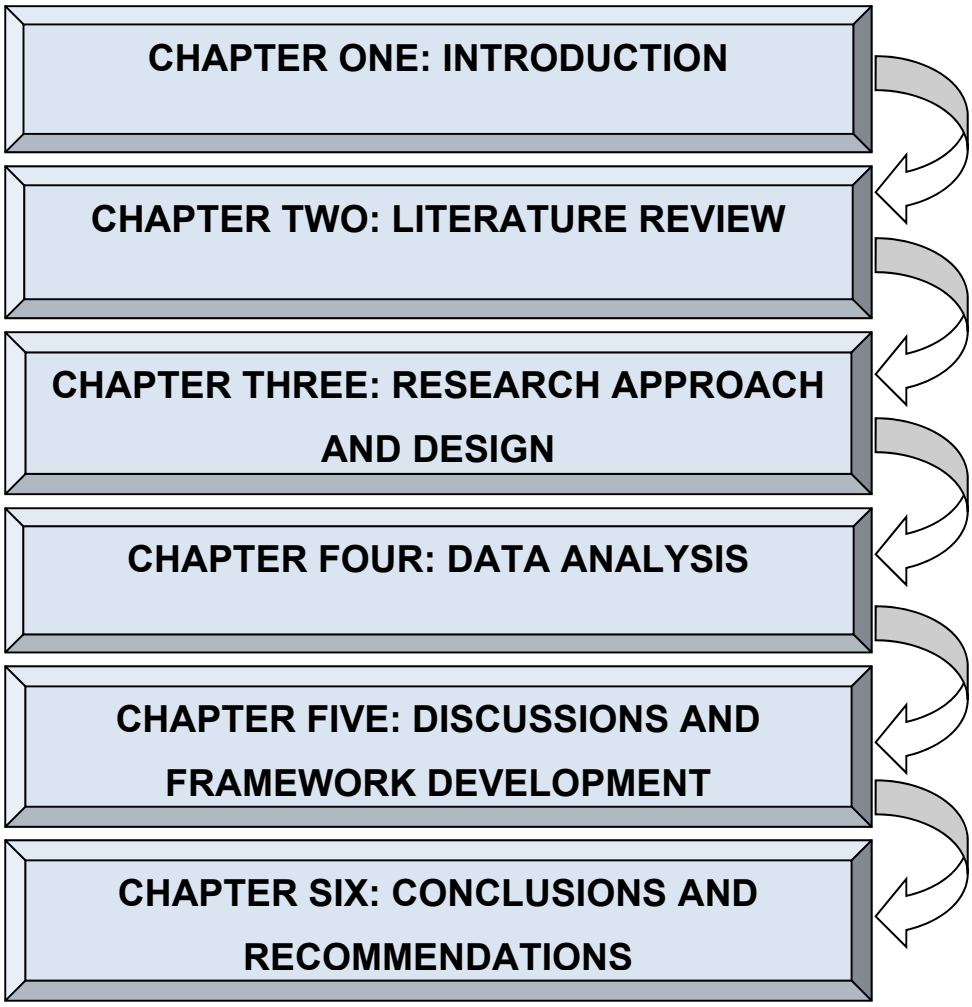
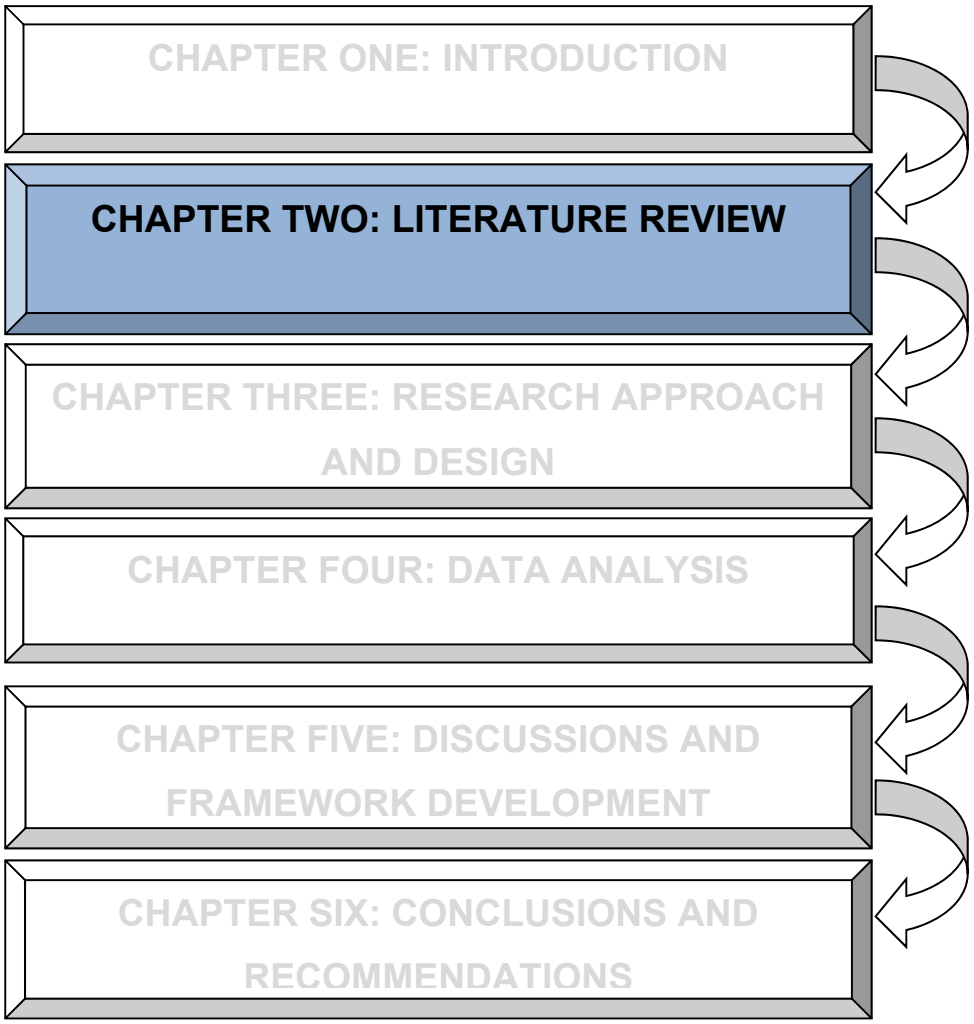



Figure 1.1 Thesis Structure

## 1.8 CONCLUDING SUMMARY

This chapter introduces the study and gives an outline of the statement of the problem. It introduces the discussion of the integration of technology into the classrooms by lecturers of different generations. Technology in this study refers to digital technology, which comprises computer-related technology. It is also important to note that ICT and technology are used interchangeably in this study.

The integration and use of educational technologies into the classrooms have the potential to improve some aspects of teaching and learning and, therefore, should be explored in more detail. The current workforce comprises different generations of lecturers, and how they integrate educational technology into their respective classrooms is central to this study. The rest of the study is organised into different chapters that outline different aspects of the study, the structure of which is shown in Figure 1.1 above. The next chapter reviews previous literature on the topics related to the current study.


CHAPTER ONE: INTRODUCTION
CHAPTER TWO: LITERATURE REVIEW
CHAPTER THREE: RESEARCH APPROACH AND DESIGN
CHAPTER FOUR: DATA ANALYSIS
CHAPTER FIVE: DISCUSSIONS AND FRAMEWORK DEVELOPMENT
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

# 2 LITERATURE REVIEW

## 2.1 INTRODUCTION

This study aims to investigate the influence of generational identity differences and the potential of a lecturer to successfully integrate educational education into the classroom. The study investigates this in the context of higher learning institutions in Southern Africa with constant referral to some international examples.

This literature review addresses the topics on technology integration, higher learning education, the Technological Pedagogical Content Knowledge (TPACK) framework, and the generations' debates. The chapter concludes with a discussion of the theoretical underpinning for the study and draws from Actor-Network Theory (ANT).

## 2.2 TECHNOLOGY INTEGRATION IN EDUCATION

To discuss technology integration requires an understanding of what it is that is being integrated. This is why this section first discusses educational technology and some of the aspects that are important about the concept. The section then reflects in-depth on technology integration and the factors thereof.

Educational technology involves the use of information and communications technology (ICT) artefacts, methods, and techniques for instruction and for learning in the education environment (Guzmán & Nyvang, 2018; Zainuddin & Halili, 2016) to enhance, promote and advance teaching and learning. Educational technology is perceived to fit into three broad areas of instruction, presentation methods and students' learning (Ross et al., 2010). Technology assists in instruction by enabling students to access classroom material such as slides, tutorials, and other learning resources. Teachers can organise and present classroom content by using technology as an aiding tool, and subsequently, technology becomes a learning tool that supports students' learning through the use of different devices in the classroom (Ross et al., 2010).

Despite the potential benefits that educational technology can bring in the education sector, it remains disputed whether the sector is using enough of it to

realise its full potential completely. Changes have been seen in the education landscape in recent years, with technology taking precedence and assuming a crucial role in transforming the sector (Scanlon, 2014; Peeraer & Van Petegem, 2015; Zhu, 2015; Çoklar et al., 2017). Research studies indicate that technology is significant and can potentially advance the sector, offer new prospects and enhance the quality of education (Al-Zahrani, 2015; Peeraer & Van Petegem, 2015; Zhu, 2015; Zhu & Mugenyi, 2015). This position has resulted in technology being seen as a need rather than a choice (Çoklar et al., 2017).

When utilised correctly, educational technology is believed to be a tool that can transform and promote teaching and learning, especially in higher education (Englund et al., 2017; Jääskelä et al., 2017). Educational technology enables access to vast amounts of information, which can enrich the learning experience in the current digital age of the 21st century (Birkollu et al., 2017; Koh et al., 2017). Educational technology examples such as electronic learning (e-learning) provide students with affordable and easily accessible ways to study (Kanwal & Rehman, 2017), as well as to enable interaction with peers and professionals who would be able to assist without any geographical restrictions (Saxena, 2017).

Other examples of educational technology include simulations, audios, and videos (Saxena, 2017; Alkahtani, 2017). Mobile learning (m-learning) is another example of an educational technology initiative which uses mobile devices such as mobile phones and tablet devices to access educational activities and facilities. Technology in education also entails the use of electronic mail (e-mail), which enable learners and teachers to communicate with one another. Other educational technology platforms are specialised software and hardware, which enable the teacher to compile documentation and disseminate to students with special needs (Alkahtani, 2017). Other forms of technology which are not specifically classified as educational technologies but which are emerging as popular and garnering momentum are wikis, blogs, podcasts as well as a variety of social media network platforms (Venkatesh et al., 2016). The study conducted by Martin et al. (2018) outlines technology trends prevalent in education from the years 2010 to 2015. Table 2.1 below details these technology platforms.

| Educational Technology | Year |
|---|---|
| Mobile computing | 2010 |
| Open content | 2010 |
| Electronic books | 2011 |
| Mobiles | 2011 |
| Mobile apps | 2012 |
| Tablet computing | 2012/2013 |
| Massively open online courses | 2013 |
| Flipped classroom | 2014/2015 |
| Learning analytics | 2014 |
| Bring your own device | 2015 |

Table 2.1: Educational trends from 2010 to 2015. Source: Martin et al. (2018)

The use of educational technology has presented several challenges, some of which are related to the educator and the way they incorporate and use it in the classrooms. The educator assumes an important role in the integration and introduction of technology in education (Çoklar et al., 2017; Guzmán & Nyvang, 2018), and therefore a lot of educational technology issues are centred on the educator and their evidently important role of integrating such initiatives (Tondeur et al., 2017). Some of the teachers face challenges with their skills and knowledge of instructional technology, therefore influencing technology integration in the teaching environments (Saxena, 2017). It is believed that the way the teachers apply their knowledge of content bears a significant role in how they will eventually integrate technology in the classrooms (Tondeur et al., 2017). Underuse, acceptance and continual changes in technologies in education are some of the issues that the sector faces (Kanwal & Rehman, 2017). Concerning some of these examples, educational technology integration remains a challenge in higher learning environments.

In order to overcome these challenges, Saxena (2017) suggests that a combination of knowledge of content, pedagogical practices learned, and a relevant framework as a guideline are necessary. This requires the educator to combine the understanding of educational technologies with relevant content and pedagogy (Blau et al., 2016). As such, it is noted that experienced instructors have the advantage of being knowledgeable in their disciplines and pedagogy and can integrate these with new and emerging technology advances (Blau et

al., 2016). Lawrence and Tar (2018) point out that the integration of new technologies into the classrooms aids learning, and can enrich the learners' digital skills necessary in the work environment. However, new technology implementations are not always appropriate for traditional teaching methods which had been followed for a while (Blau et al., 2016), and this means that the instructor needs to adapt to such changes, but such changes are still seen to pose a lot of complications within the sector (Tondeur et al., 2016b).

### 2.2.1 Aspects of technology integration in education

If technology is viewed as an important tool in education, why do literature studies indicate challenges with its integration and use? The following discussion details some of the crucial aspects of technology and its integration in education.

Technology integration in education can broadly be defined as a way of using digital tools to aid the delivery and transfer of educational content from an educator to the learner (Tondeur et al., 2016; Koh et al., 2017). The concept uses several types of digital technology initiatives such as e-learning, m-learning, videos and simulation, and others. The discussion here draws from literature statements that indicate that technology integration and use in the education sector still lags despite several evident benefits of using it for teaching and learning (Ryan & Bagley, 2015), mostly because of the required needs and skills of the 21$^{st}$-century learners.

Peeraer and Van Petegem (2015) reflect on the four possible stages of technology integration in educational institutions, which were discussed in the UNESCO (2010) paper for technology integration in education. These are:

- *Emerging* – this is when learning with technology is at a basic stage, with the basic application in the form of computers.
- *Applying* – at this stage, ICT is used by educators to improve their teaching methods in order to enhance content.
- *Infusing* – this is the stage where technology infrastructure such as computer devices and the internet are operational, and teachers use ICT in most areas.

- *Transforming* – this stage is when ICT is considered a normal aspect of daily activities.

Several factors that influence technology integration from literature are mentioned in Guzmán and Nyvang (2018), but the main focus of the study is the conditions within an organisation and how they impact professors' integration of technology. The study outlines that a professor's role in integrating and using technology is often influenced by entities within the organisation which have both direct and indirect impact on the particular professor's ability to integrate technology. Tondeur (2018) attests to this by suggesting factors that can positively influence technology integration such as training requirements, planning for technology as well as the allocation of resources (Kervan & Tezci, 2018) that should be the responsibility at the organisation level.

Other issues that need to be considered when integrating technology include policy-related issues, teacher beliefs, and perceptions as well as pedagogical practices. Tondeur et al. (2016b) assert that other factors besides the technology itself impact technology integration. The following discussion expounds on some of these aspects of technology integration.

Literature indicates that ICT policy in education is one of the important aspects of technology integration (Amiel et al., 2016; Tummons et al., 2016; Tairab & Ronghuai, 2017). Policy issues related to technology integration identified in Amiel et al. (2016) show a mismatch between what management perceives as appropriate and what happens in the classroom. Tummons et al. (2016) indicate that technology acquisition is driven and guided by policy rather than what educators in practice request and this subsequently creates a gap between these elements. Tairab and Ronghuai (2017) suggest that policy issues related to technology integration should be investigated further as they result in many challenges. The authors suggest that a more detailed policy with clear implementation of ICT is required.

Moving from one method of teaching to another, specifically a change that involves technology introduction, may present challenges for some educators and therefore impact how they subsequently integrate and use the technology

(Alkahtani, 2017). The difficulties with the use of such technologies should be taken into consideration and dealt with care.

Training of educators on ICT has been shown in literature as one of the important factors that influence the successful integration of technology (Peeraer & Van Petegem, 2015). Training requirements need to go beyond what is currently offered. In the study of Alkahtani (2017), training on the use of digital devices used for teaching was indicated as a process that should be on-going, and that should commence even before the introduction of such devices, and after that. Alkahtani (2017) suggests that training needs to focus on the actual technology devices and their relationship to content and pedagogy. Venkatesh et al. (2016) suggest that training should be continuous and be custom-made to a specific school or institution and that educators need to carry out empirical research related to technology integration in order to perfect the craft.

Another important technology integration aspect relates to pedagogical practices and beliefs of teachers, which have emerged significantly in technology integration. According to Ertmer (2005), the definition of teachers' beliefs is abounding and unclear. However, the author distinguishes between knowledge and beliefs and goes with the definition that teachers' pedagogical beliefs entail an understanding of teaching and learning on the background of teachers' beliefs (Ertmer, 2005; Tondeur et al., 2016). The relationship between pedagogical beliefs and practice is challenging because it is hard to understand which one comes first, however, the emphasis is that when one is changed, the other needs to change as well (Ertmer, 2005).

Pedagogical beliefs are said to be the psychological comprehension of one's surroundings, and the way this eventually influences teaching (Tondeur et al., 2016a). These beliefs are identified as either teacher or student-centred (Tondeur et al., 2016b), and are said to be influenced in some instances by an educator who is motivated to be effective and efficient in their craft. Teachers who have constructivist student-centred beliefs tend to use technology more and are open to an approach that allows the students to use technologies of their choice in the classroom (Tondeur et al., 2016).

Constructivist and traditional teaching approaches are the two most predominantly identified methods (Tezci et al., 2016). Constructivist teaching approaches are student-centred with the teacher being the supporter and not the transmitter of knowledge, while on the other hand, traditional teaching approaches are teacher-centred, with the teacher being the main source of information and knowledge (Liu et al., 2017). Chan & Leung (2016) suggest that the current education setting is majorly constructivist due to the widespread existence of different technologies. Zainuddin and Halili (2016) are of the view that traditional teaching activities should be adapted to web-based platforms to allow students the flexibility to study anywhere besides the physical classroom.

Some pedagogical beliefs of teachers can be a stumbling block because they influence the decisions taken by an individual teacher on how to integrate and use technology (Tondeur et al., 2016b). The relationship between pedagogical beliefs and technology shows that if a teacher believes that technology will enhance their teaching and will help students to learn effectively, there is a greater chance that they will integrate and use that technology in the classroom (Tondeur et al., 2016a). Teachers who hold constructivist beliefs are identified as those who are more likely to integrate and use technology. Venkatesh et al. (2016), however, caution that educators should not abandon the traditional teaching approaches entirely in favour of the constructivist approaches as a balance is required between the two approaches.

Tondeur et al. (2016b) investigated the relationship between teachers' use of technology and beliefs on pedagogy, and the study found five syntheses about this relationship. Synthesis one proposes that the relationship is bi-directional, while synthesis two suggests a further understanding of the factors affecting this relationship, with the importance of investigating this relationship using a multi-dimensional analysis (synthesis three). The last two syntheses outline professional-development and policies in technology integration.

Technology integration can also be influenced by the attitude of a teacher (Birkollu et al., 2017). This, therefore, makes it important to consider the attitudes of teachers towards technology as teaching is highly influenced by one's attitude

(Birkollu et al., 2017). According to Liu et al. (2017), attitudes directly impacts one's beliefs and cause a particular action. This, therefore, implies that *"…a person's attitude toward a technology would have an influence on his/her intention to adopt it*" (Liu et al., 2017:5). This view is however disputed by Alkahtani (2017), who indicates that strategies at management level impact technology integration instead of attitudes towards technology.

Another important aspect of technology integration is a teacher's professional development (Koh et al., 2017). Aspects of teacher professional development that can help with pedagogical changes which may lead to effective technology integration are design experiences that engage both professionals and colleagues, understanding of pedagogical objectives, teachers' feedback and reflection on their ICT related designs and the ability to assess the outcomes (Koh et al., 2017). It is based on teacher professional development in connection with the TPACK framework that some of these mentioned aspects are meant to aid in technology integration.

Accordingly, technology integration should not be isolated from existing knowledge of content and pedagogy (Teo et al., 2015), and it would be imprudent to integrate it without careful consideration of these two components. Technology should be integrated with an understanding that it is an enabling tool that supports pre-existing content and pedagogy (Teo et al., 2015) because technology does not influence the way an educator teaches but merely supports their teaching (Tondeur et al., 2016a).

Several remedies are suggested for the successful integration of technology. For example, it is proposed that the TPACK framework can be used to assist teachers with the knowledge of the three domains of technology, pedagogy, and content. Another possible remedy is for teachers to change from teacher-centric to a student-centric approach (Tondeur et al., 2016a).

To integrate and effectively use technology can enhance research and promote engagement with people in communities (Peeraer & Van Petegem, 2015), which goes beyond just enhancing teaching and learning. According to Schiller (2003), successful technology integration in education can be impacted by the

instructor's characteristic factors based on multiple dynamics such as age, gender, and other demographics. Banas and York (2014) assert that in most cases the teachers cannot integrate technology as a medium of instruction in their classrooms, even if they have demonstrated the ability to use technology for generating material used for instruction.

Technology initiatives in education are tools that enhance the process of learning and teaching, and therefore, as tools, their effectiveness should be viewed in light of the purpose they serve and how they are integrated and implemented into the system (Schmid et al., 2014). Ross et al. (2010) point out that the effectiveness of technology integration should be based on what teachers and students can achieve because of technology integration into the classroom. It is said that in order for transformation to effectively happen in terms of technology and its use in the classroom, availability of ICT resources does not automatically imply transformation, but rather how the educators use the technology (Tondeur et al., 2016).

Tondeur et al. (2013) mention that in the education system some educators are willing to incorporate technologies into the classroom, while others are not. The educators found in the former category are those that are innovators and are willing to exercise some level of flexibility in the classroom. However, the latter category represents educators who are resistant to change and are not willing to learn new things (Tondeur et al., 2013).

The integration of technology in the educational sector is a relatively new concept that still needs to be explored (Teo et al., 2015) because if used correctly, technology has the potential to advance the education system, especially the learners, who are required to survive in the current digital landscape. Technology integration is an ongoing process that requires educators to keep abreast of the latest innovations, which can aid them in their teaching and assist students in their learning. Technology integration is rooted in the teachers' pedagogical beliefs and practices and overlooking this can be detrimental to successful integration (Ertmer, 2005). Technology integration needs to be considered in the context where it is implemented, which is why the next section looks at the

context of higher learning in the Southern African region. The focus is on this region because of the relevance to this study on the basis that data was collected in two Southern African based countries.

## 2.3 HIGHER LEARNING IN SOUTHERN AFRICA

The discussion in this section focuses on the Southern African context of higher learning environments. The emphasis is placed in this area because data was collected in higher learning institutions in two countries in this region.

The impact of education on an individuals' development, their country, and region cannot be disputed (Firoz & Josephp, 2018; Varghese, 2013). Because of this, education forms a big part of any country in the world, and most countries are investing large sums of money in advancing the sector. However, despite the value often placed on education, especially higher learning, Africa still lags behind the rest of the world, in terms of how knowledge is generated and distributed (Woldegiorgis & Doevenspeck, 2015). Kigotho et al. (2013) affirm that Africa produces only about 1% of the world's knowledge, despite her population amounting to 13.4% in the world. Some of the higher education environments in Africa face challenges such as ill-equipped facilities, brain drain due to low salaries, and declining research initiatives, amongst many others (Varghese, 2013).

Higher learning institutions in Africa are said to be less competitive compared with other institutions in the world. This is a challenge that can be attributed to socio-economic problems that many African countries face (Woldegiorgis & Doevenspeck, 2015), as well as being under-resourced in facilities and funding (Theron et al., 2014). This makes it difficult for many higher learning institutions in African countries to attract foreign talent (Varghese, 2013). An example is one of the Southern African countries called Lesotho, which is no exception to this challenge, and in the years 2010/2011, higher learning institutions in the country comprised of only 5.1% foreign staff members (Council on Higher Education, 2013). This according to the council remains a concern because foreign staff inclusion could result in international exposure, which could potentially expose students to other cultures and foreign opportunities. The council further indicated

that this could be attributed to unattractive salaries and working conditions in the country.

Another example is South Africa, Lesotho's only neighbour, as well as being Africa's economic hub (Varghese, 2013). Despite being an economic giant in Africa, the South African higher learning sector has issues related to remuneration and workloads and faces the challenge of retaining talented and skilled academic staff members (Theron et al., 2014). The country faces this challenge because of the lack of attractiveness of academia, especially to lower ranking academics due to remuneration and the amount of workload on academics in the sector (Higher Education South Africa, 2014). It is further revealed that the sector is predominantly occupied by white male academics and has an inadequate amount of black professors despite transformation initiatives (Mail and Guardian, 2016).

South Africa is the economic hub of Africa and has, in recent years, invested a lot in education, especially concerning research and development (Varghese, 2013). Lesotho is a sovereign country completely bordered by South Africa (Johnstone & Chapman, 2009). Despite this geographic relationship between the two countries, not much can be said about their comparison in terms of their respective economies, political stability, and many other aspects including education. Education is not the only exception, as these two countries differ significantly in their growth and development. The South African government and private sector spend a significant amount of money on research and development (Varghese, 2013), while on the other side, Lesotho lacks behind significantly in research and development initiatives (CHE, 2013).

Research output levels in higher learning institutions in Lesotho are not recorded properly, but an investigation by the council on higher education indicates a low output of research by higher learning institutions, with a recorded amount of 160 overall research reports between 2010 and 2012 (CHE, 2013). Despite the country spending a large portion of its GDP on tertiary education funding, it does not invest as much on research and development (CHE, 2013). Unlike its neighbour South Africa, Lesotho is one of the African countries who only invest 0

to 0.5% of their GDP on research and development (Woldegiorgis & Doevenspeck, 2015).

Initiatives have been taken at the national level of some of the African countries to address challenges with research output. However, South Africa remains the only country that is investing hugely in research and development (Woldegiorgis & Doevenspeck, 2015). A funding framework for higher education was adopted in 2003 in South Africa, and this has facilitated an improvement in the higher education system to reach national goals (Varghese, 2013).

The discussion in this section outlined the nature of education in Southern Africa, with an emphasis on two neighbouring countries in this region. The discussion highlighted some of the similarities as well as differences in these two countries, but the focus was to highlight that Africa still lags behind in education, as compared to the rest of the world. The next section discusses the TPACK framework and how it can aid the integration of technology in education.

## 2.4 TECHNOLOGICAL PEDAGOGY CONTENT KNOWLEDGE (TPACK) FRAMEWORK

The Technological Pedagogy Content Knowledge (TPACK) framework was created by Koehler and Mishra (2009) on the foundation of Shulman's (1986) Pedagogical Content Knowledge (PCK) concept (Koehler & Mishra, 2009). The framework was originally called TPCK but later became TPACK. The TPACK framework focuses on the knowledge of integrating technology with existing pedagogy and content. It addresses the complexities involved in the collaboration of technological advances with the subject matter and how the subject matter is taught. It gives an account of the knowledge required by the educators to be able to effectively integrate technologies into the learning environments (Koehler et al., 2014).

The foundation of this framework was the realisation from the authors that teachers have challenges with integrating technologies, especially digital technology into classrooms. Some of these challenges include the complex nature of technologies, social and circumstantial issues, as well as the

complacency of some teachers to hang on to old and often outdated traditional methods of teaching (Koehler & Mishra, 2009).

The framework considers the goals aimed at with the teaching approaches used, as well as the use of technology for teaching and the kind of technologies being used (Mishra & Koehler, 2008). The framework furthermore addresses the complex nature of teaching (Mishra & Koehler, 2006; Koehler et al., 2014) and how it has been transformed from the segregation of concepts of content and pedagogy. Additionally, the framework was a way of combating a dearth of theoretical models that address the complexities of technology use concerning pedagogy (Koehler et al., 2014).

To devise the framework, the authors realised teaching needs to be considered in the context of teachers' knowledge areas, which is the content and their application of that knowledge, or pedagogy (Koehler & Mishra, 2009). In this background, the framework was developed with the notion that *technology, content,* and *pedagogy* are the main concepts toward resolving technology integration challenges (Koehler & Mishra, 2009).

Content refers to the subject matter, and Figure 2.1 outlines the outcome of the interrelationships between these three concepts. The figure shows the relationship between technology knowledge (TK) and content knowledge (CK) and the resulting technology content knowledge (TCK). This relationship demonstrates the knowledge of content and technology, but not the application thereof.

When content knowledge (CK) is interrelated with pedagogy knowledge (PK), the resulting relationship is what is termed pedagogy content knowledge (PCK). The result of this interrelationship (pedagogical content knowledge) is how the subject matter is understood and how it is organised, adopted, and represented. However, this relationship omits the technological knowledge component.

Alternatively, another relationship is between pedagogy knowledge (PK) and technological knowledge (TK), with the resultant technology pedagogy knowledge (TPK). This relationship means that there is knowledge of the

application of only the technology component, which leaves out the content part of the framework.

All of the above combinations demonstrate that a combination and interrelation of only two concepts does not produce favourable results, which can only be realised when all three are considered all at once. The ideal arrangement, according to the framework, is when all three concepts intersect at a point where technology, pedagogy, and content knowledge all integrate to produce the TPACK, as is illustrated by the middle part of Figure 2.1 below.

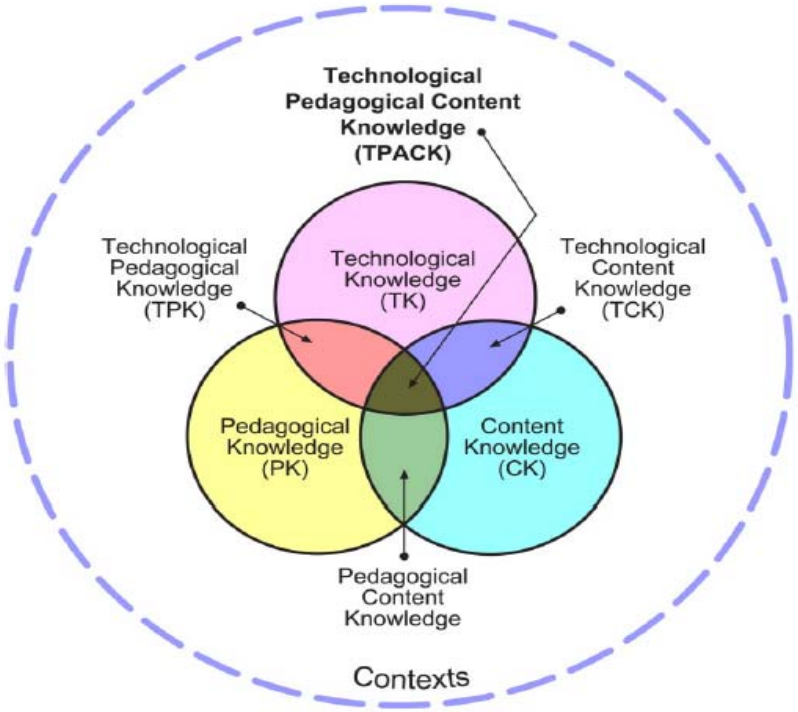



Figure 2.1 Technological Pedagogical Content Knowledge Framework (TPACK). Source: Koehler & Mishra (2009).

TPACK is important in this study because it has features of technology integration in education concerning pedagogy and content. Some of the interview questions aligned with the concepts of pedagogy and content and their subsequent relationship to technology. The framework, therefore, informed the empirical work on that foundation, which forms a significant part in showing the relevance of the relationship between these three elements. Furthermore, the framework is discussed in chapter 5 to highlight its relationship with the empirical data. This study focuses on the aspect of technology integration with existing content and pedagogy, as outlined in the previous section, but also considers the

concept of different generations, and that is why the following section discusses different aspects of generations. The discussion looks at Prensky's dichotomy of digital immigrants and digital natives, and other aspects concerning generational issues.

## 2.5 THE GENERATIONS DEBATE

The previous section looked at a framework that deliberates on the integration of technology in education. The discussion of the framework outlined aspects of how teachers can integrate technology into their classrooms with the concepts of content and existing pedagogy as well as other aspects relevant to technology integration. The discussion, however, does not consider the aspect of generations, which is what this section aims to achieve. The discussion will outline why the study of generations is relevant, as well as various debates around issues of generations such as generations in the workplace, as well as to highlight aspects of generational issues concerning the Southern African context. This section lays the groundwork of the discussion of the Generational Theory, which is an important aspect of this study and follows in section 2.6.

### 2.5.1 Why study generations?

There are various perceptions and stereotypes about generations (Martins & Martins, 2014), especially in the current digital era. The world today utilises technology for many things, and despite several challenges with it, benefits cannot be disputed. It is on this backdrop that issues are often raised on people's capabilities in terms of their knowledge and use of technology in their everyday lives, but most importantly in the workplace. It is under this premise that it becomes important to understand issues around generations, especially if they influence how people relate to one another, in academia as well as in the workplace (Lyons, et al., 2015).

It is on the basis of this background that the discussion here looks at the dichotomy of digital natives and digital immigrants (Prensky, 2001). The study of Prensky (2001) highlighted a significant difference between the younger and older generation. The debate likened the older generation, a generation of people born before the 1980s, to immigrants who have to learn a new language, and the

younger generation on the premise of being born in the digital age (Prensky, 2001). Prensky's outline of these two cohorts needs to be noted with caution because a digital native or immigrant evolves and takes on different forms throughout the years, especially with the constant digital changes. It is further noted that the debate around the digital immigrants and natives dichotomy persists even though Prensky (2009) in his later studies tried to distance himself from the concepts (Jones et al., 2010).

One of the major themes identified in Prensky's study is the differences between traditional and modern ways of learning and teaching. The issue of relevance here is how the teaching methods used today incorporate the skills of technology use and knowledge in the classrooms.

The main theme that arises from Prensky's separation of the different generations into immigrants and natives is based on differences in methodology and content in learning. The discussion of methodology and content is centred on willingness, skills, and capability of the older generation instructor who has to adapt to new ways of teaching, and as Prensky (2001:3) puts it, "*to learn to communicate in the language and style of their students as well as to teach the new content*".

Prensky (2001) suggests that some components of the traditional or legacy content should be incorporated with the current content. The responsibility for this change lies with the educators as well as with educational institutions (Jones et al., 2010).

The study of generations is important because of the stereotypes and definitions often given to the concept, which eventually impacts and influences perceptions, especially in the workplace (Martins & Martins, 2014). Generational issues in the workplace persist, and it is cautioned that to name a generation based on people's ages and therefore making decisions on such a background can prove to be detrimental (Lyons et al., 2015). This aspect is important and is discussed in the next section.

### 2.5.2 Generations in the workplace

Most of today's labour markets comprise of four generations of silent (1925-1945), baby boomers (1946-1964), generation X (1965-1980) and the generation Y/millennials (1981-1999) that have to concurrently co-exist and work together (Schullery, 2013; Akpojivi & Bevan-Dye, 2015; Constanza & Finkelstein, 2015; Nakia, 2015; Lu & Gursoy, 2016). There are several varieties of these generations, but many authors classify them within the kinds specified in this thesis (Martins & Martins, 2014).

The importance of understanding the generational differences in the workplace eliminates the negative impact of generational clashes (Becton et al., 2014; Martins & Martins, 2014). According to Nakia (2015), generations that are in the labour market and co-exist, are likely to share common values because of the transmission of values from one generation to the next. However, Constanza and Finkelstein (2015) mention that these generations all at once in the work environment cause major challenges. Martins and Martins (2014) attribute some of these challenges to subjective views, which may typically lead to stereotypes, which are a result of a lack of sufficient information. Nonetheless, literature cautions that assumptions should not be based on generational differences because there is not much empirical evidence to suggest that generational differences have an impact in the workplace (Constanza & Finkelstein, 2015; Lyons et al., 2015).

Constanza and Finkelstein (2015) conclude that there is no real evidence of the impact of generational differences in the workplace and suggest that employers should focus on issues other than these *perceived* differences.

### 2.5.3 Generations and the history of Southern Africa

The HIV/AIDS pandemic statistics in the Southern African region suggest that the composition and numbers that comprise age groups or cohorts have been affected (Heuveline, 2004). This implies that there has been an alteration in population numbers and the number of people that comprise certain generational groups. Southern African generations have a significant gap because of the plight of this epidemic, and the gap is reported to be wider in the younger

generational groups of people aged 15 to 34 (Martins & Martins, 2014). Encounters such as these make it important to study generations in their context because of the possible variations and differences that may exist across different continents (Hills & Boshoff, 2015).

It is on this basis that this section looks at the different generations and their characteristics in the Southern Africa context. The discussion is based on three of the four generations prevalent in the current workplace (Schullery, 2013; Akpojivi & Bevan-Dye, 2015; Constanza & Finkelstein, 2015; Nakia, 2015). These generations are summarised in Table 1.1 below, and a brief discussion of each is outlined in the subsequent sub-sections.

| Birth Years | Generation | Generation Cycle | Occurrences in Southern African History |
|---|---|---|---|
| 1943-1960 | Baby Boomers | Prophet | The Afrikaners National Party gains independence from the British rule, demonstrations against the pass laws (Duh & Struwig, 2015) |
| 1961-1981 | Generation X | Nomad | Experienced Apartheid mostly |
| 1982-2002 | Generation Y | Hero | The spread of HIV/AIDS and the end of apartheid in South Africa |

Table 2.2: Generations in Southern Africa. Source: Adapted from Pendergast (2009)

### 2.5.4 The baby boomers

This generation is identifiable with competitiveness and the determination to be proficient and skillful in the workplace (Martins & Martins, 2014). One of the greatest challenges with this generation in the workplace is their struggle to pass on their knowledge and what they have learned and experienced to the subsequent X and Y generations (Martins & Martins, 2014).

According to Howe and Strauss (2007), this generation in American history drove the revolutions and protested against the Vietnam War. This is also the generation that saw a lot of both men and women taking into the work

environment. This is the generation that is currently approaching retirement (Hoole & Bonnema, 2015).

In the African context, most especially in South Africa, this is the cohort that had their generation altered and socially influenced due to the apartheid policies and laws that wanted to engineer the social demographics (Tassiopoulos, 2014). The apartheid laws and policies planned and geared towards racial segregation, which were meant to benefit a single racial group in economic and social ways (Christopher, 1990), meant that this single racial group benefitted mostly in terms of education, knowledge, and experience than their counterparts in other racial groups. The outcome of this was that this racial group had more resources and opportunities that could potentially extend their stay in the workplace.

### 2.5.5 The Generation X's

Masibigiri and Nienaber (2011) point out that this generation holds critical skills that have been developed over the years of experience in the workplace. Some of the characteristics that define the generation X's are that they are less loyal to their employers because of their skills, and usually have more experience than education and are more soft skilled than the subsequent generation Y (Masibigiri & Nienaber, 2011).

Martins and Martins (2014) indicate that this generation is very resourceful and more knowledgeable, but more likely to leave the workplace when dissatisfied. The authors also state that this is the generation that experienced apartheid more than any other generation in South Africa. South Africa went through its highest level of apartheid drive during the 1960s, a period when racial segregation became explicit (Christopher, 1990). This exposed mostly a cohort of people born during this time until the end of apartheid in 1994 to the concept of apartheid and racial segregation more than any other generation in the South African history (Martins & Martins, 2014). This is the same generation that saw a lot of unrest and student uprisings, more specifically, the 1976 Soweto student uprising (Sibanda & Pretorius, 2014).

### 2.5.6 The Generation Y's

The "born frees" is a name given to this generation in South Africa (Martins & Martins, 2014:131). Martins and Martins (2014) indicate that the South African millennials are characterised by events such as the World Wide Web, and Nelson Mandela's release from prison in 1990. Hills and Boshoff (2015) point out that this is the generation that grew up with technology instead of having to adapt to it.

Other prevalent characteristics of Southern African millennials identified by Martins and Martins (2014) are that they are an angrier generation due to challenges caused by unemployment, the high levels in HIV/AIDS as well as having a sense of entitlement. This generation is also said to be more confident and highly educated than the generation before them. This generation is understood to display more diversity than their equivalents elsewhere in the world due to the changing social, cultural, and political landscape in the Southern African region (Martins & Martins, 2014). This generation also saw a lot of previously disadvantaged groups being absorbed and enrolled in higher learning institutions, especially in South Africa (Sibanda & Pretorius, 2014).

A discussion of the three generations demonstrates that it is important to understand the different diverse, often overlapping, groups of people in the workplace, as well as in their historical context to fully comprehend the perceptions and the behavioural influences about them (Mtimkulu, 2011). It is even more crucial for educators to understand their student's characteristics in order to successfully integrate and implement initiatives into teaching and learning (Lai & Hong, 2015). Understanding the aspects of the different generations is as important as understanding the theoretical background of what a generation entails. This is therefore what the next section discusses, the Generational Theory, one of the prominent philosophical underpinnings of the study on generations.

## 2.6 THE GENERATIONAL THEORY

The study seeks some clarity and reference from Generational Theory as a way of establishing a philosophical background on differing generations in the

education sector. It is important in this study to do this in order to have a background of the characteristics of the different generations and draw reference to them.

The theory of generations originates from the *essays on the sociology of knowledge: the sociological problem of generations* by Mannheim (1952). He defined generations as a social phenomenon that directs "*social and intellectual*" activities. Schullery (2013) defines a generation as a group of people born in the same period. Twenge et al. (2015:1) state that a generation is a "specified period" when people get born but uses it interchangeably with "birth cohort", which he refers to as a "given year" that people are born. A generation is further defined by Schullery (2013:253) as a group that is influenced and determined by the "formative years" of individuals.

Mannheim's Generational Theory is perceived as the foundation of the study of generations (Lyons et al., 2015). The theory combines the aspects of biology and history and looks at generations beyond the aspects of age and period. Accordingly, Lyons et al. (2015) declare that the changes of the human life cycle are attributed to the changing social and historical landscape.

The core characteristics of the Generational Theory were drafted by Mannheim (1952) on the aspects of *class position*, *location group,* and experiences in a *social location* (Hills & Boshoff, 2015; Mannheim, 1952). Mannheim (1952) emphasises the need for clarity of the individuals who make up a generation's unit. He states that a generation is not defined on the grounds of social cohorts such as family, tribe or sect. He clarifies that a generation is also not based on its association such as organisations that the individuals belong to (Mannheim, 1952).

He subsequently classifies a generation as a *class position* that an individual assumes in society. *Class position* is defined based on economic and power measures that one knowingly (or unknowingly) assumes in society (Mannheim, 1952).

The biological or sociological constructs define a generation on the basis that the common birth year of individuals becomes a mutual factor on how they socially

progress in historical terms (Mannheim, 1952). This aspect of generations also highlights that using the life and death of individuals as a determining factor of a generation would be an error (Mannheim, 1952). These two can only be used as a point of reference for the discovery of the biological aspects of the *social location*.

Furthermore, another aspect of defining a generation is based on the experiences that one acquires when they are in a particular *class position* and are in the same *social location* (Mannheim, 1952). These individuals inherently assume common tendencies that give them common characteristics. Li et al. (2013) attribute these experiences to shared events and influences experienced by a particular group of people.

According to Pendergast (2009), Mannheim developed the theory on principles of *location, actuality,* and *units*.

> ***Location*** refers to the restrictions placed on individuals based on their experiences and the group that they belong to (Mannheim, 1952; Pendergast, 2009). This principle is passive because it does not remain the same over the period (Pendergast, 2009).
>
> ***Actuality*** refers to a generation's response to social changes (Pendergast, 2009). This response is said to be a determinant of the generation's character.
>
> ***Units*** are the ranges within a generation cohort that make up a particular generation (Pendergast, 2009).

According to the Generational Theory, the separation of confusing effects is not a necessity in understanding phenomena (Lyons et al. 2015) but rather that generations are characterised by the social landscape (Nakia, 2015). The Generational Theory, however, does not clarify how individual members in a cohort individually encounter certain events (Nakia, 2015), and this issue needs to be considered with caution.

The study of generations was also made popular by Strauss and Howe (1997), who identified a generation as the period of the birth of a group of people (Li et

al., 2013; Strauss & Howe, 1997). Howe and Strauss (2007:1) stated that the overall events that occur in one's life make them who they are, and how these events affect a person signify "*how old [they] were when they occurred*". The emergence of a generation relies on sharing some experiences based on events that happened in history (Nakia, 2015).

Howe and Strauss (2007) propose that societal changes are as a result of changes in the individuals that make up a generation. They suggest that these changes, therefore, make up the four generational identities of the *prophet, nomad, hero, and artist* (Howe & Strauss, 2007). These identities are repetitive and remain in this order and fit a specific generation at a particular point in their lifetime (Howe & Strauss, 2007). A cohort will fit into any one of these identities, and move on to the next one depending on the period in time.

The division and categorisation of people into certain groups or cohorts is heavily debated as it has proven to present a lot of challenges and misrepresentation of such individuals (Vaidhyanathan, 2008). One of the challenges is the classification that restricts people into one cohort or generation. This can be rectified by not limiting and viewing people as belonging to a particular group, this as a way of accommodating any other characteristics that an individual may have that are not classified in that particular cohort or generation (Vaidhyanathan, 2008).

Akpojivi and Bevan-Dye (2015) criticise the classification of individuals into generations as being restrictive and generalising. Lyons et al. (2015) refer to the misguided use of age in the study of generations. Nakia (2015) asserts that without longitudinal studies of generations, proper conclusions cannot be drawn about the different cohorts.

Constanza and Finkelstein (2015) attribute the challenges of the studies of generations as the inability to distinguish the concepts of *age*, *period,* and *cohort*. Twenge et al. (2015) have however indicated in their study that these three concepts can now be separated. This is a precise indication of the changes that happen socially.

The theory has been used by several scholars in the studies of different generations in the workplace (Parry & Urwin, 2011; Foster, 2013; Lyons & Kuron, 2014; Constanza & Finkelstein, 2015; Lyons et al., 2015). It is therefore used in this study in the same manner.

Experiences of life are deemed as one of the defining attributes of generations. Certain life experiences set boundaries within a cohort and differentiate them. According to Schullery (2013), the traditionalist experienced the radio, the baby boomers experienced the birth of the television, generation X was the beginning of AIDS and the fall of the Berlin Wall, and finally, the generation Ys experienced the computers and the internet. It is, therefore, to the benefit of each organisation to understand individuals and what makes them different or similar, not necessarily based on the stereotypes set about on the concept of the generational differences (Martins and Martins, 2013).

## 2.7 THEORETICAL UNDERPINNING

Any research study that aims to accomplish significance requires use and reference theory in order to effectively accomplish the investigation for the study (Hofstee, 2011). This discussion draws from the study of Gregor (2006) on how to understand the structural nature of theory and, more particularly, the application of theory in information systems (IS) studies. The study also refers to Hofstee (2011) when he said that theory explains the phenomena being investigated. Orlikowski and Robey (1991:146) affirm that social theory explains the “duality” of objective and subjective foundations of a phenomenon.

Gregor (2006) suggests that the four main goals of using theory in IS studies are to analyse, to explain, to predict and to generalise. On the other hand, Hofstee (2011) suggests that scholarly theory is used in research to clarify the nature of something and the ability to support the study.

Most IS research studies are centred on the development, integration, and use of information technology within social systems (Orlikowski & Robey, 1991), which makes theory an essential component that explains the links between the social and the physical (Gregor, 2006). The premise of this study is, therefore on the

kind of theory that can show possible interactions between different elements of generations of humans and technology.

The following paragraph discusses ANT and its applicability as a "statement that provides a lens for viewing or explaining the world" (Gregor, 2006:613). The emphasis is placed on how the theory can help explain whether generational differences in the education sector can influence the integration of technology for teaching and learning. The discussion, therefore, aims to achieve this by drawing on ANT as a guiding theory.

The rationale for choosing ANT in this study draws from reviews that ANT is increasingly contributing to the education landscape to provide an insight into the investigation of interactions between human and non-human elements (Tummons et al., 2016). Due to its ability to address complex socio-technical problems (Walsham, 1997), ANT has the potential to contribute to research in educational studies. As Fenwick and Edwards (2011b:1) put it, ANT "…can open new questions and its approaches can sense phenomena in rich ways that discern the difficult ambivalences, messes, multiplicities, and contradictions that are embedded in so many educational issues."

## 2.8 ACTOR-NETWORK THEORY (ANT)

ANT is a social science theory that emerged between 1978 and 1982 in Paris, and is largely but not exclusively associated to science and technology studies (Callon, 1986; Latour, 1999; Law, 1999; Howcroft et al., 2004; Law, 2009; Fenwick & Edwards, 2010). Law (2009) cautions that ANT is not a theory, because it does not explain the "*why*" as is usually the case with theories, but rather gives a descriptive narration of stories about "*how*" relationships are established.

So what does ANT entail? ANT has been described in many terms, such as *material semiotics* (Law, 2009), *relational ontology, inscriptions* (Booth et al., 2015; Jackson, 2015), *heterogeneous actor-networks, symmetry,* and *translation* (Callon, 1986; Law, 2009). Each of these concepts will be explained in the following paragraph, with translation discussed in more detail, in its own section, because of its relevance to this study.

*Material semiotics* refers to the reality that is translated into action through practice (Goldman et al., 2015). The concept assumes material and semiotic relations between the elements (Roth, 2015). It makes the social practices to be abdicative “rather than deductive modes of inquiry” (Austin, 2015:4). This can be clarified through an example of the study of Meijering et al. (2016:35), which explores the reintroduction of stroke survivors into their home environment. The study explores how survivors adapt to their homes as places with a new identity and relationship. It outlines the concepts of material semiotics where the homes of these survivors become a place of “struggle” (Meijering et al., 2016:35). A home is defined in terms of being *material*, *social* and *personal*. The stroke survivors have to adapt to the home as the *material* and enact their reality through the practice of giving their homes a new meaning.

Material semiotics also explores how to drive into action the relationships between the various and often diverse elements of a network that comprises human and non-human actors. The notion of material semiotics draws from the heterogeneous associations (discussed in the later text) of the social and the natural elements within a network (Law, 2009). These elements are heterogeneous in character or content (Law, 2009).

ANT disregards the segregation of the social and technical elements and perceives them to be attached and interrelated (Howcroft et al., 2004; Nguyen et al., 2015). It does not distinguish between technologies and societies and specifies that these elements should not be studied as separate entities (Klecuń, 2004). The ANT network, therefore, assumes that there are no boundaries set that may separate or segregate elements into either being on the inside (or the outside) of the network (Latour, 1996).

The following section further outlines some of the other important tenets of ANT that were mentioned earlier in the definition of ANT. The discussion is about the networks, the actor, and the four moments of translation. The section concludes with an account of the value of the use of ANT in education studies and some of the criticism towards the approach in IS research. This discussion is important as it justifies the selection of ANT for this study.

### 2.8.1 The “Networks”

The collection and arrangement of actors make up the actor-network. The network is arranged for purposes of completing actions or certain tasks (Booth et al., 2015). According to Fenwick and Edwards (2011b:2), the networks produce effects such as “knowledge, identities, rules, routines, behaviour, new technologies, and instruments.” These networks are intertwined but are not limited to spaces or time (Fenwick, 2010), but can be depicted as spaces that enable certain practices to occur (Goldman et al., 2015).

The network should not be thought of as a technical, infrastructural arrangement (Latour, 1996). The theory clarifies networks as heterogeneous societies comprised of human and non-human actors and artefacts grounded in the natural and social sciences (Latour, 1996; Callon, 1999; Wang et al., 2015).

Latour (1996) cautions scholars about the misconceptions that are related to the actual network. The dimensions of a network are based on closing the distance that can occur between elements (Latour, 1996). Networks should be seen as a way of closing up the gaps and breaking down the barriers between objects and elements (Latour, 1996) that are different in structure.

A network viewed from the ANT perspective disregards scale in terms of size and power (Latour, 1996). The scale and size of a network are determined by the intensity of the interconnectedness of the actors (Latour, 1996).

### 2.8.2 The “Actor”

The actor in the theory can be either human or non-human. According to Callon (1999), the actor has no stable form, and can therefore not be predetermined. The actors or *actants* assume the role of directing and manipulating the situations within the network (Klecuń, 2004). According to Latour (1996:373), “an actant can literally be anything provided it is granted to be the source of action”. This description of an actor qualifies that within the ANT network, an actor is not necessarily an individual human element (Latour, 1996).

The definition of an actor lays the foundation for the concept of *symmetry*, which states that humans should not assume a superior role over non-human elements

in the actor-network and that these elements should rather be regarded as equals (Fenwick, 2010; Fenwick & Edwards, 2011a). Symmetry sets the basis for the concept of heterogeneous existence and networks. So what exactly does a *heterogeneous network* entail? It is a network that comprises elements that are diverse in nature but which are afforded the same status (Arnaboldi & Spiller, 2011; Miettinen, 1999). In the opinion of Law (1992), heterogeneity is a crucial aspect of what ANT advocates because of the diversity of elements in the network, which are treated as equals.

*Relational ontology* is another element of ANT that outlines the nature of an *actor*. *Relational ontology* is, therefore, defined as the ability to act on the foundation of the relationship and not on the nature of the actor (Booth et al., 2015).

ANT is described in several foundational terms; however, the moments of translation forms the basis of the theory and are discussed in the following sub-section.

### 2.8.3 The four moments of translation

The *sociology of translation* is a four-stage ANT framework (Hamel, 2015) based on the study conducted by Michel Callon of scallops of St. Brieuc Bay in France (Law, 1986; Callon, 1986). The study gives an account of three researchers who wanted to encourage fishermen of St. Brieuc to cultivate scallops in a similar way to which they (researchers) had learned and discovered on a trip to Japan. The study would later be centred on the established relationships between the scallops, the fishermen, and the researchers (Callon, 1986).

In the study, the fishermen are persuaded by the researchers to use the scientific information that the latter had discovered on their Japan trip in order to increase the production of scallops (Jackson, 2015). Besides the fishermen, the researchers also established the network by inciting interest amongst their scientific colleagues, whom they persuaded to recognise and study scallop cultivation in the way that they had seen it done in Japan.

So what is *translation,* and how is it used in ANT? According to Bauer (2015), to translate is to make equal. He says that since two things cannot be the same, translation also entails *betrayal* or *shifting*. *Translation* in terms of ANT refers to the compilation and arrangement of relations between human and non-human elements within a particular actor-network and based on a particular interest (Kitto, 2003). The translation is a vulnerable process prone to failure (Law, 2009). All it takes is one of the components to fail, and the entire translation process is jeopardised (Law, 2009).

To explain *translation* according to Callon's study, the concept is based on the four moments of translation, as was depicted in the St. Brieuc Bay study. The four overlapping moments or phases are *problematisation, interessement, enrolment* and *mobilisation* (Callon, 1986; Howcroft et al., 2004; Klecuń, 2004; Wang et al., 2015). These moments explain the way actors negotiate and define their identity, their interactions, and manoeuvres within their network. Translation also outlines how being part of the network is determined by negotiation (Howcroft et al., 2004). The concept also specifies the enrolment of different actors in the adoption of innovation within the network (Callon, 1986). This concept was defined "*translation"* on the grounds of knowledge and the establishment of relationships within a network, as well as the actors involved in them and their mutual influence despite being social or natural beings (Callon, 1986). The following sections discuss in detail the translation moments and relate them to the study of the scallops of St. Brieuc.

*The moment of problematisation*

Once the actors have been determined, given identities and their relationships defined within the network, the moment of problematisation has been defined. This moment identifies a set of actors for a particular network and establishes how vital they are in the network (Callon, 1986). In a research study, the actors can be determined using the research questions. Callon (1999) identified the actors and their identities based on a set of questions compiled by the researchers who wanted to establish the feasibility of harvesting the scallops the same way they saw and learned on their trip to Japan (Callon, 1986).

It is in this moment of translation where the roles of other actors are specified by the dominant actor/s, an activity which makes them indispensable within the network (Callon, 1999; Booth et al., 2015; Hamel, 2015; Jackson, 2015). The definition of actors and roles can translate into the definition of the situation or the phenomenon (Klecuń, 2004). The actors become allies in the network on the grounds of finding the potential solution to their perceived *problem*. The translation of the problem into a solution is based on the common affiliation of trying to find a common solution by both the allies and the actors of the network (Howcroft et al., 2004).

In the study of the scallops of St. Brieuc Bay, the researchers assumed the role of being main actors in the network as they defined the nature of the problem for the other actors, as well as negotiating to be the obligatory passage point (OPP) (Callon, 1986; Jackson, 2015). OPP is an attribute that the main actor assumes, which enables them to indicate the possible actions, alliances and deviations that must be accepted or forged (Callon, 1986; Jackson, 2015).

The OPP's nature allows the dominant actor to undertake the responsibility of being a "gatekeeper" (Booth et al., 2015:4). Callon (1986) explains this through the use of a diagram that identifies the actors and the obstacles that can inhibit them from achieving their goals. It shows that each actor or a set of actors within the network, whether human or non-human have goals they aim to achieve, but need to go through the OPP in order to attain those goals or *inscriptions* (Booth et al., 2015). The OPP is outlined in Figure 2.2. The diagram illustrates a series of alliances that define the identities of the actors as well as the possible obstacles and ultimate goals.

In essence, problematisation implies the following:

- a network of allies
- establishment of associations
- roles and identities of the actors
- what the actors want in the network and their eminent goals
- the OPP

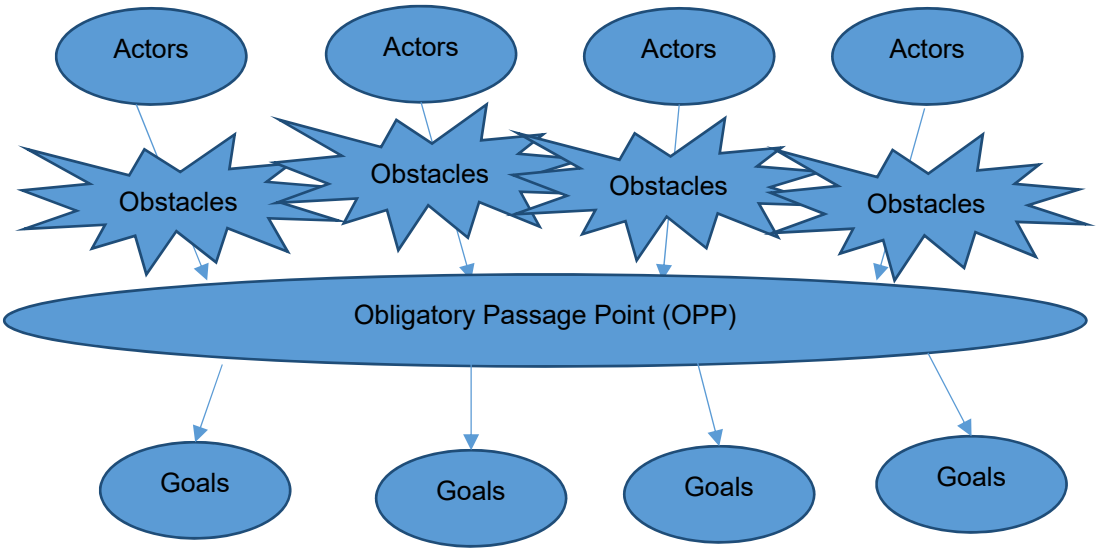



Figure 2.2: The Obligatory Passage Point (OPP). Source: Adapted from Callon (1986).

*The moment of interessement*

The second moment of translation is the moment of interessement. At this moment, the roles of the actors defined by the main actor in the moment of the problematisation stage are "locked into place" (Callon, 1986:61). The main actor attempts to get the other actors to be interested in enrolling and being part of the network (Howcroft et al., 2004). Each actor identified in the problematisation stage either accepts the role defined for them or refuse to accept the identity and roles but define their own (Callon, 1986). The dominant actor, therefore, needs to convince the other actors that their roles are reasonable (Booth et al., 2015).

The scallop researchers had to convince all the other actors that their roles were feasible within the network. The fishermen's roles were locked by being persuaded that this method of cultivation would protect the scallops from predators and therefore increase the harvest (Booth et al., 2015). The scallops, on the one hand, were put into collectors that ensured their survival and therefore reaffirmed to them the greater chance of survival (Callon, 1999). The scallops accept their defined role when they attach themselves (Callon, 1986). Finally, the scientific colleagues got the reassurance that their knowledge would be enhanced if they study this method of scallop cultivation (Booth et al., 2015).

*The moment of enrolment*

This moment describes the negotiations that accompany the moment of interessement. This moment follows the other moments and outlines the alignment of actors with their specified roles. The roles are assigned on the grounds of the actors accepting the particular role. The actors start to see and represent themselves and their identity on the foundation of the roles given to them by the main actor (Callon, 1986; Booth et al., 2015; Jackson, 2015).

*The moment of mobilisation*

The “mobilisation of allies” (Booth et al., 2015:4) indicates that the main actor mobilises the other actors to do certain activities within the network (Howcroft et al., 2004). This iterative final stage of translation outlines whether the actor-network was successful or not (Booth et al., 2015). It does this by evaluating whether the given roles were appropriate or not and whether the roles were able to align with the other actors’ or not.

The stability of the actor-network depends on the successful establishment of the moments of translation (Booth et al., 2015), which can be challenged and disrupted at any point in the lifetime of the translation (Callon, 1986). The successful translation is not always guaranteed, and if it fails, there needs to be a retranslation (Jackson, 2015:34). This hence explains that the actor-network is not necessarily as stable as the main actors would like it to be.

The moments of translation are a crucial component of ANT, which is why this study aligns the main components of the Generational Technology Integration (GTI) framework to them. Besides the moments of translation, the other aspects of ANT are important and of value. However, the translation process remains one of the prominent features of the theory. The following section discusses and establishes why ANT is valuable in education research.

### 2.8.4 The value of ANT in research studies in education

Several research studies demonstrate the suitability of using ANT in education research studies (Fenwick & Edwards, 2010; Ackland & Swinney, 2015; Hodgson, 2015; Mitterle et al., 2015; Tummons et al., 2016). The motivation for

using ANT in this study is to look at the education sector as a network that comprises both human and non-human actors. ANT can introduce possibilities to analyse the integration of educational technology in higher learning through some of its tenets such as the *translation concept.* According to Fenwick and Edwards (2011a), ANT had largely been in use in other disciplines such as technology and sociology, but they believe that it can add value to studies in education. They assert that the theory can be used in research in education to impose or present questions and phenomena to observe and realise the complex issues in the sector. Examples of some of these complex issues are discussed in the following text.

According to Watson et al. (2015), the education sector is still marred with the use of industrial age models in the current information age. According to these scholars, the education needs and goals of today's learners are varied and require flexibility often afforded by the use of technological advances (Salmon & Wright, 2014; Watson et al., 2015). This can also be rectified by changing teaching practices by the academic staff to promote student-centred learning approaches (Salmon & Wright, 2014).

The education sector also faces policy-related challenges (Fenwick & Edwards, 2011a). The political influence of governments in educational policy makes it difficult for such policies to be free of "messy mobile assemblages and attachments" (Fenwick & Edwards, 2011a:713). The influence of politics and government in education policies often emanate from the visions and goals that the government set with little consideration of educational sectors' readiness to adopt some of the goals set (Tarus et al., 2015).

The two examples mentioned in the previous paragraph prompted this research to consider using ANT to offer a new way of learning about and understanding the education sector (Fenwick & Edwards, 2011a). The study also considers the use of the theory (ANT) because of the growing interest in its use in education research studies (Bauer, 2015). To elaborate more on this, the following paragraph explores some of the research studies of ANT in the education sector.

The study of Fenwick and Edwards (2010) explored the use of ANT in educational policy on the premise that the educational practices are made of objects that need to align and assemble to produce consistent and comparable standards. This is in line with the study by Popkewitz (2004), which indicated that the education sector is an environment that requires standards to drive for actions that work towards solving a particular problem.

The value of ANT in education studies is also outlined by Tummons et al. (2016) as a sociological framework that highlights the relationships between the human elements such as lecturers, students and technicians, and the non-human elements that comprise computers, textbooks, and technological devices. The study demonstrated how ANT enforced the importance of the human and non-human actors working together for the successful completion of any given task (Tummons et al., 2016).

The study of Ackland and Swinney (2015) used ANT to explore the virtual learning environment and used the theory to investigate obstacles and entrances in a professional development module. The study's findings revealed education as a good service to consumers' needs and revealed how political discourses tempted the human actors to act out when they realised that technology gained prominence over them (Ackland & Swinney, 2015).

Mitterle et al.'s (2015) study investigated the German higher learning education sector and used ANT as a methodological foundation to determine how administrative policies interact and impact teaching.

The use of ANT in education was likewise explored by Hodgson (2015) in the study that explored changes and power shifts in the learning space. This study outlined the relationships between students, teachers, and change elements. Power was identified as a collective effect rather than an individual aspect. The study explored the change in learning spaces from the classroom to outdoor spaces and their impact on the relationship between the student, teacher, and content, through changes in power from one actor to another. The spaces were classified into network *spaces of prescription* for the classroom and *spaces of negotiation* for the outdoors (Hodgson, 2015). The distinction between the two

spaces was made on the premise that the confinement, containment, and controlled structure define the former space, whereas the latter space is not limited to space and time.

In this study, ANT is embodied by the principle that the education sector represents a network that comprises lecturers of differing generational identities. The human actors are represented by the lecturers of different generations, who strive to integrate technology elements within the existing pedagogy and content, as well as the students who receive content and use it to gain knowledge. The other elements within the network, such as technological advances, generational identities, pedagogy, and content, make up the non-human elements within the network. A detailed specification of the entire human and the non-human actors are covered in chapter 5 (Discussion and framework development). The significance of ANT for this study is the flexibility that exists within the network. ANT acknowledges that the dynamics and the composition of actors within the network can change or even assume different roles at one point or another (Wang et al., 2015). If this happens, there is a need for the realignment of the actors and for the relationships to be re-enforced again.

It is, therefore, the aim of this study to use ANT to demonstrate the relational dimensions between the generational difference of lecturers and technology integration into classrooms, as well as institutional policy aspects in the education network.

### 2.8.5 The critique of ANT in IS research

The influence of ANT in research studies cannot be disputed. However, just as much as the approach has influence, there is as much critique towards it (Cresswell et al., 2010). The following is an account of some of the criticisms mentioned about the theory.

One of the greatest disputes about ANT is whether it is indeed a theory, as its naming suggests, or whether it is something else other than a theory (Cresswell et al., 2010). It is therefore suggested that because of this shortcoming, ANT can best be utilised in collaboration with other theoretical underpinnings (Walsham,

1997; Cresswell et al., 2010). This is why this study uses ANT in collaboration with the Generational Theory.

Amongst other aspects of ANT criticism, Walsham (1997) identifies the issues with the concept of symmetry, which does not recognise a difference between human and non-human actors in the ANT network.

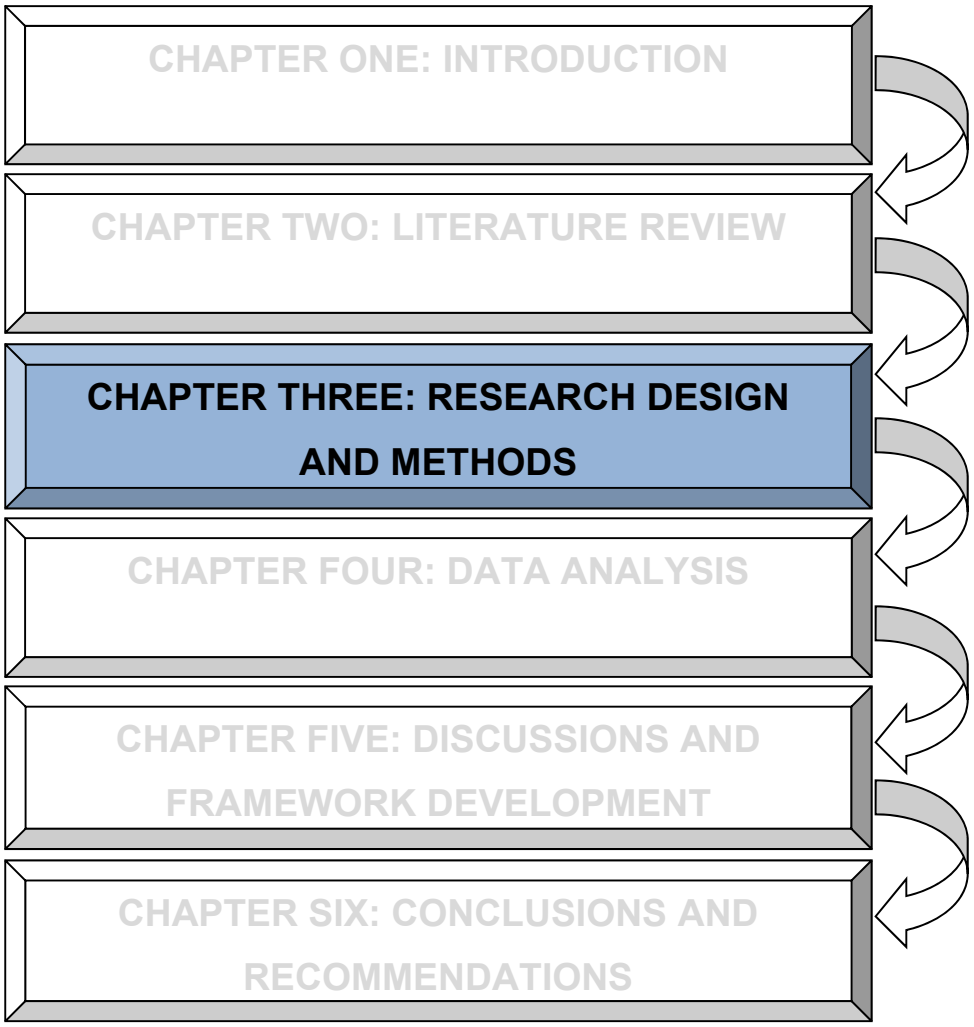
One other challenge noted about ANT is the issue around the constant modifications that the theory's pioneers often make to the theory (Cresswell et al., 2011). Despite all of the noted criticism, the author understands the profound contribution that ANT has contributed to research, especially IS research.

## 2.9 CONCLUDING SUMMARY

This chapter reviewed the current literature on aspects of technology integration, generations, and theoretical underpinning. It was observed from the literature that most work environments are made of at least three different cohorts of people, often classified as generations. Literature also suggests that the education sector still faces many challenges in the integration and use of educational technology.

ANT remains influential in research studies, especially in education. Its value has been highlighted by several studies conducted in education research. The theory enables the visualisation of social relations between human and non-human elements that are present in the education environment. It has also been used to highlight policy issues, power shifts in the learning space as well as obstacles and entrances in a professional development module. These are a few examples that have demonstrated the value of using ANT in education research. Despite its value, ANT remains to be criticised, especially on the concept of symmetry, as well as that it does not qualify to be called a theory. Despite all its shortcomings, ANT's value cannot be disputed, and a good suggestion is that it can best be applied in collaboration with other theoretical underpinnings (Walsham, 1997; Cresswell et al., 2010). This study aimed to achieve this with the use of Generational Theory and some aspects of TPACK framework to present elements that will be valuable to make sense of and investigate the *influence that generational identities can have on lecturers to successfully integrate and use*

*different educational technologies in the classroom, some of which may be complex and specialised for particular subjects.* The following chapter highlights how the study was carried out to investigate this problem. The chapter outlines the research design and methods used.


CHAPTER ONE: INTRODUCTION
CHAPTER TWO: LITERATURE REVIEW
CHAPTER THREE: RESEARCH DESIGN AND METHODS
CHAPTER FOUR: DATA ANALYSIS
CHAPTER FIVE: DISCUSSIONS AND FRAMEWORK DEVELOPMENT
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

# 3 RESEARCH DESIGN AND METHODS

## 3.1 INTRODUCTION

This chapter discusses the means of inquiry to seek answers to the identified problem. The research aims to investigate the influence of generational identity differences of lecturers in integrating educational technology for teaching and learning in three higher learning institutions, located in two Southern African countries. One of these institutions is located in one country, whereas the other two are located in one country.

The chapter is organised and arranged on the metaphor of the research "onion" (Figure 3.1), a process of "peeling" through the different layers to build the context of the overall research design. The onion reveals the different layers of *research philosophy*, *research approach, research strategies, choices, time horizon,* and finally, the *data collection techniques and procedures* (Saunders et al., 2012).

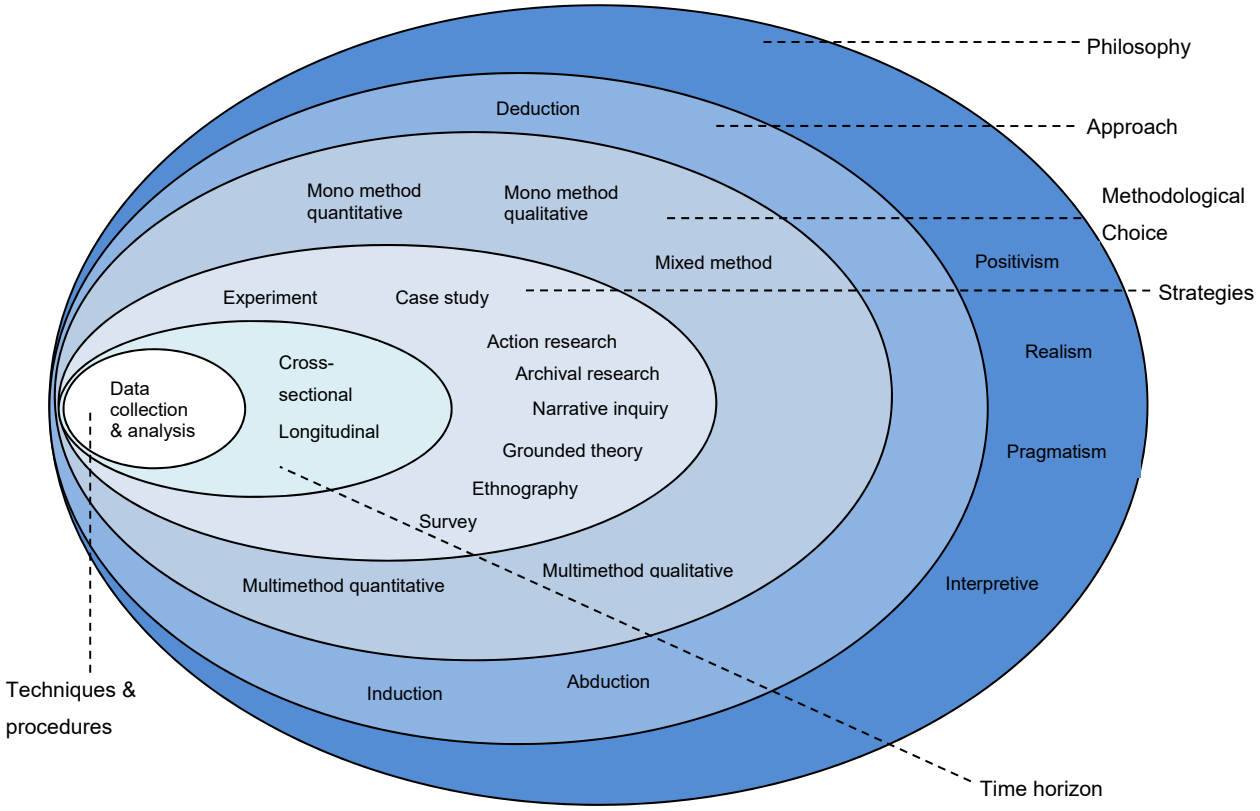



Figure 3.1 Research "onion". Source: Saunders et al. (2012)

## 3.2 RESEARCH DESIGN

Research studies require a research design as a guideline of how the study will be carried out to address the study's research problem and questions (Saunders et al., 2012). Myers (2013) asserts that the research design section should outline the decisions taken by the researcher on the best possible approach to conduct the study in terms of the philosophical underpinning, the methodology, how data will be collected, and eventually analysed. This is the chapter that gives the reader an insight into how conclusions were drawn, and therefore needs to be completed to the point that it guides the reader on the flow of the body of the entire study (Hofstee, 2011).

This study uses the research onion by Saunders et al. (2012) as an outline of the process of the research inquiry. The chapter begins with an explanation of ontology and epistemology, which inform the research philosophy. All research studies need to have an underlying philosophical assumption (Myers, 2013). Research philosophy explains how knowledge is developed as well as the nature that guides such knowledge (Saunders et al., 2012). The philosophy selection in research informs the initial ideas that a researcher may have, and eventually explain how they view and understand the world (Saunders et al., 2012). The philosophical choice is often guided by how practical it will be to carry out the study, as well as based on the research training that the researcher received (Creswell, 2013).

The following discussion will outline the philosophical assumptions undertaken in this study, which is then followed by all the required research inquiry steps that informed this study on the metaphor of the research onion being "peeled" one layer at a time to address the entire methodological plan. The discussion concludes with phases of research techniques and procedures where data collection and analysis are discussed.

### 3.2.1 Philosophical Assumptions

**Ontology and epistemology**

Ontology is defined as the nature of the world (Oates, 2006; Cornford & Smithson, 2006; Saunders et al., 2012), and its foundation is the discovery of what is “out there” (McNabb, 2015:225). The question to address with regards to ontology is the existence of reality out there that awaits to be discovered by research inquiries (Willig, 2008).

The concept is explained by Oates (2006) as the beliefs of a particular school of thought about reality. Orlikowski and Robey (1991) discuss ontology on the subjective and objective nature of a phenomenon being investigated. The subjective view looks at the human influence when interpreting, creating, and modifying the social world, while on the other hand, the objective view implies that the institutional properties influence the human activities to explain the phenomena (Orlikowski & Robey, 1991). It is on this principle that this study aligns with the subjective view which eventually informed the way the researcher undertook the study.

This view dictated the design of the study and therefore informed the way the researcher got answers about reality (Fouche & Schurink, 2011). Saunders et al. (2012) assert that subjective investigations afford the researcher the ability to understand the reality of particular phenomena based on being informed by the actions and intentions of participants in a particular social setting. The researcher had an interest in exploring the subjective route because of being informed by literature and therefore had prior knowledge and understanding of research philosophies, and also that the outcome of the subjective investigation can potentially be meaningful and reveal in-depth insight into the association between the aspects of generations and technology in a higher learning environment. This interest was incited on to the researcher through the time spent in a higher learning environment as a lecturer, and therefore stimulated certain assumptions and observations that she wanted to carry out in the form of a research inquiry.

Another philosophical concept is epistemology. The philosophical undertaking of epistemology in research studies is to ask questions about knowledge, how to

obtain it, and the limitations thereof (Olivier, 2004; Myers, 2013). Chua (1986) asserts that people produce knowledge about social and physical settings for other people. Epistemology, therefore, informs the methods to be used in order to gain knowledge about the world (McNabb, 2015). A philosophical undertaking informs the epistemological stance of a research study (Myers, 2009) and is largely but not exclusively dominated by three paradigms of positivist, interpretive, and critical research (Orlikowski and Baroudi, 1991).

Epistemology in a qualitative research study implies that the researcher has an interest in interacting with participants of the study as much as possible (Creswell, 2013). Epistemology in qualitative studies is consequently informed by what is being said by the studied participants based on subjective interpretations made by these participants (Creswell, 2013).

Saunders et al. (2012) caution that philosophical choices should be based on the suitability to address the research questions of the study rather than on whether the one is superior to the other. For a qualitative inquiry, the philosophical undertaking is guided by assumptions of ontology, epistemology and methodology (Creswell, 2013). The discussion here outlines the two prominent assumptions of ontology and epistemology (Saunders et al., 2012).

Research studies need to illustrate an understanding of philosophy as well as to indicate explicitly what the study's philosophical undertaking is, to show how the study was informed by them (Creswell, 2013). Based on the understanding of epistemology, this study used an interpretive approach to investigate the integration of technology in education. This philosophy is discussed in the following section.

### 3.2.2 Interpretive philosophy

A research study is interpretive when it addresses the relations of elements in a social setting as well as the subjective meaning that people have on interconnections of the social phenomena (Orlikowski & Baroudi, 1991; Klein & Myers, 1999). This research philosophy is based on understanding and not explaining the consciousness of human beings (Babbie & Mouton, 2011) and

how humans as social actors interpret the world around them (Saunders et al., 2012).

The main aspect of interpretive research is the emphasis placed on “social actors” (Saunders et al., 2012:137). The role of actors viewed from an interpretive lens is how they perceive reality with the consideration that these perceptions may change over time (Oates, 2006). Such perceptions are often established through “language, consciousness, shared meanings and instruments” (Myers, 2013: 38). The outcome of this is that the researcher can establish and consequently understand the actors’ reality. This means that the researcher can make comprehensive assumptions about phenomena through the subjective meanings provided by human participants (Myers, 2013). The subjective reality informed this research study through the interpretations made by lecturers of different generations about the subjective reality of the influence of generations on technology integration in higher education.

The role of the researcher in interpretive research is that they become one with the investigated population (Myers, 2013). This means that the researcher can understand the phenomena properly if they assume an “empathetic stance” and view reality according to the participant’s interpretation of that reality (Saunders et al., 2012:137).

Interpretive research has, in recent years, grown in information systems (IS) studies (Klein & Myers, 1999). Interpretive research in IS research studies is associated with the investigation of the social context of an IS (Oates, 2006) and can assist researchers to comprehend how humans in their social setting react to information systems (Klein & Myers, 1999). According to Walsham (2006), earlier research by Orlikowski and Baroudi (1991) indicated a dearth of interpretive studies in IS research. However, in recent years, there has been a significant increase and contribution of interpretive studies in the discipline. Interpretive studies in IS have proven to be valid and can potentially produce a deeper understanding of the management of the IS phenomena (Klein & Myers, 1999).

The following is an account of how interpretivism manifested in this study and is based on the characteristics outlined in Oates (2006:292):

- ***Multiple subjective realities***: the version of the “truth” was a construction of how 34 interviewed lecturers view reality in terms of generational influence and technology integration for teaching and learning.
- ***Dynamic, socially constructed meanings:*** specified by participants to give meaning to phenomena by communicating with the researcher through the conducted interviews.
- ***Researcher reflexivity:*** This means that a researcher in interpretivist research will not remain neutral but can be one with the research participants within their social setting.
- ***Study of people in their natural social setting:*** entails that the researcher understands the participants’ natural setting and how they perceive reality. This means that the researcher stands back and allows the participants to tell their story the way they see it, not according to how the researcher might have previously perceived it.
- ***Qualitative data analysis:*** Leximancer (computer-aided qualitative data analysis software) was used in this study to generate themes and concepts from data.
- ***Multiple interpretations of*** evidence from the findings of the study allow the researcher to be able to make several interpretations about the reality of the participants.

The discussion of interpretive research makes it the best alternative for this study. In addition to the discussion in the previous text, the researcher chose this approach because of socially constructed perceptions about phenomena that this kind of research allows. It means that the subjectivity of the approach allows different views to reality, which was preferred by the researcher.

Table 3.1 summarises the interpretivism research philosophy.

| | |
|---|---|
| **Philosophy Assumption** | Interpretivism research philosophy |
| **Ontology** | Socially constructed, subjective, may change |
| **Epistemology** | Subjective meanings motivating actions and social phenomena |
| **Data collection often used** | Small samples, in-depth investigations, qualitative |

Table 3.1: Summary of the research philosophy undertaken

### 3.2.3 Approach

The layers of the research onion show that once the philosophical stance has been established, the onion peels off, and the next layer is the research approach. Central to this study is the investigation of different generational identity elements of lecturers and the influence on technology integration for teaching and learning. It is, therefore on this background that this study seeks to explore the education system as a network comprising both human and non-human actors. This network is made up of different lecturers who are classified by various generations, and who strive to integrate technology for teaching and learning successfully.

Saunders et al. (2012) discuss three different research approaches of abduction, deduction, and induction. An inductive research approach allows a researcher to have a feel of the reality of the research setting selected (Saunders et al., 2012). This inductive approach is carried out using a qualitative approach, a methodological choice selected to undertake the study in three higher learning institutions located in the Southern African region. Two of these institutions are located in the same country, one is a private higher learning institute, and the other is a public university. The third institution is the only public university in that country.

The three approaches of abduction, deduction, and induction are different in logic in that when conducting research the abduction approach moves back and forth between data and theory, whereas deduction flows from theory to data and inductive moves from data to theory or conceptual framework (Saunders et al., 2012). In inductive research, “data collection is used to explore a phenomenon, identify themes and patterns, and create a conceptual framework” (Saunders et al., 2012:144). The current study followed the logic of data collection, and then

the subsequent generation of the framework which was informed by the data results and literature and this is ultimately what informed the design of the study.

A philosophical underpinning such as interpretive philosophy guides and influences a research method in research undertaking (Myers, 2013), and in this study, the method is qualitative, and the next section gives background details of this method, and how it manifested in the study.

### 3.2.4 Qualitative research design

In research studies, several methods exist, but the two most prominent are qualitative and quantitative research methods (Myers, 1997; Fouche & Delport, 2011). While quantitative studies are synonymous with numerical inquiry and with an origin in the natural sciences, qualitative research is often referred to as non-numerical research, which originates in the social sciences and is linked to but not necessarily exclusive to interpretive research philosophy (Saunders et al., 2012; Myers, 1997). It is important to note that qualitative studies are largely interpretive. However, they can also be positivist or critical (Myers, 1997).

The classifications of qualitative and quantitative research methods are numerous, but the most obvious one is the distinction made between these two design methods (Myers, 1997). The methods differ on how the inquiry is carried out, from the strategy used to the purpose of the investigation right through to data collection and analysis (Fouche & Delport, 2011). Each of these methods is guided by the philosophical foundations of what is being investigated (McNabb, 2015). The method followed in this study is a qualitative research method.

Qualitative research design is characterised by the meanings that the participants taking part in the study, place on the phenomena (Saunders et al., 2012). The emphasis of qualitative research is the contextual setting where the activities and decisions undertaken by the research participants occurs (Myers, 2013). These assist researchers in understanding the phenomena based on what was said and done by participants; within a particular context. To acquire the meanings, a strategy is used as a means of inquiry into the phenomena being investigated, and this, therefore, informs the data collection method that the study will undertake (Myers, 1997).

An important aspect highlighted in qualitative research studies is the natural setting within which the phenomenon is investigated (Creswell, 2013). According to Myers (2013), the researcher can experience the participant's context to make informed interpretations on the background of understanding where they carry out their activities and make decisions. This gives light to their choices and actions. The participant's setting is often explored during the data collection phase when the researcher is conducting fieldwork (Creswell, 2013). This contextual setting is defined by Leedy and Ormrod (2014:147) as the "real world". Fieldwork and interaction with the participants in their natural setting where the phenomena are being investigated is a crucial aspect of qualitative research.

In this study, the researcher conducted a semi-structured interview with the lecturers in their respective institutions. This experience enabled the researcher to have an interaction with the participants in the natural setting of their work environment. McNabb (2015) suggests that the researcher and participant interaction affords the researcher the ability to interpret the data and make informed decisions on the foundation of what they heard and saw.

The ability of the researcher to make interpretations and draw conclusions on the investigation based on the interaction with the participants highlights another important characteristic of qualitative research, and this is the subjective nature of the inquiry (McNabb, 2015). In this study, the interpretations and drawing of conclusions are based on a combination of aspects, that of the themes and concepts that emerged from data analysis, documents, literature, and on the interaction between the researcher and the participants within their natural work environment.

In this study, the researcher was able to understand some of the complex aspects that can influence different generational lecturers and the integration and use of technologies within the classroom environment. This highlighted another principle of qualitative research, which states that the researcher's main aim is to understand the complex nature of reality (Leedy & Ormrod, 2014).

According to McNabb (2015), qualitative studies are flexible and may go through changes while data is being collected and studied. Leedy and Ormrod (2014)

advise researchers conducting qualitative research to keep an open mind, and to be willing to embrace the possible changes as they may lead to better study than previously anticipated. The researcher in this study experienced some flexibility of qualitative inquiry while collecting data. The intended participating population was previously 36 lecturers, however, due to the changes that occurred during data collection, the number had to be reduced to 34. Another important change was that one of the institutions was going through a student protest during the data collection period, and therefore there was a need for the use of technologies because physical access into campus was impossible. This change had an impact on the data, as was expressed by some of the lecturers who participated in this study.

Once the methodological choice, such as qualitative research, is chosen for a study, the strategy of inquiry can be established. Qualitative studies are associated with several strategies, which are, in turn, related to each other based on their ontology and epistemological foundation but differ in their emphasis, scope, and procedures (Saunders et al., 2012). Qualitative research has mainly been associated with action research, case study, ethnography, grounded theory and narrative research (Saunders et al., 2012; Myers, 1997). These approaches are commonly associated with qualitative research inquiry. However, Creswell (2013) points out that the possible choices are more in number than mentioned in the previous text and are classified differently, by different authors, often across various disciplines.

In IS research studies the prominently used strategy is qualitative case study research, and this is because of the nature of the discipline and how it mostly focuses on IS and organisations (Myers, 1997). The case study strategy was selected in this study based on this reason and several others discussed in the following text. Firstly, the case study research strategy is mostly followed in IS literature, and therefore, it enabled the researcher to refer and be guided by the available published works. Secondly, choosing the case study approach was because the researcher had a personal interest in understanding phenomena within its real-life setup as well as the interpretations that participants give to their experience. Furthermore, case study research was chosen because of its

relevance and appropriateness to the investigation in this study. It is relevant because it affords the researcher the ability to conduct a case within the confines of its settings. It is under the premise of the mentioned reasons for this study, a case study research strategy was followed. The case study research strategy is explored in the following section.

### 3.2.5 Case study research

So what exactly does a case study research strategy entail? It is referred to as a research methodology, research strategy, or an inquiry that may be carried out in qualitative research as an entity of investigation or an outcome of such an investigation (Creswell, 2013). It is an action taken to achieve a goal; in this case, the goal is to answer the research question (Saunders et al., 2012), and the action is to make contextual meanings out of the formulated research questions (Myers, 1997). Case study inquiry seeks to understand the background which the research is based on and the investigation is carried out within the setting where there is an interest to understand a particular phenomenon (Myers, 1997; Saunders et al., 2012, Walsham, 1995).

The philosophical stance of the research determines whether the case study is interpretive, positivist, or critical (Myers, 1997). Positivist case studies in business studies were the predominant method in the previous years, however, interpretive case studies have now become regular (Myers, 2013). If the case is interpretive and the research study is correctly executed, it can make an invaluable contribution to research in the IS field (Walsham, 1995).

Case studies in positivist research are meant to test hypotheses and are mostly concerned with validation and reliability (Myers, 2013). Alternatively, interpretive case studies rely on meanings that participants give about reality and often do not rely on validity and reliability, but the quality is determined by how credible the story is as well how the study has been generally presented (Myers, 2013).

Case study inquiry explores a particular setting or settings in detail (Cresswell, 2013), in order to understand the conditions in that setting, especially those experienced by the participants (Strydom & Bezuidenhout, 2014). This is done in a particular time frame, which is characterised by a detailed data collection

strategy (Fouche & Schurink, 2011). The role of the researcher in a case study inquiry is to have background evidence from reviewed literature, to have access to the intended location of investigation, as well as to gain some trust from the intended participants (Fouche & Schurink, 2011).

According to features discussed in Creswell (2013), a study has to have the following characteristics in order to qualify as a case study:

- The case needs to be identified and must be distinguishable within certain confines. In this study, a group comprising lecturers in higher education institutions was identified. This group comprises of lecturers of differing age groups, from three different higher learning institutions. As such, this is a holistic single case study strategy, with embedded units. Three differently located higher learning institutions represented the units. This type of case study allows a researcher to make an investigation of one problem but represented by several units (Baxter & Jack, 2008).
- The case study can be instrumental in understanding the influence of generations in the integration of technologies for teaching and learning. In this case study, the issue was how generational identities of different lecturers influence the integration of technologies for teaching and learning.
- An in-depth understanding was accomplished in this study by the use of qualitative data in the form of interviews conducted with the lecturers as well as in the form of strategic documents of the respective institutions. The technique used for data collection was semi-structured interviews, which were conducted with thirty-four (34) lecturers of different age groups or generations. A generation in this study is a cohort of people grouped into age categories. The categories were informed by the generational groupings often highlighted in literature studies. The lecturers belonged to different faculties and departments.
- Data analysis for this study was approached in such a way that a report of transcripts compiled as a whole and not separated in units was used.

- A description of the three units is covered in chapter 4 (data analysis). Themes were identified, and a discussion of findings is covered in chapter 5.
- The themes discussion leads to the presentation of a conceptual framework in chapter 5, which is the theoretical model for this study. A case study research can be linked to theory in several ways, one of which would be the development of a framework (Oates, 2006). In this study, the case study led to the development of the GTI framework.
- The study concludes the meanings made by the participants, and this is covered in chapter 6.

The defining features of a case study research according to Myers (2013) are the following:

- The study should be interesting and present some stimulation to the researcher and the intended readers.
- There should be sufficient evidence provided to show what the participants said during the interviews, and this can be presented in the form of quoted text.
- The theory underpinning for the study should be complete and be able to cover the principles that guide such a theory.
- The study should be able to indicate differences in some of the views from the subjects in the study.
- The study should have the ability to be enjoyable and engaging to the reader.
- The study should make a relevant scientific contribution to knowledge.

Case study research is a predominant method used in several social science studies including studies in education (Yin, 2014). Yin (2014) highlights that the field of the study it does not matter, but that the deciding factor to use case study

research stems from the objective of trying to understand complex phenomena in the social world.

The case study strategy discussion leads to the time-horizon layer of the research onion. This research study followed a cross-sectional approach. Cross-sectional research studies are undertaken at a particular point in time or are a “snap-shot” study undertaken within a constrained period (Saunders et al., 2012). A cross-sectional study is characterised by making a comparison of a sample of people from different age-groups (Leedy & Ormrod, 2014). Cross-sectional studies differ from longitudinal studies because the latter is undertaken over a long period (Saunders et al., 2012). According to the study by Orlikowski and Baroudi (1991), cross-sectional studies emerged as dominant research in IS studies. Due to time restrictions allocated for academic studies, most research studies can be cross-sectional, however, those that are not restricted for time may follow a longitudinal route (Saunders et al., 2012). This study had time allocation restrictions, hence why the cross-sectional approach was the appropriate one.

Once the time horizon of the study is established, the next layer is the discussion of the techniques and procedures undertaken for the study. The next section outlines the discussion of the data collection and data analysis, which are grouped under the research methods topic.

## 3.3 RESEARCH METHODS

This section discusses the methods that were used to carry out the research study. It outlines the techniques undertaken to carry out the research design discussed in the previous section. The next section looks at the target population, and the following section discusses data collection and data analysis.

### 3.3.1 Target Population

The selection of the sample population is based on the purpose of the study that aims to investigate the influence of generational differences and the successful integration of technologies in education by different lecturers.

The participating population of this study is 34 lecturers who are categorised into age groups. The categories are three broad groups of lecturers who are ages 20 to 35 years old, with the second category of ages of 35 to 50, and the last category of those who are 50 years and above. The categories are based on the age groups that are predominantly available in the workplace (Nakai, 2015). These age groupings were modified to accommodate the different age categorisations defined in literature such as the baby boomers who are currently age 51 years old and above, the generation Xs who are 36 to approximately 50 years old and the generation Ys who are between the ages of 20 to 35 years old (Bencsik et al., 2016; Duh & Struwig, 2015; Hoole & Bonnema, 2015). These age categories are slightly varied across the different studies and can sometimes be grouped based on their location (Nakai, 2015).

The 34 participating lecturers' academic ranks are as follows:

- Institution A1 (public university in country A)
    - 1 professor
    - 2 associate professors
    - 3 senior lecturers
    - 4 lecturers
    - 1 assistant lecturer
- Institution B1 (public university in country B)
    - 3 senior lecturers
    - 8 lecturers
- Institution A2 (private higher institution in country A)
    - 1 acting dean
    - 2 head of programmes
    - 9 lecturers

It is important to note that all the participants in this study are referred to as lecturer and not according to the above indicated academic ranks. Lecturer, teacher, and educator have been used interchangeably in this study. It is also important to indicate that at the time of data collection, the private higher

institution did not have any academic ranks except for the dean, deputy dean, head of programme and lecturer positions for all the academic staff.

### 3.3.2 Sampling

Qualitative research studies use sampling strategies, but they are not as clearly defined as in quantitative research studies (Strydom & Delport, 2011), and sample sizes often depend on what is being investigated and develop along the way (Creswell, 2013).

In this study, the drawn samples are from the departments/faculties of education, economic and management sciences/commerce and law, humanities, natural and agricultural sciences/agriculture/applied sciences/science, and technology. The study used three faculties from each institution to be representative of different educational disciplines.

Samples were chosen from the identified departments or faculties of education, economic and management sciences/commerce and law, humanities, natural and agricultural sciences/agriculture/applied sciences/science and technology, and age were purposively selected. Four participants were selected from each faculty. However, due to unforeseen circumstances, not all the faculties were represented by four, some had three participants. The age selection categorisation was used to select participants.

The heads of the department identified initial participants and in turn, they assisted the researcher in identifying other potential participants for the study. An electronic mail (e-mail) detailing the purpose of the study was sent out to possible participants where necessary. Using participants who were prepared to help with the study made it easy and possible to carry out the study successfully.

A total of 34 lecturers made up the sample size for this study. Eleven of these participants were from the public institution based in country A. The intention was to interview a total of 12, but due to last-minute cancellation by one of the lecturers, and time constraints, the study used only 11. These lecturers belonged to the faculties of education (4 participants), economic and management sciences (4 participants), and the faculty of natural and agricultural sciences had

3 participants. A total of 12 lecturers were interviewed from the private higher institution based in country A. These lecturers belonged to the faculties of applied sciences (4 lecturers), humanities (4 lecturers), and commerce and law faculty with 4 participants. The last institution located in country B had 11 participants instead of the 12 proposed and contacted. Cancellation by one of the lecturers from the faculty of education brought the institution's total to 11 participants. Four participants each from the faculties of agriculture and the faculty of science and technology, were interviewed. The participants were carefully selected so that they covered and represented the age categorisation sampling discussed in the previous text. Out of the 34 interviewed, only one participant decided to withhold her age.

## 3.4 DATA COLLECTION

In-depth semi-structured interviews were conducted with the identified lecturers for the study, and strategic plans of the institutions were downloaded from the respective institutions' websites.

### 3.4.1 Interviews

The primary source of data for this study was a collection of semi-structured interviews. Interviews are important data gathering techniques in qualitative case studies. According to (Myers, 2013), interviews are compulsory for case study research. Interviews enable the researcher to collect rich, insightful data that can be comprehensive enough to indicate the participants' "experiences or behaviours, opinions or values, feelings and factual knowledge" (Esterberg, 2002:45).

Semi-structured interviews require the researcher to have pre-compiled theme-based questions that can be used as a guideline to follow during the interview process. These compiled questions are used only as a guide to allow for additional questions or any other issues that may develop during the interview process (Oates, 2006; Myers, 2013; Creswell, 2013).

The prior themes/clustering which were used to divide up the interview questions for this study include ***technology integration into the classrooms, perception***

***of educational technology and the education sector as a network.*** The outline of the interview questions has been attached in appendix A.

The time allocation of semi-structured interviews varies based on how the conversation with the participants flows. According to Myers (2013), interviews should not be restricted to a particular amount of time as the interview process can see issues emerging during the process. The interview sessions for this study ranged from around 20 minutes for the shortest interview, to around 40 minutes for the longest interview.

The process of conducting the interviews started as soon as the study was cleared by the ethics committee, as per the institution's research ethics requirements. The ethical clearance was obtained from the institution where the researcher is registered as a doctoral candidate. Once the clearance was obtained, the researcher made contact with the data collection locations. These institutions also required the researcher to apply and get approval to conduct the research study. The approvals were attained and are attached in appendix B.

Once the approvals were obtained, the researcher made contact with the heads of the department for assistance in identifying the potential participants of the study. The researcher was an employee of the private higher institution in country A at the time of data collection and hence was familiar with some of the intended participants of the study. At this institution, once ethical clearance to conduct the study was approved, the researcher contacted the participants by going and meeting them personally to explain the intention to use them as participants in the study.

The head of the programme in the humanities faculty was approached and asked to participate in the study. Because of his administrative role in the faculty, he was able to assist the researcher by identifying the possible participants for the study. Also, because of his role within the faculty, he was familiar with their ages, which was a significant factor for this study. Once these participants were established and identified, the researcher went to them personally to indicate the intention and to request their permission to be participants of the study. The same process occurred at the faculty of commerce and law, where the acting

dean at the time took part in this study and also suggested possible participants for the study. This made it easy to find participants and invite them to take part in the study. The third faculty of applied sciences was the one which the researcher worked in, and it was therefore easy for her to find suitable participants due to being familiar with them.

Once the participants had been approached and a suitable date and time were agreed upon by both the researcher and the participant, the interviews commenced. All of the interviews, except two were conducted in the offices of the participants. The other two were conducted in the researcher's own office. Before the interview commenced, all the participants were asked to read, understand and agree with the details of "*the letter of introduction and consent*" (see appendix B), then sign it. The researcher would then briefly outline how the interview would commence, such as that notes will be taken during the interview, as well as that the interview session will be recorded if the participants felt comfortable and agreed to it.

The interview sessions would then continue with introductory questions being asked; however, additional questions would be asked where there was a need for more clarity or a further explanation required. Most of the participants were free to talk and were able to express themselves during the interviews, and they all seemed comfortable, probably because the interviews were conducted in their offices. Only one of the participants at this site seemed a bit uneasy. This could have been because she was the head of the programme and had very limited time, and therefore she seemed hurried and answered questions very quickly as if she wanted to get the interview over with. Despite this, the researcher could still find valuable insight from her interview.

The interviews at this site were conducted in November 2016. There were no special time schedules set aside to conduct the interviews at this site because it was during the academic year, and classes were still in progress. The researcher had to conduct the interviews during lunch breaks and often between class times with some of the participants.

Before the process of the interviews taking place at this site, interviews had already been conducted at the site in country B. Once the clearance (attached in appendix B) by the institution was issued, the interviews were conducted. The same process as indicated in the previous section was followed. All interviews were conducted in the participant's offices during a time that was arranged and agreed upon by the researcher and the participants. Four participants from the science and technology faculty took part in the study. One of the participants in this faculty requested not to be recorded. He indicated that he was not comfortable with being recorded; therefore only notes were taken during the interview. One other participant indicated he did not have enough time to sit down and conduct the interview, and therefore requested that the copy of questions be sent to him so that he could answer them at a suitable time. He did answer the questions and e-mailed them back with the answers to the researcher after a week. Due to time constraints, the researcher felt she could not find alternative participants and therefore accepted the mailed response.

At this same institution, after an arranged meeting with the head of the department to identify potential participants, 3 participants from the faculty of education were interviewed. The fourth participant cancelled the interview at the last minute due to an illness, and once again because of the time constraint and the fact that the researcher had travelled to country B for only a limited time, the researcher made the discretion that the three interviews would be appropriate. The same procedure was followed with these participants, and they all agreed to be recorded. One of the participants, decided she was not comfortable disclosing her age. Despite the participant's non-disclosure of age, the researcher made an assessment that the participant is probably in the middle-ages group. Furthermore, after an assessment of her responses to the questions, the researcher decided that her input was valuable and made the decision to include this feedback it in the study, despite her not disclosing her age. The interviews at this location were conducted in September 2016 during the researcher's semester break at her workplace.

In October and November 2016, the interviews were conducted at the third institution located in country A. The ethical clearance for this institution had been

received and issued in August 2016 together with approval to carry out the study. The institution was faced with student protests, and therefore, access to campus was restricted, which made it a challenge to have easy access onto the campus to conduct the interviews. All the participants had to write a letter to campus security management requesting permission for the researcher to have access to the campus. Permission was always awarded, but sometimes a postponed appointment with any one of the participants meant that the participant had to re-apply for the researcher to have access to campus. However, despite all of these, 11 interviews were conducted with 4 participants from the economic and management sciences, four from education, and three from the natural and agricultural sciences faculties. One participant cancelled due to time constraints, and because of the challenges of access onto campus at the time, the researcher decided to use the 11 interviews instead of 12. The same process of issuing the consent letter to the participant to sign, using guiding questions for the interview, and recording the sessions was followed at this institution as well. There were no incidences at this site, except restricted access onto campus.

In general, all the interviews ran smoothly, and the researcher gained much experience interacting with participants of different ages, differing educational backgrounds, work experience, as well as diverse social background. Myers (2013:129) likens the interview process to a “drama”, which is set on a “stage”, with “actors” and an “audience”, who go through a “script” in order to “perform” by entering and exiting the stage.

### 3.4.2 Documents

Strategic plan documents placed on the institutions’ websites were downloaded and used as secondary data. The documents assume the role of non-human actors within the education network. According to Myers (2013), documents can be used to enforce some actions, which in this case were represented by the strategic plan documents of the institutions. The establishment of data collection strategies leads to the next part, which looks at how data analysis was carried out.

## 3.5 DATA ANALYSIS

Data analysis is an approach that can be customised for any research study, and there is a thin line between the collection of data and its analysis in qualitative studies (Olivier, 2004; Myers, 2013). For this research study, a computer-aided qualitative data analysis software (CAQDAS) called Leximancer was used to run the analysis on the transcribed interviews.

The analysis started simultaneously with the interviews. This is because, after each interview or closely timed set of interviews, all the notes and the recording were listened to and transcribed using Microsoft Word. The interviews were listened to and compared to the notes and then transcribed. Each interview took around 3 hours to be completely transcribed into text. The transcribed interviews were arranged into folders and saved on to the computer according to the institution, then onto a folder per faculty to allow for easy retrieval later.

Transcribing the interviews required a quiet environment, where the audio recording could be listened to without any noise or interruptions. The researcher would listen to all the audio recordings after the interview session, or at the end of the day of the interview/s. After listening to all the interviews, the researcher would then embark on the process of transcribing. The field notes taken during the interviews would be scanned through to get the feel of the textual content of the interviews. The interviews would then be listened to with constant pausing and rewinding of the audio recording device (Samsung note tablet 3). Due to time constraints and illness of the researcher at some point during the interview processes, the researcher gave 10 of the interviews to a family member to transcribe for her. The researcher then went through the transcriptions to re-check the work and to make corrections where necessary. This assisted the researcher in finishing all the transcriptions in time.

Once the transcriptions were completed, the data was loaded onto the Leximancer 4.0 tool to generate themes and concepts. The analysis was fed onto the tool separated by the cluster sections, and the results were therefore per cluster and not per the entire document. Using Leximancer only lasted for a few

hours, and this was done in three days. A detailed discussion of how the analysis was carried out is dealt with in chapter 4 of the data analysis.

## 3.6 VALIDITY AND RELIABILITY

Both quantitative and qualitative studies need to prove their credibility (Golafshani, 2003). Quantitative studies prove this by using instruments, whereas qualitative studies mostly rely on the researcher to be able to put effort into the credibility of the study (Golafshani, 2003). Qualitative studies commonly rely on "credibility, neutrality, consistency and applicability" rather than just the notion of validity and reliability which are more applicable to quantitative studies (Golafshani, 2003:601).

Golafshani (2003) suggests that in order to achieve credibility in qualitative studies, the generalisation of the research results can lead to the trustworthiness of the study. He also suggests that the outcome of the cases selected for the study will impact generalisation. Triangulation also makes a big contribution to testing the reliability and validity of qualitative studies (Long & Johnson, 2000; Leedy & Ormrod, 2014).

This study collected data from multiple sources at the three different institutions in the two Southern African countries. The institutions' strategic plan documents were also collected and used to address the concept of triangulation in the study.

To further address the issues of validity, as suggested in Leedy and Ormrod (2014), the researcher got feedback from reviewers on interpretations and conclusions drawn from the study. The study and the proposed framework were validated using reviews from three faculty members in the IS department, where the researcher is currently enrolled as a doctoral candidate. These reviewers were individually invited to have a discussion of the findings and the framework on the basis that they are experts in the academic field of IS. Their reviews and feedback are covered in detail in chapter 5 of this study.

## 3.7 ETHICS

Consideration of ethics in research is important especially when it involves people as participants in the study as well as to maintain the reputation of the

concerned learning institution (Myers, 2013). Ethics in research entails how the study is conducted with consideration of morals and responsibility (Blumberg et al., 2005).

Myers (2013:45) outlines some aspects of “honesty, plagiarism and informed consent” about ethics in research. Honesty measures were enforced by a researcher to make sure that the research study is credible. The University of Pretoria, the institution where the candidate is enrolled for the doctoral study, enforces very strict measures on plagiarism, and this research study has tried to adhere to the policy on plagiarism.

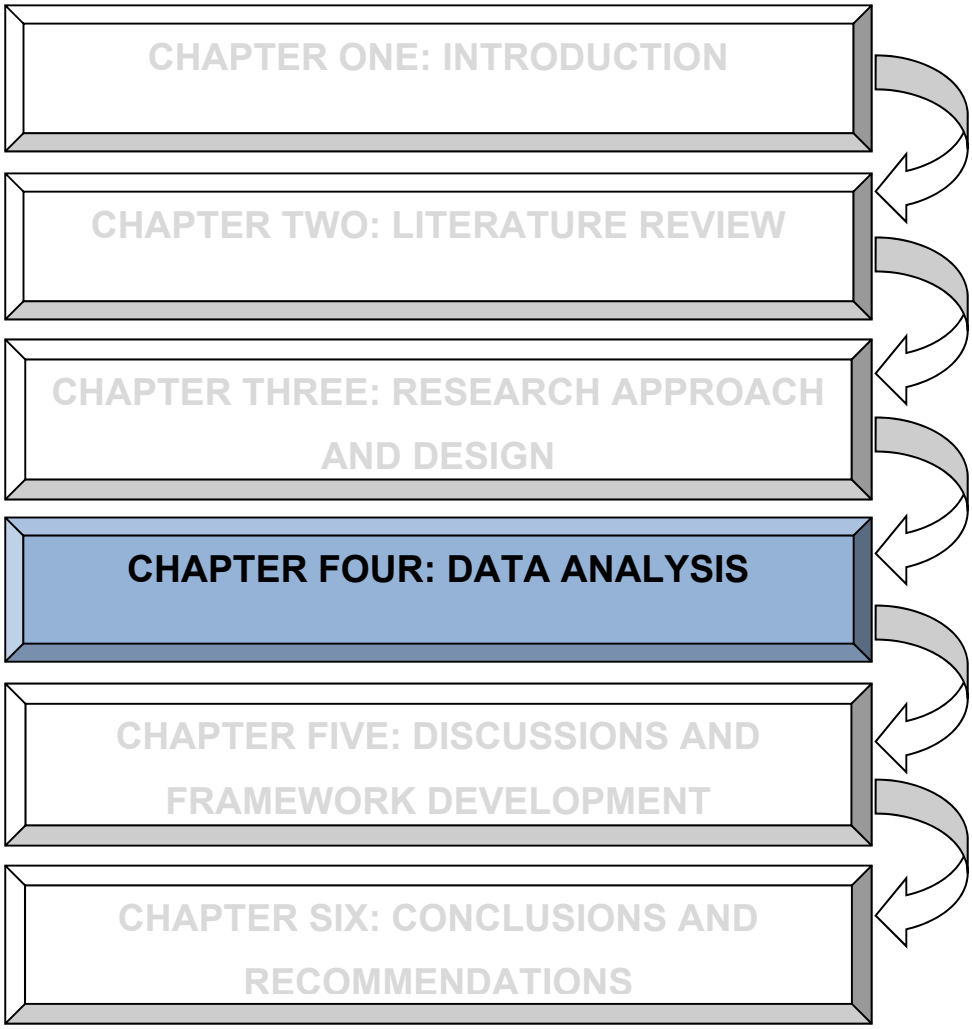
The participants were not forced to take any part in this study. The participants were informed of the intent and benefits of the study, and a consent letter (attached in appendix B) was given to the participants for signing, and this was an undertaking by the researcher to maintain credibility with the participant. The interviews were conducted on time schedules that were suitable for the individual participants of the study. All recordings and notes were taken with the informed consent of the individual interviewees, and their right to privacy, confidentiality, and anonymity were carefully considered where required by the participant. The researcher applied for ethical clearances from all three institutions.

## 3.8 CONCLUDING SUMMARY

This chapter details how the study was carried out. The chapter is meant to give the reader the ability to understand how conclusions were drawn for the study. Table 3.2 below summaries the method and the research design undertaken in this study based on the research onion.

| RESEARCH DESIGN ASPECT | EXAMPLE |
|---|---|
| Philosophy | Interpretive |
| Research Approach | Inductive |
| Methodological Choice | Multiple methods, Multimethod qualitative |
| Research Strategy | Case Study |
| Time Horizon | Cross-Sectional |
| Data Collection | Interviews and Documents |
| Data Analysis | CAQDAS (Computer-Aided qualitative data analysis software. Leximancer 4.0 tool. |

Table 3.2 Summary of the methodology


CHAPTER ONE: INTRODUCTION
CHAPTER TWO: LITERATURE REVIEW
CHAPTER THREE: RESEARCH APPROACH AND DESIGN
CHAPTER FOUR: DATA ANALYSIS
CHAPTER FIVE: DISCUSSIONS AND FRAMEWORK DEVELOPMENT
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

# 4 DATA ANALYSIS

## 4.1 INTRODUCTION

This chapter discusses the qualitative data analysis for this study. The data was analysed using Leximancer, version 4.0. The discussion on the results seeks to address the main research question and the sub-questions. The main research question seeks to determine:

*"What is the influence of the generational identity elements on a lecturer's ability to successfully integrate technology into the higher learning education?"*

The following is a list of the sub-questions which were outlined in chapter one:

- *Why do lecturers integrate technology differently?*
- *What individual preferences cause differences in integrating technology into the classroom?*
- *What are other factors responsible for technology acceptance in the education environment?*
- *What are the differences in perception and use of technological advances by lecturers of different generations across the different faculties or departments?*
- *How can Actor-Network Theory (ANT) explain the generational identities and technology integration in education?*

There are several approaches to qualitative data analysis due to the diverse nature of the strategy (Coffey & Atkinson, 1996), and it is possible that it can take on any form depending on the focus and the aims of the research study (Lewis, 2007). It is with this background that the analysis of this work concentrates on the concepts and themes generated by the Leximancer tool. The concepts and themes generated by the analysis tool are discussed, which are, in turn, related to the focus areas of the questions asked during the data collection phase, as well as being discussed according to the moments of translation of Actor-Network Theory (ANT).

## 4.2 BACKGROUND OF THE HIGHER LEARNING INSTITUTIONS

The following is a background of the higher learning institutions where data was collected. Two Southern Africa countries where data was collected are referred to as countries A and B as a way of enforcing anonymity. The three institutions are labelled A1 (in country A), B1 (in country B) and A2 (in country A) in no particular order, to avoid using their real names as a way of protecting their identities. The discussion gives a summary of each institution and outlines the respective participating lecturers.

The participants' demographic information is included as part of the discussion of each institution in order to link them to the respective establishment. The demographic information includes the participants' age, which is an important component of this study. It is important to note that when the analysis was undertaken, the transcripts were not separated according to the particular institution but were grouped according to four sections that separated the interview questions. Each section had a compilation of the transcripts from all the 34 interviewees, and each particular section would be uploaded for analysis (this process is discussed in more detail later in the text). The purpose of this process was to avoid an impression that this is a comparative study.

### 4.2.1 Institution A1

Institution A1 is based in country A, a Southern Africa country. It has several campuses; data for this research study was collected from only two campuses that of education and the main campus. The institution has nine faculties, namely Economic and Management Sciences; Education; Engineering, Built Environment, and Information Technology; Health Sciences; Humanities; Law; Natural and Agricultural Sciences; Theology; Veterinary Sciences and a business science school. Data was collected from the Economic and Management Sciences, Natural and Agricultural Sciences and Education faculties.

The profiles of the participants are outlined in Table 4.1 below. The table shows the faculty they belong to, their ages, highest academic qualification, and the number of years they have been involved in the teaching profession. Eleven

interviews instead of twelve were conducted due to one of the lecturers cancelling their appointment.

| Faculty/Department | Age | Gender | Highest Academic Qualification | Number of years as a lecturer/instructor |
|---|---|---|---|---|
| Natural and Agricultural Sciences | 48 | Male | PhD Zoology | 12 years |
| | 59 | Male | PhD Agriculture | 14 years |
| | 51 | Female | PhD Genetics | 22 years |
| Economic and Management Sciences | 60 | Female | PhD | 36 years |
| | 24 | Female | Masters | Two years |
| | 33 | Female | PhD Informatics | Seven years |
| | 43 | Female | PhD | Four years |
| Education | 28 | Female | Master of Arts | Three years |
| | 44 | Male | Doctorate | 13 years |
| | 46 | Female | Master of Arts | 23 years |
| | 60 | Female | PhD | 18 years |

Table 4.1 Profiles of participants at Institute A1, in country A

### 4.2.2 Institution B1

Institution B1 is located at one of the villages in the capital town of country B. It is the only public university in the country, whose history has its origins from as far back as 1945. The university has seven faculties, namely Agriculture, Education; Health Sciences, Humanities; Law, Science and Technology, and Social Sciences. Data for the study was collected from the faculties of Agriculture, Education and Science and Technology.

The study proposed to collect data through the use of interviews from twelve lecturers. However, only eleven were collected due to the last-minute cancellation of one of the participants due to an illness. Due to time constraints, the researcher decided that eleven interviews from this institution would constitute enough data. Table 4.2 below outlines the profiles of the participants from this university.

| Faculty/Department | Age | Gender | Highest Academic Qualification | Number of years as a lecturer/instructor |
|---|---|---|---|---|
| Agriculture | 59 | Male | PhD Agricultural Agronomy | 37 years |
| | 46 | Female | Masters in Consumer Science | 14 years |
| | 48 | Female | PhD Consumer Science | 19 years |
| | 33 | Male | Masters in Agriculture | Three years |
| Education | 39 | Female | Masters in Education | Ten years |
| | Not disclosed | Female | Masters in Education | Eight years |
| | 33 | Female | PhD Informatics | Seven years |
| | 56 | Male | MBA | 13 years |
| Science and Technology | 32 | Male | Masters in Engineering | Four years |
| | 47 | Male | PhD | Eight years |
| | 46 | Female | PhD Biotechnology | 15 years |
| | 46 | Male | Masters in Science | Three years |

Table 4.2 Profiles of participants at Institute B1, in country B

### 4.2.3 Institution A2

This is a private, higher learning tertiary institution, located in country A. During the collection of data, the institution was undergoing a name change, as well as the restructuring of the different faculties, and therefore ended up with four faculties, namely Commerce and Law; Humanities; Applied Sciences and the Foundation faculties. The initial proposal was to collect data from the former faculty of Information Technology, which was ultimately merged with the Science faculty to form the Applied Sciences faculty. The Law and the Commerce faculties were also combined to form the Law and Commerce faculty, as initially, the proposal was to collect data from the Commerce faculty. Therefore data was collected from the newly merged Law and Commerce faculty. The third faculty was Humanities, which had remained unchanged during the restructuring. The following table (Table 4.2) outlines the participants of the study from this institute. The next section outlines aspects of the computer-assisted qualitative data analysis software (CAQDAS) tool used to analyse data.

| Faculty/Department | Age | Gender | Highest Academic Qualification | Number of years as a lecturer/instructor |
|---|---|---|---|---|
| Applied Sciences | 44 | Male | Honours in Statistics | 12 years |
| | 67 | Female | PhD Physiology | 25 years |
| | 31 | Female | Masters in Information Systems and Technology | Nine years |
| | 24 | Male | Bachelor of Science in Computer Science | Two years |
| Commerce and Law | 44 | Female | MBA | 14 years |
| | 56 | Female | Masters of Philosophy | 19 years |
| | 45 | Male | Masters in Economics | Ten years |
| | 27 | Female | Human Resources Honours | Three years |
| Humanities | 31 | Female | Master of Arts | Four years |
| | 29 | Male | Bachelor of Arts Honours | Three years |
| | 26 | Female | Politics and International Relations Honours | Four years |
| | 49 | Male | Masters in Communications | Ten years |

Table 4.3 Profiles of participants at Institute A2, in country A

## 4.3 THE USE OF LEXIMANCER ANALYSIS TOOL TO ANALYSE DATA

The individual interview audio recordings (the interview questions are attached in appendix A) were all manually transcribed, and each captured onto a Microsoft Word document. The interview questions were compiled into four sections, namely, the *demographic information (Section A)*, *the integration of technology into the classroom (Section B*), the *perception of educational technology (Section C*), and *the education sector as a network (Section D).*

All transcribed responses were grouped according to the respective section. For example, all the responses for sections B, C, and D from all the 34 participants were merged into a single document so that all answers to the relevant sections were all contained within a separate document. This means that the result was

three separate documents associated with each section, with the fourth one being a compilation of all the different documents into a single file.

Leximancer software, version 4.0, was used as an analysis tool for the transcribed interviews. The tool has later versions, but the researcher was only able to access version 4.0., which is still an appropriate version to work with.

In the Leximancer main window, a new project was created, and under this project, several sub-projects were created depending on the intended analysis. An example sub-project would be “analysis section A” for the relevant section. In the project control window (Figure 4.1), the “Load Data” stage required that the document with transcripts be uploaded. Once the ready light goes on, the next stage would be to generate “Concept Seeds”. The settings were not adjusted in any of the stages. Once the ready light went off, the next stage would be the generation of the thesaurus. The last stage was to run the project, after which the concept map button would generate the different analysis maps, which showed concepts as well as themes relative to the particular uploaded document.

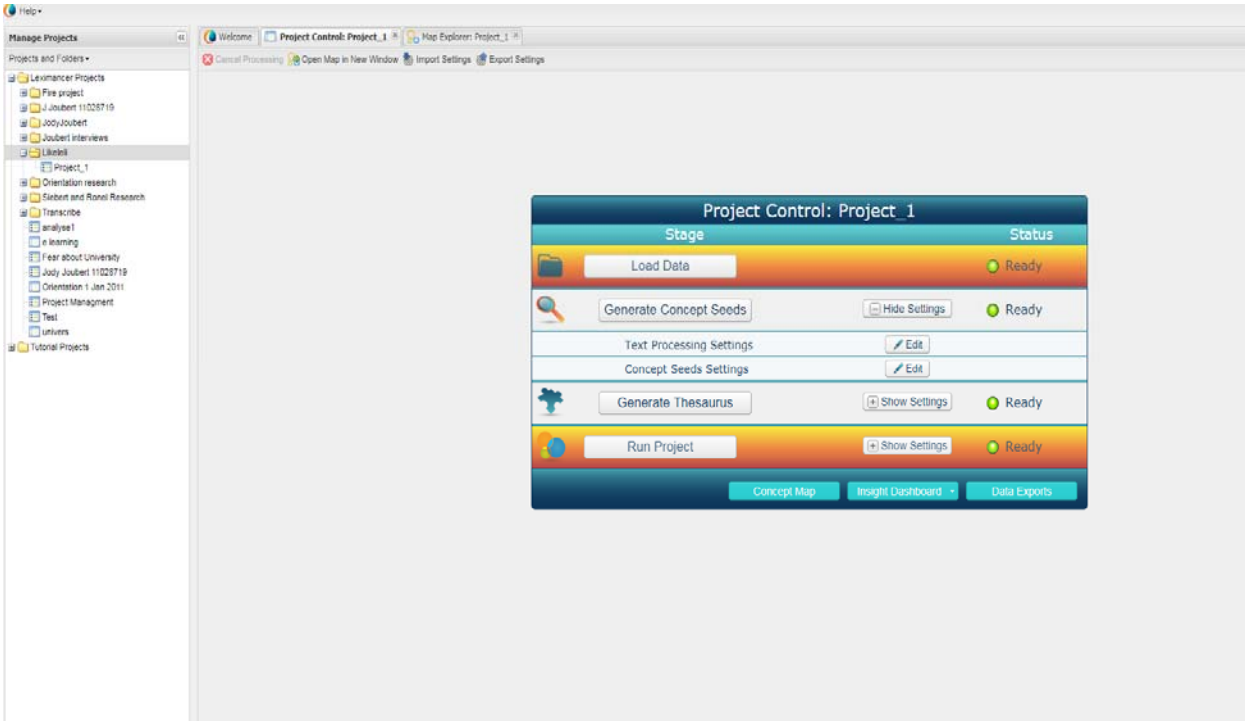



Figure 4.1 Leximancer Dashboard.

The resulting concept map, such as shown in Figure 4.2 below, would then be adjusted to display several options of the same analysis.

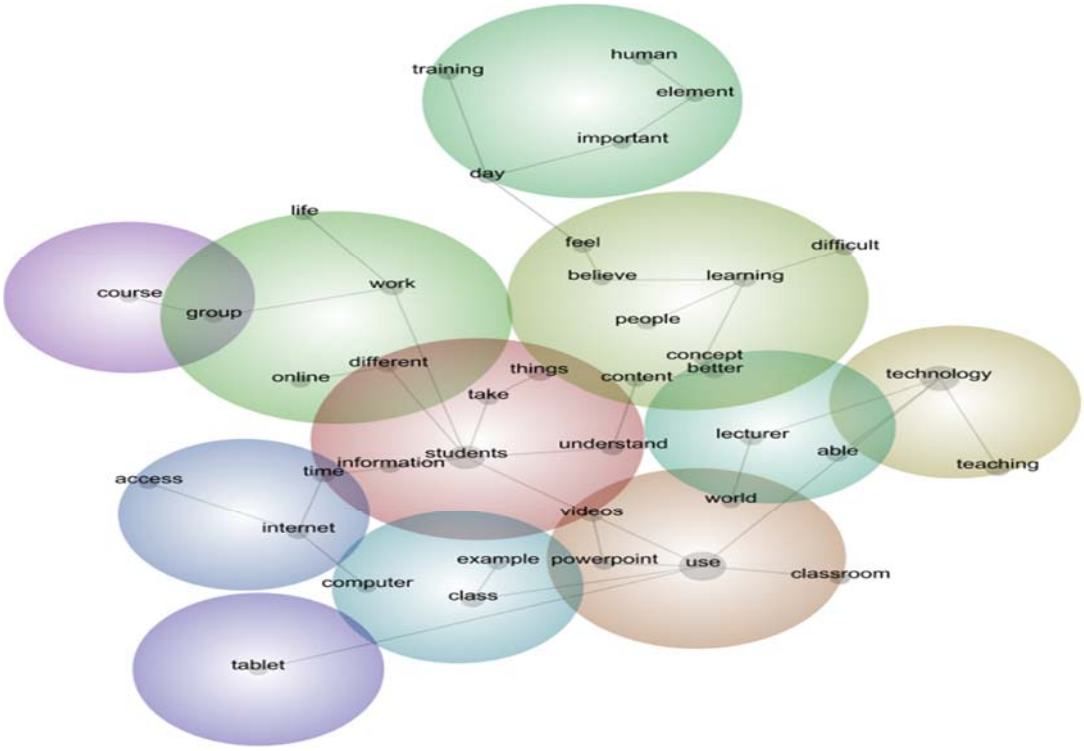



Figure 4.2 Sample Leximancer concept map. Source: Leximancer (2011)

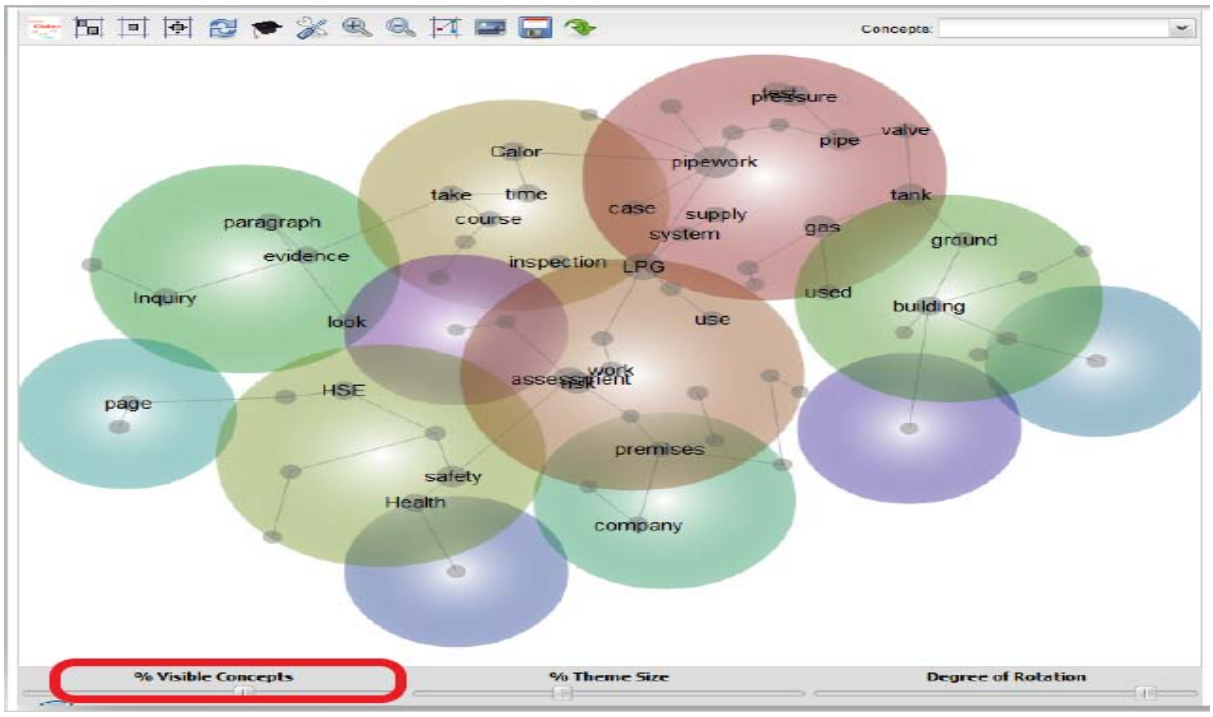



Figure 4.3 Sample concept map with map settings. Source: Leximancer (2011)

Adjusting the map on the visible concept slider, as shown circled in red in Figure 4.3, would show the concepts related to the document currently being analysed. The result of such an action would yield a concept map without any themes (the

bubbles show themes, and overlapping bubbles indicate the relationship between the themes), as shown in Figure 4.4 below.

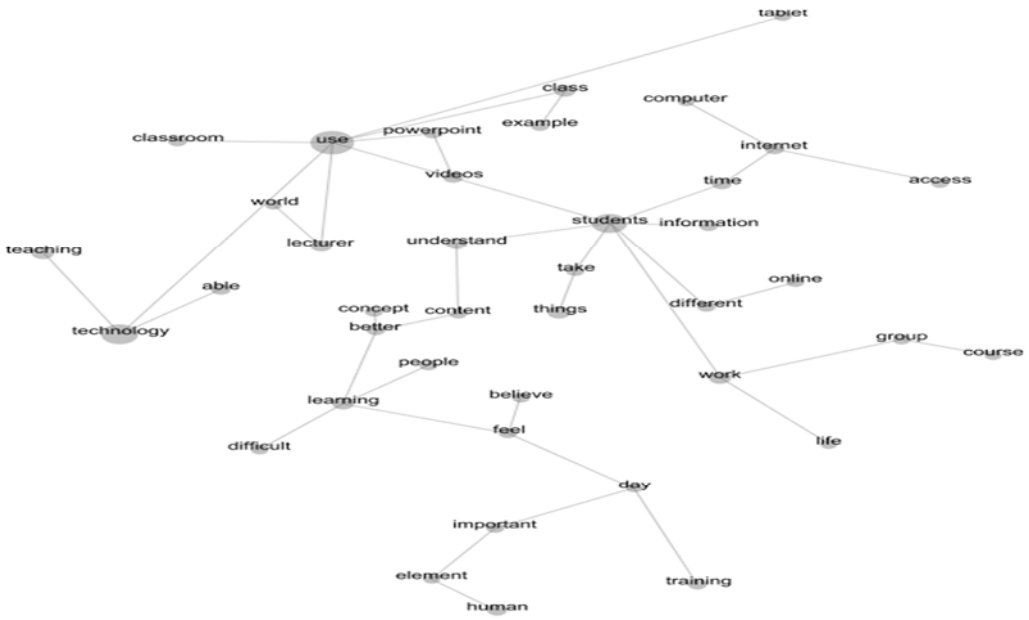



Figure 4.4 Sample concept map without theme groupings (bubbles)

## 4.4 RESULTS

The discussion here draws from the concept maps and themes generated from the analysis. As previously indicated, the questions on the interview guide were divided into four parts of section A, section B, C and D. Section A was excluded when the transcribed text was loaded into the Leximancer tool because it only captured the demographic information of the participants, which has been outlined and shown in section 4.2 above.

The interview questions were generated based on the sub-questions in such a way that each interview question aligned towards addressing one or more sub-questions, and the sub-questions, in turn, aligned towards the main research question. The results from the data analysis are linked to each of these sections.

The transcripts were first loaded onto Leximancer as a whole, which is a document that merged all the sections B, C, and D, and it produced the map shown in Figure 4.2. Concepts and themes were generated based on this data and therefore gave a feel of the overall results from the data. Subsequently, the

different sections were loaded as separate documents to give an outline of the results for each section. After several adjustments to the settings and working on the Leximancer tool, the concepts and themes were discovered and will be discussed in detail in the following text.

### 4.4.1 Concepts

The concepts are linked and related to one another by the connecting lines. It is important to note that the discussion and consideration of the concepts are based on the links that occur between the main concepts (which are shown by the size of the concept circle) and the directly connected sub-concepts. The other lesser important concepts are not discussed in this text, as the documents of Leximancer advise that these can be ignored, because they lack substance (Leximancer, 2011). The concepts which were generated from the data are as follows (the sub-concepts which are directly linked to these concepts are written in the brackets in front of each corresponding concept):

<u>The combined sections B, C and D</u>

**Students** *(understand, difficult, class, different, use)*, **use** *(teach, tablet, teaching, PowerPoint, videos, using, students),* **classroom** (take, technology), **technology** *(learning, believe, learn, used, feel, classroom),* **internet** *(things, access),* **training** *(important, people),* **work** *(questions)*, **able** *(student)*, **feel** *(people, technology)*, **learning**, **difficult**.

<u>Section B: Integrating Technology into the Classroom</u>

**Use** (*tablet, teaching, specialised, access, PowerPoint, student*), **technology** (*learning, educational, using, classroom*), **students** (*course, understand, online*), **internet** (*work, doing, able, information*), **things** (*real, people, course, lecturer*), **training** (*day, learn, people*), **time** (*Classroom, class, stuff*)

<u>Section C: The Perception of Educational Technology</u>

**Students** (*learn, content, information, module, teaching, learning, use),* **technology** *(things, used, difficult, classroom*), **use** (*teach, feel, using, things,*

*students*), **using** *(example, videos, use),* **content** *(understand, students),* **work** *(group, student),* **classroom** *(important, world, life, technology)*

Section D: The Education Sector as a Network

**Human** (*day, take, element, crucial, using*), **technology** (*factor, feel*), **students** (*people, work, class, tablet*),

The above information details the main concepts and their respective linking sub-concepts for the respective sections. As indicated, only the important concepts and their corresponding sub-concepts have been included in these lists.

The resulting concept maps show the concept and how such concepts intertwine with one another. The following figure shows a typical concept map, showing the connector lines that indicate the relationships and links between these concepts. Figure 4.5 shows the concept map which was generated from the combined data for all the sections B, C and D. The data was combined and analysed as a collective here to try and get the overview feel and a bird's eye view of the combined data.

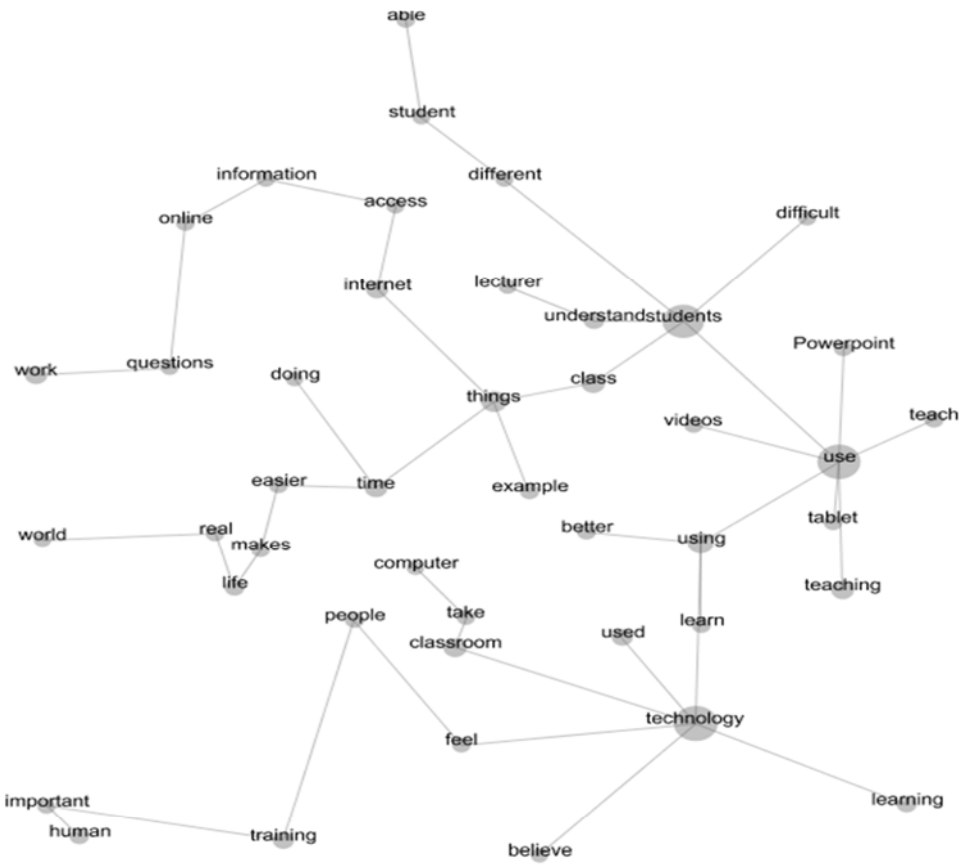



Figure 4.5 Concept map for all data combined

To generate this type of map, the scroll bar on the theme sizes was set to zero (0%). This, according to Leximancer (2011), allows one to have a clear view of the concepts within the theme bubbles. According to the ranking list produced for the concepts, the main concepts, which are also the important ones from the data, are identifiable by the size of the circle. The bigger the circle, the more important the concept becomes (Leximancer, 2011). The biggest circle indicates what is most important to the participants who were interviewed.

It is also important to note the concepts that have a link or a connection and are located close to the most important concept. According to Leximancer (2011), these concepts are regularly mentioned together with the important concept. From the map in Figure 4.5, it is evident that the three most important concepts are *“technology”, “students”* and *“use”.*

### 4.4.2 Themes

Figure 4.6 shows sample emergent themes for section B data, with their corresponding concepts. The themes are represented by the colour bubbles/circle on the map (Leximancer, 2011). The bubbles indicate the relationship between the concepts and their corresponding themes. All the related concepts fall within the same theme bubble. The themes' importance is indicated by the colour of the bubbles, and not the size of the bubble. The size of the bubble simply shows the overall relating concepts that make-up or fall under that particular theme. The red colour shows the most important or the most relevant emergent theme from the data. The themes are generated according to the "colour wheel" (Leximancer, 2011). The redder colours indicate importance, while the bluer colours indicate the less important themes.

According to Figure 4.7, the important themes are *"use", "technology", "internet"* and *"things".* This can also be verified by Figure 4.6 below, which is a graphical representation of the themes and their connectivity percentage scores. The colour codes of the bubbles are also an indicator of the importance of the themes. A closer look at the map and the results according to the thematic summary shown in Figure 4.6 specify "*used*" is an important emergent theme. However, use and used mean the same thing and therefore refer to the same principle, which is why used is not indicated as an important theme here.

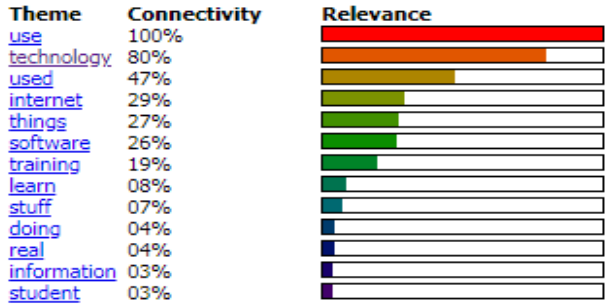



Figure 4.6 Thematic summary for section B data

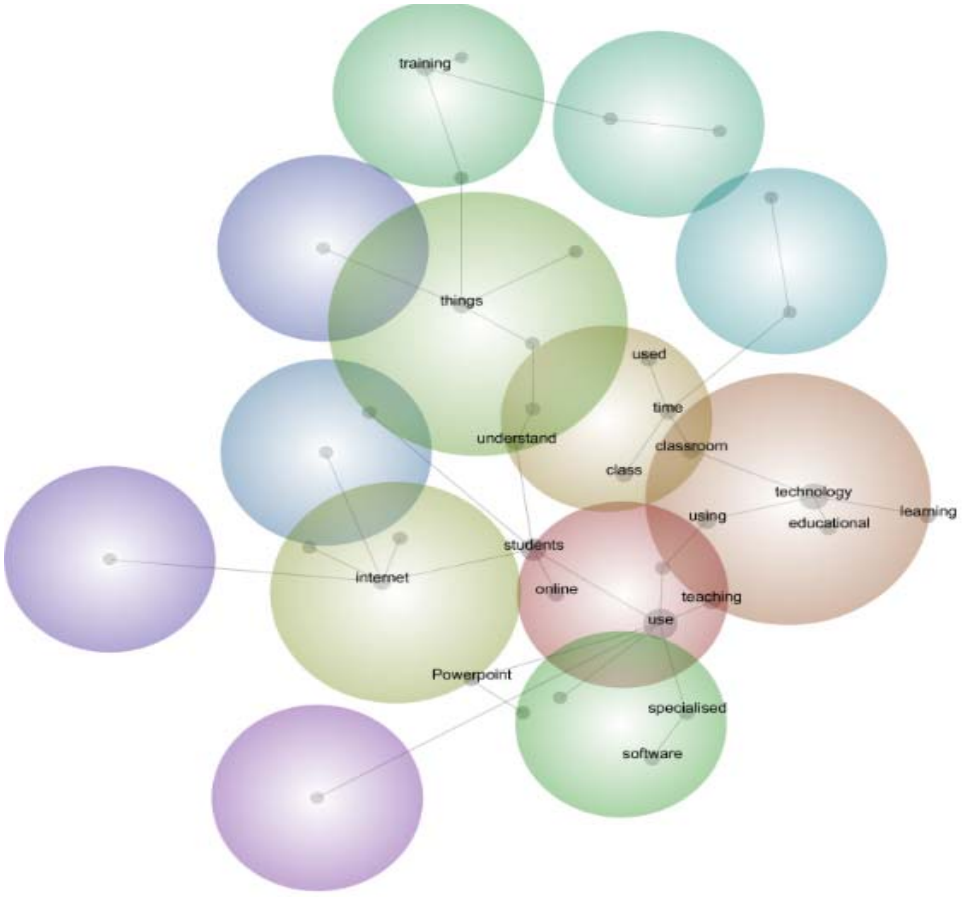



Figure 4.7 Concept map for section B data

The information outlined in this sub-section is a sample illustration of how themes are generated and displayed by the Leximancer tool. The following sub-sections discuss in detail the links between the concepts and themes generated for the respective sections B, C and D.

### 4.4.3 Linking the concepts and themes to the focus areas

The questions of the interviews when data was being collected were grouped into the four sections of ***demographic information, integrating technology into the classroom, the perception of educational technology and the education sector as a network***. These are the priori clustering, based on the research questions for each section (Miles & Huberman, 1994). The following discussion looks at each section and aligns the outcomes of the analysis to each one of them. According to Punch (2005), it is imperative to link the data analysis outcomes to the research questions, which is what this section aims to do.

#### 4.4.3.1 Integrating Technology into the Classroom

The aspects that would motivate an individual lecturer to integrate educational technologies into their classrooms for teaching and learning are under review here. The questions which were asked in this section were based on the following research sub-questions:

- *Why do lecturers integrate technology differently?*
- *What individual preferences can cause differences in integrating technology into the classroom?*

The first two questions that were asked in this section had a list of five possible answers, and the participants had to choose the only one that best represented them per question. Table 4.4 outlines the answers to these questions. The answers have been arranged and presented in the age categories that were mentioned in the methodology chapter (chapter 3) of this study. These categories are arranged as follows: category 1 for participants aged between 20 to 35 years old, category 2 for 36 to 50-year olds, and category 3 for those aged 51 years and above.

Question 1 asked the lecturers to use a 5-point scale to rate themselves in their confidence to use computers and any other form of technology. The following is a list of possible answers that each participant had to choose from:

- Highly competent (I consider myself a professional in the use of technology)
- Competent (I can do a lot with technology)
- Intermediate (I can find my way around using technology)
- Poor (I struggle to use technology effectively)
- Very Poor (I am not able to use technology at all)

Question 2 also required the participants to use a scale to rate themselves on their interest to use technology in their respective classrooms. They had to choose from the following possible answers:

- Extremely interested

- Highly interested
- Moderate interest
- Not interested
- Not interested at all

| Age Category | Participant Age | Competence rating | Interest rating |
|---|---|---|---|
| 20 - 35 years | 24 | Competent | Highly interested |
| | 24 | Competent | Moderate interest |
| | 26 | Competent | Highly interested |
| | 27 | Intermediate | Highly interested |
| | 28 | Intermediate | Moderate interest |
| | 29 | Highly Competent | Extremely interested |
| | 31 | Highly Competent | Moderate interest |
| | 31 | Competent | Moderate interest |
| | 32 | Highly Competent | Extremely interested |
| | 33 | Highly Competent | Extremely interested |
| | 33 | Competent | Extremely interested |
| 36 – 50 years | 39 | Competent | Moderate interest |
| | 43 | Highly Competent | Extremely interested |
| | 44 | Competent | Extremely interested |
| | 44 | Competent | Extremely interested |
| | 44 | Competent | Highly interested |
| | 45 | Competent | Highly interested |
| | 46 | Highly Competent | Extremely interested |
| | 46 | Competent | Extremely interested |
| | 46 | Competent | Highly interested |
| | 46 | Competent | Highly interested |
| | 47 | Highly Competent | Extremely interested |
| | 48 | Highly Competent | Highly interested |
| | 48 | Competent | Highly interested |
| | 48 | Intermediate | Highly interested |
| 51 and above | 51 | Competent | Moderate interest |
| | 56 | Competent | Highly interested |
| | 56 | Competent | Highly interested |
| | 59 | Intermediate | Highly interested |
| | 59 | Intermediate | Moderate interest |
| | 60 | Competent | Extremely interested |
| | 60 | Competent | Moderate interest |
| | 67 | Intermediate | Moderate interest |
| Unknown | Age withheld | Poor | Moderate interest |

Table 4.4 Age categorisation of the participants and corresponding answers to questions 1 and 2

According to Table 4.4, all the participants, except one, indicated that they are competent with the use of computers and technology, and they ranged themselves as being either “highly competent”, “competent” or “intermediate”. The one participant rated her competency level as poor. This indicates that in terms of competency all except one of the participants felt competent in one way or another. It is important to note that in category 3, a group of lecturers who are in the age group of 50-year olds and above, no one participant felt they were highly competent in their knowledge of technologies and computers. Table 4.4 outlines all of the different competency levels with the corresponding age category, age and interest rate of the participants.

The second question, also a multiple-choice question, requested each participant to rate their interest to use technology in the classroom. Technology, in this case, was explained to the participants as any form of electronic/digital technology, educational or otherwise. The technology was furthermore explained that it could be a simple form of technology or any complex technology. Eleven participants indicated that they were extremely interested in using technology in the classroom, with four from category 1, six from category 2 and one from category 3. Seven participants from category 2 said they were highly interested, with three for both categories 1 and 3. Moderate interest in technology was indicated by four participants from categories 1 and 3 and only one participant in category 2 indicated that they are moderately interested. The participant who decided not to disclose her age, and who indicated that she is poor in her competency to use technology and computers in question 1, pointed out that she was moderately interested to use technology in the classroom for teaching.

All the other responses for section B open-ended questions were loaded onto the Leximancer tool, and the following concept map in Figure 4.8 was produced.

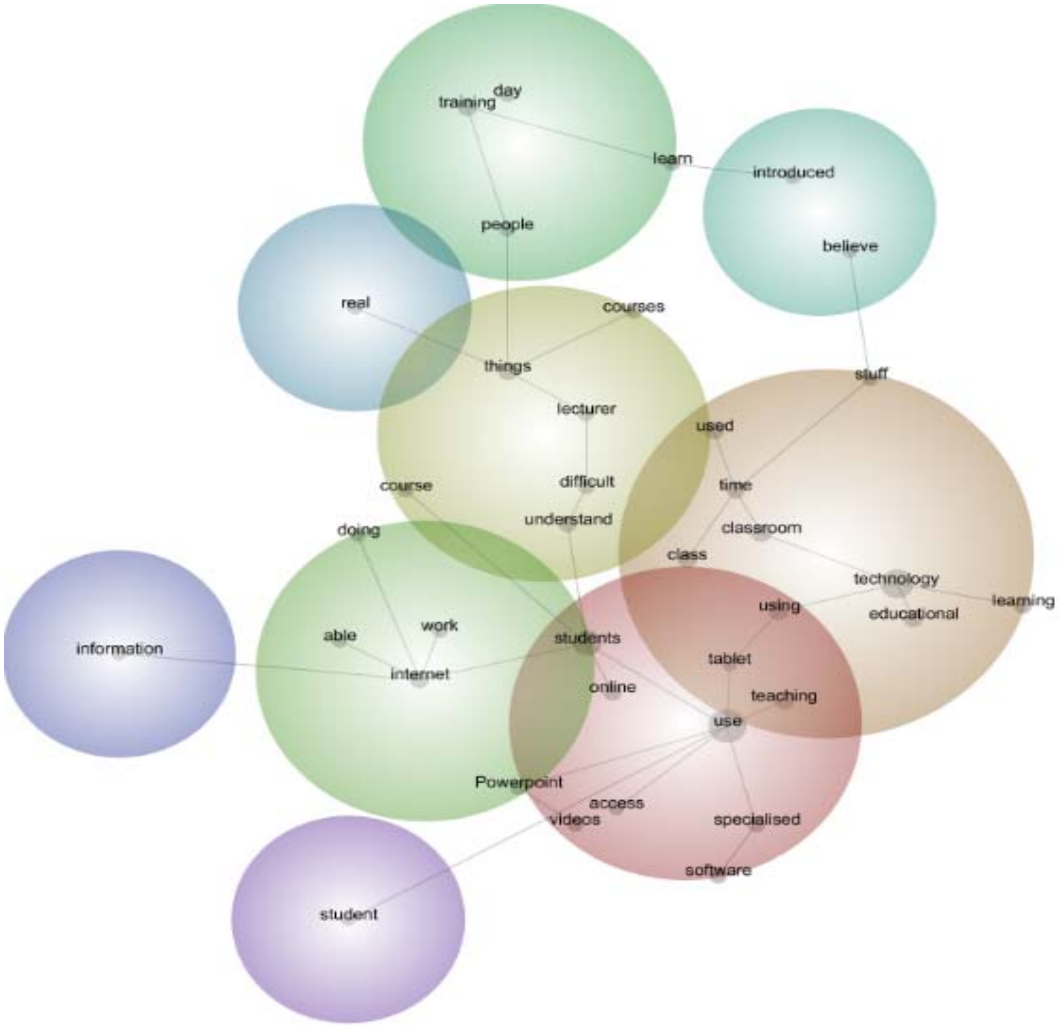



Figure 4.8 Combined theme and concept mapping for technology integration in the classroom

Figure 4.8 shows the emergent themes, as indicated by the coloured bubbles, the corresponding main concepts, and the sub-concepts for section B data. The linking lines show the connectivity between the concepts and their sub-concepts. It was indicated in section 4.3 that Leximancer uses colour codes to show the importance of the theme. On the basis of these colour codes, Figure 4.8 outlines the theme named *"use"* as the most important one. This is also shown in Figure 4.9 below, which gives a thematic summary, the corresponding connectivity percentages as well as the bars that indicate the relevance of such a theme. According to these two figures, in section B, the most important emergent theme is *"use", followed by "technology", "used", "internet", "things", "software", "training", "learn", "stuff", "doing", "real", "information"* and *"student"* respectively. The concepts form groupings within a particular theme, and these are text that is

usually mentioned together and has a conceptual relationship (Leximancer, 2011).

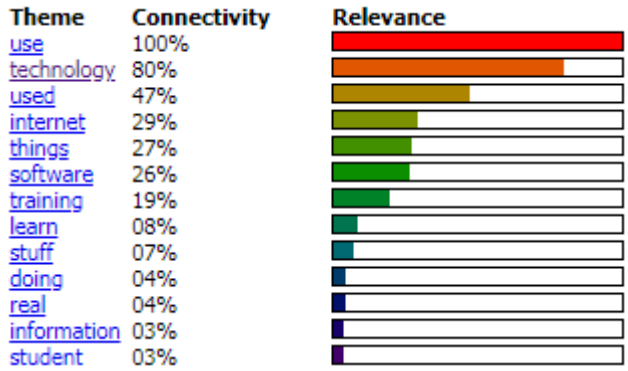



Figure 4.9 Thematic summary for technology integration in the classroom

The Leximancer tool was adjusted to display themes at 50%, and the result was the graphical representation shown in Figure 4.9. It was after this adjustment that the decision was taken to focus on the two themes of *use and technology*. These are the most important themes, and each has a list of a range of concepts relating to them, as well as being highlighted by the two hottest colours of the colour wheel. The theme called *used,* as seen on the thematic summary in Figure 4.9 with 47% connectivity and relevance was ignored because it simply highlights the past tense of the word use. Also not included in this discussion are all the themes and concepts highlighted by the bluer bubbles.

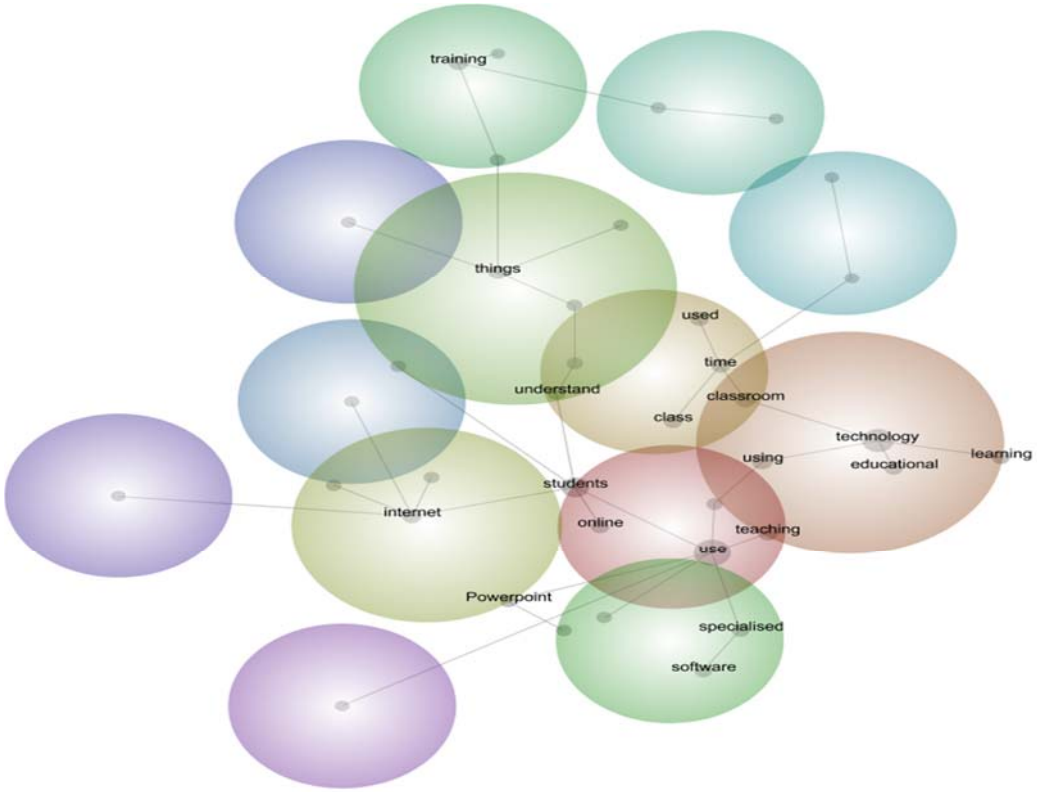



Figure 4.9 Combined theme and concept mapping at 50% adjustment for section B data

| Theme | Concept | Relating Sub-concept(s) |
|---|---|---|
| **Use** | Use | Teaching<br>Tablet<br>Specialised<br>Software<br>Access<br>PowerPoint<br>Videos<br>Using |
| | Students | Online |
| **Technology** | Technology | Learning<br>Educational<br>Using<br>Tablet |
| | Time | Stuff<br>Used<br>Class<br>Classroom |

Table 4.5 Themes with corresponding concepts and sub-concepts

Table 4.5 outlines the composition of these themes and their corresponding concepts, which are based on the concept map shown in Figure 4.8 above. The following discussion deliberates on the different themes, concepts and sub-concepts in detail.

**Use**

A lot of lecturers are using Microsoft **PowerPoint** for **teaching,** with only a few who use **specialised** technology or software. Some of these lecturers who use PowerPoint indicate that the type of subjects they teach do not require any other form of technological advances or any form of specialised technologies or software. One response indicated that *"it's not like I am doing something IT related or anything,..."*. There was an observed belief from some lecturers that the type of subject determines the amount or the need for technology use in the classroom. This was seen in the following statements: "...*sometimes it's not appropriate for all disciplines, in some disciplines it's very difficult to bring in technology because of the type of the discipline it is...*", *"I don't think its necessarily a need for the subjects that I lecture...", "...it's not always really applicable to my classroom", "...but what I teach is more conceptually based and in fact I find that technology tends to get between...".* It was observed that a possible barrier can be created that limits the integration of other technologies into the classrooms because of this understanding of technology by some of the lecturers.

Besides the use of PowerPoint in the classroom, it was observed that specialised **software** technologies are used by fourteen lecturers, and examples are software for genetics, media studies, physiology and data mining. These specialised software packages were most shared among colleagues and not particularly prescribed by the specific institution. Some of the twenty lecturers who do not use any other specialised technology or software in their classrooms cited the following reasons:

> *"...there has not been advances in technology to make theory subjects more practical or application based."* **(A female lecturer aged 27 years old)**

*"...because they are not accessible here as yet..."* **(A male lecturer aged 59 years old)**

*"We have decided not to because actually we prefer the students to all be in one group."* **(A male lecturer aged 48 years old)**

Sometimes, integrating technologies into the classroom can be hindered by a lack of knowledge about such technologies. For one participant (age not disclosed), the use of **specialised** technology in the classroom was not because of lack of access but because she had *"…no idea what it is."* She continued to say that "*I don't even know whether I would say I need it, I don't know what it is."*

Failure to integrate some technologies into the classroom can sometimes be attributed to lack of accessibility to such a platform. This was indicated by two participants; one of them said that *"because they are not accessible here as yet…but I'd like to have that opportunity",* and another indicated that she struggled to get a hold of the technologies that she felt should be accessible in the classroom. Despite the need for a particular technology, lack of **access** can be a hindrance to the integration of that particular technology into the classroom. Access to Wi-Fi technology allows some lecturers to integrate technology into their classrooms, however if the connection is slow, it can create an inconvenience and therefore hinder or discourage use and ultimately affect integration.

The availability of computers, phones (smartphones), electronic devices and the internet have been regarded as technologies that allow students to access resources or more information and flexibility which can be helpful in and outside of class. This can encourage the integration and eventual use of technologies in the classroom in order to make it easier for the dissemination of resources and information to the students. At times the use of technology is often seen as a way of *"trying to keep…(students) engaged"*, which could be a positive outcome for teaching and learning.

Several comments indicate that the use of **videos** for teaching is also a favourite among different lecturers. Videos are "*incorporate[d], "integrated", "show[n]"* to students during lectures, as well as being *"record[ed]"* and uploaded onto

YouTube for students. One of the institutions was going through student protests during data collection for this study, and the use of videos became a central part of lessons, as lessons were being recorded and uploaded by the lecturers on the institute's online platform or on to YouTube for student consumption. The use of technology, most specifically videos became one of the only ways lessons could be disseminated. For these lecturers, the integration and use of videos into their teaching became the only available option to deliver the lessons to the students.

The **use** of technology by **students** can influence whether that technology is incorporated into the classroom or not. One participant commented that she would rather limit the amount of technology in the classroom because it often gets the students "*stuck"* on it rather than on the actual content of the subject being taught. She said *"they use particular software packages but actually that's not what we want to teach them…to use because they tend to get stuck on the software. We want them to understand the concept and so we go for,…paper based."* This implies that some lecturers avoid integrating technologies into the classroom because of the reaction and behaviour of students towards the technology and its use.

Sometimes technology use in the classroom does not work as intended and therefore influences a lecturer to use older methods of teaching. This was seen when one lecturer explained that she has an electronic **tablet** device which is meant to assist her in class, but she explained that she had to go back to using transparencies in order to fit in drawings of use case diagrams because they could not properly fit onto the screen of the electronic tablet. In this case, the lecturer had to revert to using older technology methods.

The availability of **online** learner management platforms called "Click-Up" (institution A1), "THUTO" (institution B1) and "MyLMS" (institution A2), in the three respective data collection locations have been positively and negatively perceived. These online platforms are used by the lecturers to disseminate content for students and have been reviewed positively by some lecturers and seen as *"helpful piece of technology", "quite useful"* as well as *"more or less useful in terms of convenience".* Some of the negative comments towards these

platforms included, *"there are lecturers who have trouble with that",* and *"I don't think it has any value, besides being administrative"*.

Within the theme of *use*, it is evident that several factors have the potential to contribute positively or negatively towards the intention to integrate technologies into the classroom for teaching and learning. Some of these factors show that technologies are viewed more as a necessity than an option, while others may be an enhancement to the way teaching and learning is conducted in the classes. However, other factors can be a hindrance and therefore discourage integration and use of certain technological advances. The following discussion is on the theme of *technology,* which emerged as the next prominent theme in the analysis results of section B.

**Technology**

Technology is discussed here as the next emergent theme in this section. The name of the main concept is also technology, and it has 80% connectivity to other emergent concepts. Its relevance is an orange colour, which is the second hottest colour according to the colour codes in the Leximancer tool. The sub-concepts directly linked to this concept are *learning, educational, using and classroom*.

Of all the participants interviewed, only two participants indicated that they did not have an idea of what **educational technology** entails. This question intended to get a perspective of what each lecturer's thoughts were towards what technology means in their classrooms. Their individual understanding could have a link to their decision to either integrate or not integrate technologies for teaching and learning.

The following list is a compilation of the emergent impressions given about what educational technology entails. Each lecturer interpreted educational technology the way he or she understands, and according to these responses, a fair amount of these lecturers view technology in their classrooms in a positive way. An indication of this can be because of phrases such as "*mak(ing)… teaching process easier", "…reinforce(s)…my content", "…assists in educating…", "…facilitate learning…", "…advance learning…", "…aids education…",*

*"…facilitating the process of imparting knowledge…", "…assist in either teaching or learning…", "…supplement …", "…to aid…", "…support your teaching…", "…disseminate the content or the subject better… a support mechanism…"*. Table 4.6 outlines all the responses to this question.

**Educational technology** was generally seen as a positive aspect within the teaching and learning environment, with only two lecturers attaching a negative connotation to its definition. One of these two lecturers implied that she does not need it in her classroom and that her students are not always ready for technology use in the classroom. The second lecturer indicated that she feels that technology use in the classroom is not always appropriate for certain educational disciplines. However, the general perception is that technology is a positive platform, and this is deduced from the given responses by the lecturers, as shown in Table 4.6 below.

| Age Category | Age | The meaning of educational technology |
|---|---|---|
| **20 - 35 years** | 24 | *technology that is used in the process of education and learning… is technology that furthers learning for the purpose of education* |
| | 24 | *basically the Tools used to apply education* |
| | 26 | *the use of technology within the classroom and the learning process* |
| | 27 | *We **facilitate learning** through technological means.* |
| | 28 | *technology that is used in the classroom when you work with educational, educating students or learners in the classroom* |
| | 29 | *the incorporation of technology with education… utilising technological innovation that assists in educating students. Incorporating innovation* |
| | 31 | ***reinforce whatever my content** is* |
| | 31 | *I am quite aware of the new technologies… my biggest issue is that it is not always really applicable to my classroom… I don't necessarily use some of those apps that you get in order to kind of enhance it, it seems that the students are not always ready for those kinds of technology* |
| | 32 | *how we incorporate ICT into education* |
| | 33 | *use of technology in teaching, in fact not necessarily to teach but to incorporate technology in teaching because of all the technology in our lives these days* |
| | 33 | *the technology that we use to make our teaching abilities and **teaching processes easier*** |
| **36 – 50 years** | 39 | *ways in which we can use technology to advance teaching… all the tools that are maybe electronic and assist us to advance our teaching* |

| | | |
|---|---|---|
| | 43 | *Yes.* |
| | 44 | *the use of technology in the classroom… computers assisted learning (CAL) and e-learning as well and also the introduction of ICTs* |
| | 44 | *the use of technology for purposes of teaching and learning.* |
| | 44 | *Any technology we have for studying* |
| | 45 | ***facilitating the process of imparting knowledge** in whatever field* |
| | 46 | *applying technology in the teaching and learning system* |
| | 46 | *the incorporation of computers, the internet, and the intranet into the curriculum* |
| | 46 | *a form of educational technology, through which you can assess the students' uploaded assignments etc.* |
| | 46 | *application of technology in disseminating knowledge, basically in classroom and wherever educational activity is happening* |
| | 47 | *Not quite sure of the definition. I am not really into the definition quite well.* |
| | 48 | *teaching materials that can help me apply the recent technology in the classroom, not necessarily in the classroom only but also while communicating with the students,* |
| | 48 | *we use all sorts of terms for it, like Hybrid learning* |
| | 48 | *technology that we use that **aids education*** |
| **51 and above** | 51 | *using technology, specifically IT-based technology, **to aid** or teach* |
| | 56 | *something to do with the technology that we use to **assist in either teaching or learning*** |
| | 56 | *using technology in the classroom, other, the internet, tablets, or even e-mail, and then also having the e-book* |
| | 59 | *can be able to transmit a lot of information.* |
| | 59 | *I don't have a definite definition in mind* |
| | 60 | *any type of technology that you can use in educational teaching environment… I see it all as anything that can **support your teaching**.* |
| | 60 | *educational technology was any device that enabled the teacher or the instructor **disseminate the content or the subject better… I consider to be a support mechanism*** |
| | 67 | *use of available technology… in addition or **supplement*** |
| **Age not specified** | Age withheld by participant | *use of computer in general PowerPoint for teaching* |

Table 4.6 Educational technology definition by the participants

The analysis results show that **technology** has a direct link to **learning**. The concepts of technology and learning were positively identified by these phases, *"[technology]... takes learning to a whole new level", "...the world is ever-changing...if we want to create individuals who are ahead of the curve, we need to be ahead of the curve in the way we teach and the way that they learn."*

One of the negative aspects of integrating technology into the classroom is whether the technology is meant for learning or not. This was evident from comments that indicated that technology in the classroom might not necessarily be for learning purposes, but rather for social use.

> *"I think they like it because they have the new technology whether they use for academic purposes is highly questionable...I always see them on WhatsApp or Facebook on the tablet..., sometimes they have the study guide, the e-copy of the study guide open, but I don't know if it's for learning purposes"* **(A female lecturer aged 26 years old)**

Technology for learning was also seen negatively by one other lecturer, who indicated that it might not be applicable for all disciplines.

> *"...learning through technology or technological software that has been created or applications, but other theory subjects, it's very difficult to merge or to find where technology can fill the gap for students to understand the concepts better."* **(A female lecturer aged 27 years old)**

For one lecturer aged 31 years old, her position was negative on **technology** in the **classroom**. This was seen when she commented that *"...everything would bomb out, something that should have taken two minutes to just type in search would have taken too long. And so it really hampered my ability to bring the real world into the classroom..."*

For another lecturer, technology in the classroom was the use of videos to bring relevancy of a subject that could have otherwise not been relevant. This was further strengthened by another lecturer who said: *"…now I really believe that the reason my classes are much improved is that I have good visuals to show."*

Technologies in the classroom also allow some lecturers to manage larger groups of students better, as well as to assist them in the actual delivery of content. A lecturer aged 60 years old had this to say about technology in the classroom and how it can assist her in managing the larger classes she teaches. *"I have exceptionally large classes…I am already feeling like I am teaching facelessly because I can't even see the students at the back of the class. If I*

*were to use specialised technology, I would want to use technology that brings back the human that brings back the personal into my teaching."* Another view of technology in the classroom was the integration of videos, discussions and online presence, which was shown as a way of adding *"…a whole new level"* to learning.

On the other hand, the link between technology and the classroom is not always viewed positively by other lecturers. One such comment was given by a 26-year-old lecturer who indicated that *"technology can be very hazardous in the classroom because I find that [the students are] constantly on their tablets instead of being present".* One lecturer had a solution to this problem and indicated that she has become creative and that she engages students and technology in the classroom by making students use their technological devices to research for *"academic purposes rather than for their social*" needs. Another lecturer indicated that *"...Learners can play on their phones, and they need a kind of a quiz."*

The link between the integration of technology into the classroom and the outcome relationship between the concepts of technology linked with learning was seen in this way:

> *"…we cannot do without technology. If we use it for the right reasons, I think we are going to excel both the instructor and the students in achieving our objectives of teaching and learning."* **(A male lecturer aged 48 years old)**
>
> *"Technology, we can't do without it, we cannot do without technology…"***(A female lecturer aged 27 years old)**
>
> *"…if you don't use technology to keep up, the students are just going to lose interest because you just can't compete with Twitter and Facebook and Instagram, so I really believe that you can do a lot more with technology…"***(A female lecturer aged 24 years old)**

However, one participant disputes the fact that they cannot do without technology by indicating that technology use is based on preference or choice but not necessarily a need.

It can, therefore, be drawn that the "technology" concept when linked to "learning" shows that the classroom environment requires technology. Nevertheless, it is not just the mere fact of the integration into the classroom that makes the environment conducive, but the use, and mostly for the right reasons that make technology beneficial.

The integration and use of technology into the classroom environment was seen by other participants as:

> *"…mostly good,…however I find the use of e-books problematic and obviously the fact that it allows for a space of disengagement with the students…"…"***(A female lecturer aged 26 years old)**

> *"…sometimes people assume that showing students videos and showing students, or even using applications will enhance their learning, it goes back to what I said that we assume that our students are digital natives, but they are not. So, for us to then bombard them with technology even further, and tell them "this is how you must learn, this is how you will be assessed ", throws them off completely, so you find them not being engaged, you find them not wanting to address the real issue which is "I don't understand what's going on because I don't know what this is,…" …"* **(A female lecturer aged 27 years old)**

Integrating technology into the classrooms for teaching and learning has been outlined in this section, and several views emerged in the previous discussion, which indicate that it is viewed both positively and negatively. These varied views indicate that several factors can either encourage or discourage technology integration and use in the classroom. This brings the discussion to the analysis results of the cluster of questions that were grouped in the section called *the perception of educational technology*.

#### 4.4.3.2 The Perception of Educational Technology

The questions asked in this section were compiled to address the following sub-research questions:

- *What are other factors responsible for technology acceptance in the education environment?*
- *What are the differences in perception and use of technological advances by lecturers of different generations across the different faculties or departments?*

The lecturers' perception of educational technology about the emergent themes and concepts is discussed here. Figure 4.10 shows the themes and the corresponding concepts, with the themes highlighted by the coloured bubbles. Only the first four themes and the corresponding concepts are discussed here. They are chosen based on their relevance and the corresponding connectivity percentages to other concepts. These are *students, technology, content, and class*.

The corresponding concepts for these themes are as follows:

- Students (use, teaching, learn, information)
- Technology (things, used)
- Content (understand)
- Class (example)

Some participants view the relationship between students and the use of technology within the perception of the educational technology framework as a "*distraction"*, and therefore the use of technology needs to be restricted. This is so because the perception is that students use technology for *"their own personal doings while in class"* and *"students can access more information that may be dangerous to them."* It was cautioned by one of the participants that one should be careful when using technology and not assume that certain objectives will be met by just showing students videos and thinking that students will learn effectively.

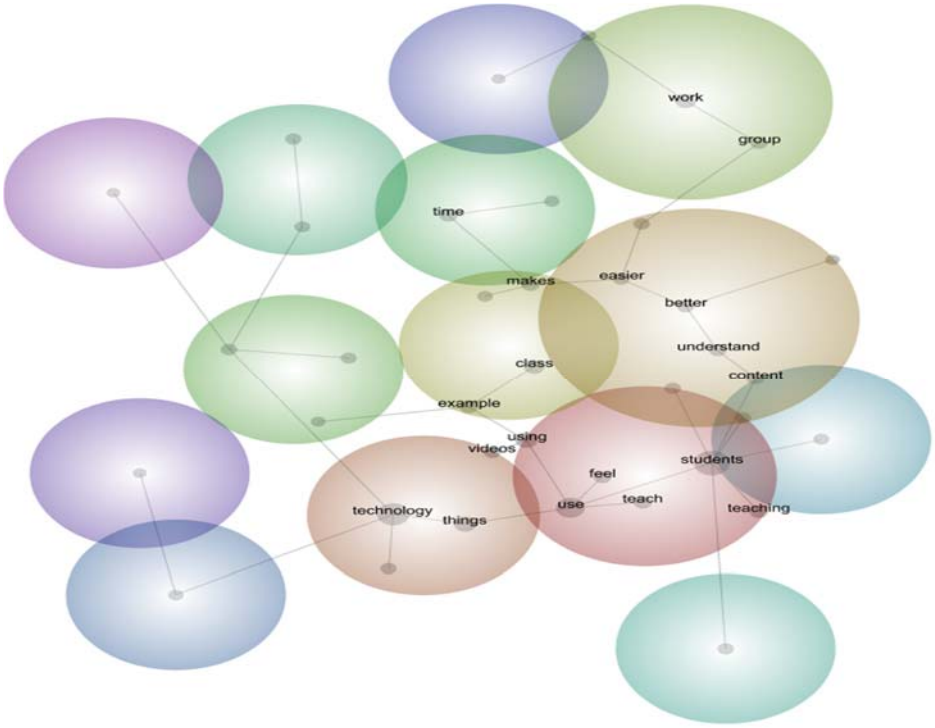



Figure 4.10 Theme and concept mapping for perception of educational technology

| Theme | Connectivity | Relevance |
|---|---|---|
| students | 100% | |
| technology | 54% | |
| content | 46% | |
| class | 35% | |
| work | 25% | |
| classroom | 16% | |
| time | 14% | |
| able | 12% | |
| learning | 06% | |
| module | 06% | |
| difficult | 05% | |
| concept | 03% | |
| slides | 03% | |
| important | 03% | |

Figure 4.11 Thematic summary for perception of educational technology

Technology use by students is perceived positively when it allows lecturers to relate better with their students. Technology use also allows students to be *"more engaged"* and when used correctly, technology can be beneficial and allow teaching and learning objectives to be achieved effectively. One participant, aged 27 years old emphasised that it should not be assumed that students know how to use technology and computers just because they are thought of as *"digital natives"*.

**Learning** and **teaching** have been shaped to some degree by the use of technology and computers in the classrooms. There are both advantages and

challenges which can influence the perception of using technologies for teaching and learning. The interviews revealed issues related to these aspects. When asked about their overall experience with the use of educational technology for teaching and learning, the lecturers' perception was shown by their responses and presented a fairly positive view. The views are outlined in the following excerpts:

The positives:

*"...lessons are more interesting and fun, it gives us more collaboration..."* **(female, 31 years)**

*"...it has allowed me to learn more and build me to motivate students to come with extra, motivate them to build even better equipment..."* **(male, 24 years)**

*"...very very helpful..."* **(female, 67 years)**

*"...Technology, we can't do without it...If we use it for the right reasons I think we are going to excel both the instructor and the students..."* **(male, 48 years)**

*"Some positives, I think I was a late adapter... ,I kind of got the grip with the value add because it is about adding value and enhancing the experience. So its always been positive..."* **(female, 31 years)**

*"Mostly good, however I find the use of e-books problematic and obviously the fact that it allows for a space of disengagement with the students..."* **(female, 26 years)**

*"Very interesting for me, very informative, very interesting, it's like an assistant lecturer on its own. It really assisted me in teaching more of the topics very very well..."* **(male, 49 years)**

*"So when we use those you even see the excitement in the students, they are excited just for the fact that there is a new thing that they are using. Students want to learn something they don't know, they get bored when you teach them the same thing so I make it a point that I don't use the same notes now as I used last year, because it gets boring, they already know, their friends told them."* **(female, 46 years)**

*"Students like it more, they become more interested in the content."* **(female, 48 years)**

*"Well it is really nice. And most of the time when you are teaching using technology the students get more interested in seeing how to do the things that you are teaching them. So it is really good, and I think in the future technology will be a necessity or requirement especially at this educational level we are at in teaching and learning."* **(male, 33 years)**

*"I think it has its pros and cons. We have students who would not be confident and comfortable in interacting with the lecturer so I think that platform allows them it to be easier..."* **(female, 39 years)**

*"It has been beneficial..."* **(female, age withheld)**

*"...to some extent it helps... There will be cases when using slides makes students forget about the slides. So technology does help."* **(male, 47 years)**

*"If I don't have the technology, I will not be able to present my course properly or efficiently."* **(male, 59 years)**

*"I really like technology... if the technology works, I really like it and it makes work much easier."* **(female, 24 years)**

*"It's been positive, I endorse it"* **(female, 51 years)**

*"Positive for teaching and for the students"* **(female, 60 years)**

*"I love it, I think the student love it and I think they like doing something that's a little bit different than having them reading from the textbook."* **(female, 33 years)**

*"It was both positive and negative. I have learned a lot and I think if used correctly it can really enhance the learning experience."* **(female, 28 years)**

*"Very positive and the only thing that you should keep in mind is that you mustn't use technology for technology's sake, it must always be to your lesson outcomes."* **(male, 44 years)**

Despite the positive feedback, there were several challenges expressed. The following is a representation of the excerpts from some of the participants who emphasised the challenges they faced with the integration and use of some of the technologies. The excerpts indicate their remarks in quotation marks, with the respective gender and age shown in brackets after each comment.

*"...doesn't replace the personal touch."* **(female, 67 years)**

*"...if you rely only on that you can end up being unprepared for the class, due to technology letting you down or the system where it's the projector, the internet connection, so no."* **(female, 56 years)**

*"...overall experience is challenging..."* **(female, 27 years)**

*"...however I find the use of e-books problematic and obviously the fact that it allows for a space of disengagement with the students."* **(female, 26 years)**

*"My experience is that currently our working environment at large has not adopted to this technology fully, even around campus, not uniformly accessible or distributed."* **(male, 59 years)**

*"...but at the same time it might be restricted not knowing the students are lost or not."* **(female, 39 years)**

*"Sometimes analysis needs to be done online even when collection is done, you find out that you don't have good connection. So if we had a lab that had good connection a lot of work would be made easier."* **(female, 46 years)**

*"...but negative if it's not working. It's terrible if you've prepared a whole lecture consisting of PowerPoints and videos and a game and everything and then, nothing is working."* **(female, 60 years)**

*"The only problem in our institution is the fact that technology doesn't always work. So that is a bit of a problem for me..."* **(female, 24 years)**

*"Look I must say you get frustrated sometimes, especially, our infrastructure is not that supportive of using technology, for example using YouTube videos, and the laptop of the varsity is not that great, so it is frustrating sometimes."* **(female, 43 years)**

*"…also negatively; a lot of frustrations, things are not always running as smoothly and as correctly as you wish them to, so on the other hand it does make life more difficult in some instances."* **(female, 28 years)**

*"Overarching the last 15 years, immense frustration; I'd eventually buy my own cords; I'd cut keys to get into boxes I have to fill codes, there's a constant barrier to using technology. I have bought my own data projector; I have a lot of my own technology, flip charts whatever feels for me is part of educational technology because I struggle. It is a constant GESUKKEL (struggle)."* **(female, 60 years)**

Another aspect of the perception of educational technology in the classroom was the actual delivery of **content**. Technology use in education has allowed some lecturers the ability to deliver content faster, enhanced the content, has made it more interesting, improved student's understanding of the content better, and one of the participants even went further to indicate that *"...without technology I don't know how I would deliver the content to the students".* However, one lecturer indicated that technology *"...doesn't change the content..."* and another cautioned that it also still depends on the kind of subject being taught.

The *perception of educational technology* is one of the clusters which informed this study. Another important cluster, which is also the cluster that informed the framework development in chapter 5 is discussed next. This cluster highlights aspects of ANT and how it informed the empirical work.

#### 4.4.3.3 The Education Sector as a Network

In this section, the inquiry was seeking answers to the following question:

- *How can ANT explain the generational identity aspects and technology integration in education?*

The education sector as a network comprises human and non-human actors. This is the heterogeneous characteristic nature of ANT, as discussed in chapter 2. This view supposes that human and non-human elements assume equal roles, disregarding their human or non-human nature, the concept called symmetry (Booth et al., 2015). The use of ANT as a methodological lens is drawn from Booth, et al. (2015), who advocate its use in nursing and other informatics research. ANT is applied to aid in answering questions related to how people are affected in their environments by the use of material objects (Booth et al., 2015). It is on this premise that ANT is used here.

The participants were asked to imagine the education sector as a network that comprises human and non-human participants. Humans would be anything that is in a human form, such as students, lecturers, administrators or any other human element that would influence within the sector. Non-humans would be the technology, electronic or otherwise, processes, procedures or any other non-

human component in the education sector. The participants were tasked to determine which element between the human and the non-human played a more crucial role within the sector, and which one would cause the most dysfunction if it were to be removed from the network. Figures 4.12 and 4.13 outline the results for this section. *"Human"* and *"students*" were the two most important emergent themes generated from the analysis with *"equally*" as the next theme but with lesser significance (this is determined by the colour code of the bubble and the connectivity percentage outlined in Figure 4.12 and 4.13).

The concepts within the "human" theme are the ones highlighted within the theme bubble. These are *"element", crucial, "take", day, "using", "technology*". Within the *"students"* theme, the following concepts emerged: *"class", "tablet"* and *"people".*

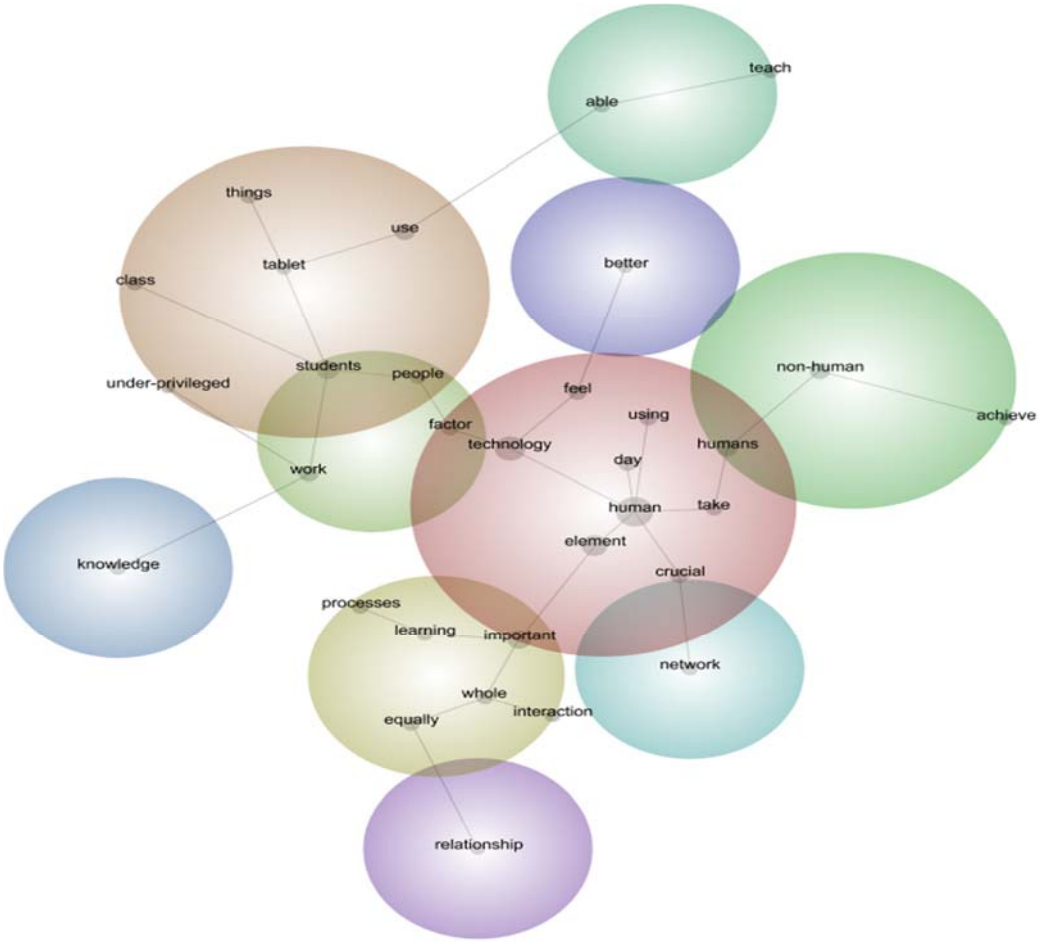



Figure 4.12 Theme and concept mapping for the education sector as a network

| Theme | Connectivity | Relevance |
|---|---|---|
| human | 100% | |
| students | 29% | |
| equally | 18% | |
| work | 14% | |
| non-human | 09% | |
| able | 06% | |
| network | 04% | |
| knowledge | 03% | |
| better | 02% | |
| relationship | 02% | |

Figure 4.13 Thematic summary for the education sector as a network

Callon's moments of translation are considered in this section on the basis of establishing a methodological lens. As was previously discussed in chapter 2, these moments are *problematisation* (how to become indispensable), *interessement* (how allies are locked into place), *enrolment* (defining and coordinating roles) and *mobilisation* (Callon, 1986).

The education sector is referred to as a *network* that comprises human and non-human elements. The sector as a network is in line with one of the objectives of the study defined in chapter 2, which aims "*to explore the education system as a network, on the foundations of the ANT moments of translation*". The following is a discussion of the data and how they fit into the moments of translation.

### *i. Problematisation*

A central feature of problematisation is when the focal actor(s) identifies their interest in a problem they encounter, and they do this to achieve their objectives and establish themselves as obligatory passage point (OPP) (Shim & Shin; 2016). OPP enables the main actor(s) to designate actions, alliances and deviations to other actors within the network (Callon, 1986; Jackson, 2015).

In the three locations of data collection, problematisation began when lecturers of different generations had to integrate and use technological advances in their classrooms. They had to address the issues of integrating and using technology successfully in their classroom environment for the delivery of content.

In this study, the moment of problematisation is the influence of generational identity differences and the ability to successfully integrate technology for the delivery of content. The delivery of content is the main objective of the lecturers,

this delivery is done using technological advances which are integrated and used effectively within the classroom environment for the benefit of the students. It is under this premise that lecturers strive to integrate and use such technologies effectively. Several excerpts from the data support this with the following phrases, *"helps us to deliver content", "it enhances classroom content", "enhance my teaching"*. The following quotes detail the problematisation as being put forward by some of the main actors.

> *"Just one example, when I started teaching, there wasn't technology. We didn't have technology. So, if you changed something in your prepared lessons that you used more than once, then you had to make a new transparency. These days, you can just change it on your computer, for instance if you are using a PowerPoint presentation, you can then change it in the presentation and its changed, and maybe if you want to change it for specific group, then you can save it for that group.* **(46 year old female lecturer, with 23 years of teaching experience in tertiary education)**

> *"...So in the past maybe when I didn't have so much technology at my disposal I would have given the students worksheets for example to fill in, problem statements that they would have to solve in writing but these days for instance I show them for instance the YouTube video in which they have to identify the problem and solve the problems. So different methods but the same outcomes: Solving real-life problems."* **(44 year old male lecturer with 13 years teaching experience in higher learning institutions.)**

> *"...you were either to draw that or look for pictures, it took you ages to look for pictures, whereas now I really believe that the reason my classes are much improved are that I have good visuals to show."* **(60 year old lecturer, with 18 years of teaching experience in tertiary education)**

Sometimes, the interest of lecturers to strive to successfully integrate technologies into the classrooms is influenced by the nature of the courses they

teach which may require specialised technology. They mentioned these with the following statements:

> *"This could be done by going to the gene bank to download some sequences and align with the software and then you are able to see the differences."* **(A senior lecturer in microbiology and biotechnology, 46 years old)**

> *"…for example when doing programmes like experiments software does helps."* **(A physics and electronics lecturer, 47 years old)**

> *"…in some instances we use tools like simulators, where you simulate the lab environment that the students are able to grasp the concept."***(A computer engineering lecturer, 32 years old)**

> *"The nature of the courses I teach."* **(A lecturer in consumer science, 46 years old)**

> *"My modules need those technology that are accessing satellite information, that remote first information like transpiration temperature…"* **(A physics and irrigation lecturer, aged 59 years old)**

The successful integration can be as a result of how the lecturers view technology in the classroom. For most lecturers, technology integration and use in the classroom has a lot more to do with how the students perceive and relate to the technology. According to these lecturers, integration and use are related mostly to the impression they get from the students. This observation is regardless of the generation of the lecturer but spans across the generation categories of lecturers who were interviewed for this study.

> *"I think the delivery is more interesting and more interactive than previously."* **(A female lecturer aged 60 years old)**

> *"I think where we are now, I think it's very difficult to not use technology in trying to keep them [students] engaged. I think it's a way of keeping them constantly engaged"* **(Female, 26 years old)**

*"I find out that many students their eyes widen and in awe and they start actually to be attentive in the classroom because they have been unlimited to technology. I find that when I switch on my computer, even if it's a movie, to show a film or film analysis and many of the students it's a break they quickly sit up and watch the film and enjoy that."* **(Male lecturer aged 29 years old)**

*"My perception is that they like it. It doesn't necessarily give them as much of an advantage as they think it does because they still need to apply their brains to the topic but I think it is received positively by the student so although they still need to apply their brains they are more inclined to do it if you present it to them in a strategy or something that they like."* **(51 years old female lecturer)**

*"So it enables students to understand the content better because they have access to have a means of getting information..."* **(A male lecturer aged 56 years old)**

*"Well the students do really love the technology, and they do find it really useful." "...in this day and age a lot of the students are technology savvy so it helps us lecturers when we are also in the same state."* **(33 years old male lecturer)**

*"So when we use those you even see the excitement in the students, they are excited just for the fact that there is a new thing that they are using."* **(46 years old, female lecturer)**

*"...we are in a technology driven world, I think that's the way that students and learners communicate right nowadays,... so that is where they feel most comfortable at."* **(28 years old female lecturer)**

To add on to the above reasons which influence the interest to integrate and use technology for teaching and learning, some of the lecturers indicated that:

*"I wouldn't be employed, I would definitely be unemployed, because everything that I do is about technology."* **(32 years old male lecturer)**

*"It has helped me a lot. Otherwise I would have been stressed."* **(Male lecturer aged 59 years old)**

*"Without technology I don't know how I would deliver the content to the students. Really it helps me very much and it is efficient."* **(33 years old male lecturer)**

*"Yes I feel that it is required. The reason why I say that is because my modules that I teach are practical, so they require a lot of hands on and introducing new concepts... If I didn't use technology, I would feel like most resources would have not be available for me. The way I view that is if something is already introduced to you, it's very difficult to not want to use it, because it's already introduced to your environment."* **(24 years old male lecturer)**

*"Technology, we can't do without it, we cannot do without technology. If we use it for the right reasons I think we are going to excel both the instructor and the students, in achieving our objectives of teaching and learning."* **(45 years old male lecturer)**

*"I mean if you don't know it [graphics software] there is no need for us to employ you in this department". "Sometimes describing or teaching a certain concept and the students still don't get it, all you need to do is "ok, go to your tablet, I want you to logon to this particular website, see that". There is always a podcast, in YouTube, you will get exactly, they will see it will be demonstrations "ohh, its clear now". And they can always go back, even on their own, it speaks volume than you just stand there and trying to explain whatever and they will get it."* **(49 years old male, who is head of programme)**

*"For instance, when looking at a DNA structure and looking into mutations so with technology you are able to see more clearly what is meant by mutation and what is seen when DNA mutates."* **(A female lecturer aged 46 years old)**

*"Some of the things takes longer to do but will be shorter when I use technology, so it does help."* **(47 years old male lecturer)**

*"...I mean the future is precision farming, if I can put it that way, and without technology you cannot have precision farming as an end goal. Yes, precision farming and efficiency. You cannot improve efficiency without technology."* **(A male lecturer aged 59 years old)**

*"I need to teach them how to be problem-solvers and how to think outside the box and if I use technology then they can see that I, as a lecturer, am thinking outside the box and doing some weird kind of things in class because I do like doing weird things."* **(A female lecturer, 33 years old, 7 years teaching experience)**

The statement above is evidence that some of the interviewees feel that technology use in the classroom is a necessity, but mostly driven by the needs of the students.

Three lecturers gave the impression that technology and age are related. They indicated that:

*"...because I am quite young, since I have been in tertiary education technology space has always been available." "For me I have been exposed to technology my entire higher education space, so I can't tell you how it would have been before."***(26 years old female)**

*The thing is I am a different generation, I am not a millennial. I am a different generation..." "...as a millennial... using technology comes naturally, whereas I have to really go and try to figure it out. If you don't tell me, because I am not necessarily, I am more of a late adapter to technology, I don't go out there and seek new technology through which I can enhance the learning experience, so, unless you bring me new technology and tell me "ok, this is how we are going to use it, this is how it's going to enhance your life""* **(31 years old female)**

*"It depends on the type of lecturer. We all know that people are scared of new technology and the era that I grew up in I'm obviously younger*

*than a lot of my colleges, I grew up with technology, I am used to technology and it is easier for me to figure it out. So the younger the people the easier it is to understand it."* **(33 years old female)**

Sometimes, the need to introduce and use technologies in the classrooms can be swayed by an individual interest in the actual technology as this became evident through the following statements:

*"I enjoy technology. I don't over rely on it but I enjoy creating PowerPoint presentations and I enjoy correlating different ideas for the students. I enjoy it."* **(29 year old male lecturer)**

*"I really like technology. The only problem in our institution is the fact that technology doesn't always work. So that is a bit of a problem for me, so I, if the technology works, I really like it and it makes work much easier."* **(Female, 24 years old, teaching for 2 years)**

Furthermore, the impact that technology has made on some of the lecturers can be attributed to them using it in their respective classrooms for teaching and learning.

*"...it changed my world, how I structured my classes, it changed the way I approach my preparation, it changed the way I teach my classes and I hope it makes a different in students' lives."* **(A female lecturer aged 31 years old)**

*"...it's unbelievably liberating to be able to discuss something that is in theory chapter in the textbook and then go onto the internet to show them how it happens in real life and how it's dealt with... I work really hard to bring in the real world into the classroom. And quite frankly, I can't bring in the real world without the internet..." "I cannot see myself preparing students without technology."* **(31 years old female lecturer)**

*"Very interesting for me, very informative, very interesting..."* **(49 years old male, who is head of programme***)*

*"I enjoyed it. I realise that there is still a lot for me to learn..." "...I think there is like so much that I haven't explored that will benefit the students."* **(44 year old female accounting lecturer)**

*"I really like using the technology…"* **(26 years old female lecturer)**

The need to integrate and use technology for teaching and learning is furthermore addressed in the strategic plans of the institutions where data was collected. The plans indicate the obligation by the respective institutions to have educational technology used in place within the teaching and learning environments.

In addressing this need, the strategic plan for Institute A1 reads as follows:

*"Information and communication technology (ICT) is an essential and important strategic resource for the University's scientific work, its management of knowledge, in interacting with students, staff and members of other institutions, and for the efficient administration of the University. Accordingly, it is our aim to keep the University's systems abreast of international developments in the field, and to deploy ICT as a strategic resource."*

Institution B1 has a part that addresses this issue in the plan, and it is outlined in the section on the strategic goals:

*"…increase student and staff technological competencies" by "Increase[ing] the use of Thuto by staff and students"* Thuto is a learner management system (LMS) used by the institution.

The strategic plan for institute A2 was not available online. However, a document termed "strategic and operational objectives for 2011 to 2014" was available to the researcher on a personal capacity, which was one of the documents circulated to employees. This document was used on the basis that ethical clearance had been granted to the researcher to research the institution. The following excerpt outlines one of the objectives indicated in this document:

*"Develop and establish eLearning and mLearning…"*

The second aspect of problematisation in the study by Callon (1986) involves the identification and definition of actors. Actors can be in a human or non-human form, as long as they assume a position that can affect decisions and developments within the network (Shim & Shin, 2016, Troshani & Wickramasinghe, 2014). As indicated, the problematisation stage commences with the identification of actors. Below is an account of the actors in this study.

*Identification of the actors:*

The details about the definition of an actor in ANT are discussed in detail in section 2.7.2 in chapter 2 of the literature review. The identification of actors below is divided into two types of actors, the human and the non-human actors. The following is a list of the human actors:

a. ***The lecturers:*** these are represented by the 34 lecturers who took part in the study. They are different generations of lecturers in different educational institutions who are responsible for the decisions to integrate technology into the classrooms.
b. ***The students:*** these are represented by the learners who are being referred to by the different lecturers. They are not direct participants in the study but form a significant part of the study.
c. ***Training personnel:*** the role of these actors can be significant because they are responsible for transferring the technology skills to the lecturers who are then required to use the technology in the classrooms.
d. ***The institutes' managers:*** their role is to implement the strategic goals of their respective institutions successfully.

The following is a list of non-human actors:

e. ***Technology:*** the medium/platform used by the lecturers and students to teach and to learn within and outside of the classroom environment.
f. ***Strategic plans/documents:*** the institutions' strategic plans give a directive of where an institution plans to be in a particular time frame, and they usually cover five years.
g. ***Processes and procedures:*** are meant to enforce the objectives of the strategic plans.

h. ***Subject content:*** Plays a crucial role as the network has to function effectively in order that the delivery of content is successful, through the use of the technology medium.

The identification of actors leads to the establishment of the OPP (Callon, 1986). The definition and characteristics of the OPP are discussed in detail in chapter 2 of the literature review in sub-section 2.8.2. OPP allows the different actors to establish themselves by asking questions relevant to their activities within the network. All their questions are aligned to eventually answering the question of how the lecturers, who are different in age and fall within different generations, successfully integrate technology into the classroom. The following section discusses the next moment of translation concerning the actors who have been identified.

### *ii. Interessement*

The previous section outlined the moment of problematisation, which is followed by interessement, the second phase of ANT's moments of the translation process. In this phase, the main actor persuades the other actors to get interested in the defined problem and then locks them "*into place*" (Callon, 1986). This is a way of enforcing the problem or interest which was specified in the problematisation phase (Tatnall & Burgess, 2002). The lecturers, who are the main actors in this case, assume the role of enticing the other actors to be interested and align themselves with the interest that they have specified in the problematisation stage. The interest of the lecturer is to successfully integrate technology in order to use it to deliver content effectively. The interests of the identified actors are "locked into place" through the opinions of the lecturers. The discussion here will focus on how the alignment of the other actors is achieved after they have passed through the OPP. The discussion outlines interessement for each of the identified actors.

The following excerpts show how the focal actors see interessement concerning the student actors.

> *"Students like it more, they become more interested in the content..."* **(A female lecturer aged 48 years old)**

*"It just to increase the interest of the students, to enhance it, to make it more interesting or attractive to the students..."* **(A male lecturer aged 44 years old)**

*"Students are more engaged, lessons are more interesting and fun, it gives us more collaboration..."* **(31 year old female lecturer)**

*I found with experience that often students relate more to technology..."* **(Male lecturer aged 29 years old)**

*"...if you don't use technology to keep up, the students are just going to lose interest..."* **(A 24 years old female lecturer)**

*"I believe that it makes a lecturer more interesting to the students, so you can illustrate things better..."* **(A female lecturer aged 60 years old)**

*"…most of the times when you are teaching using technology the students get more interested in seeing how to do the things that you are teaching them."* **(33 years old male lecturer)**

With interessement, the process can go either way; the interest can be accepted and locked into place by the other actors, or inversely it can be rejected. If the interest is rejected, the allies can choose their interest that is different from the one specified by the main actor. This is demonstrated by the following quotes:

*"...if you don't use technology to keep up, the students are just going to lose interest, because you just can't compete with Twitter and Facebook and Instagram."* **(A female lecturer aged 24 years old)**

It is evident that in some situations, the students could indicate their interest. They do this by using technology for other reasons other than for learning the content.

The next human actor whom the focal actor "locks into place" is the institutions' management. The management assumes a place of authority and therefore, can influence directly or indirectly the integration of technology. It means that they can come between the lecturers and the other actors such as the technology,

the processes and procedures, the strategy plans, training and the training personnel. This is evident from the following excerpts:

> "*Well they have [institution's' management] introduced things like blackboards… There's new technology that they have introduced but I have never used it."* **(A male lecturer aged 59 years old)**
>
> *"…that's when they introduced this thing called Thuto [learner management system]. It has been quite useful…"***(A female lecturer, age undisclosed)**
>
> *"…the training hasn't stopped because the university management really wants the lecturers to use that tool."* **(A male lecturer aged 33 years old)**
>
> *"The institution has opened an office locally, for continuous training. So that we do not lag behind."* **(A male lecturer aged 59 years old)**
>
> *"But the question is, does the institution know themselves of what they need to train you about?"* **(A male lecturer aged 49 years old)**
>
> *"…they introduced the tablet, the purpose was first of all for the students to be using the e-books and again to link, your lecturing, … but where you can actually link the process of lecturing the student using the tablet."* **(A male lecturer aged 45 years old)**
>
> *"…they have introduced…the tablets but that about 4 years ago, and I was just talking to the dean the other day, and I was saying you know what, we have had this for the past 4 years, even the personal cellphones, we don't keep them for 4 years, after 3 years you change it, but we still having the same device and technology is overtaking us, it will be become redundant."* **(A female lecturer aged 44 years old)**

According to the main actors (lecturers), the institutes' management is locked into place by directly or indirectly exercising their role and making sure that the strategic plans are carried out by the stakeholders of the institutions. The main actor aligns them with their interest in making sure that the processes and

procedures within the network are followed to promote the successful implementation of technologies within the classrooms.

Training is a non-human actor that is important to the lecturers in order for them to successfully integrate the technologies. The following view of training was observed through the perspective of the lecturers:

> *"I would prefer Training, the reason why I say training is because it will eliminate a lot of time for me trying to learn on my own…"* **(A male lecturer aged 24 years old)**
>
> *"I prefer being taught, like having training, because what I have seen in the past, we do assume that everyone is technologically aware, but you will out that simple things…"* **(female, aged 44 years old)**
>
> *"…it would be good to train initially…then you can, of course with these technological devices we tend to learn as we use them…"* **(male, aged 45 years old)**
>
> *"I think there is room for education and training especially if the new technology is important, some people obviously then prefer to do it themselves and play around and have a look at it."* **(female, aged 26 years old)**
>
> *"Even though we know this stuff, it's still good to re-train you, bring you up to speed…"* **(male, aged 49 years old)**
>
> *"I think training is imperative."* **(female, aged 39 years old)**
>
> *"I think there should be training because sometimes if you have to learn it on your own it takes a lot of effort from your side and a lot of commitment."* **(female, aged 24 years old)**
>
> *"There is a need for extensive training on the use of these educational technologies."* **(male, aged 46 years old)**

Despite the positive outlook on training by some lecturers, others had a negative attitude. The following details the negative feedback provided:

*"I genuinely come out think that I have wasted 4 hours because it's either information overload or it's too fast…"* **(female, aged 60 years old)**

*"…training is seen especially by lecturers in general as something I am forced to do, I am going to sit there and watch, we become our own students when we go training, you sit there and you're like, "but why am I here, it's an hour for no reason?"* **(female, aged 27 years old)**

"*No, there is no need for training, I see myself as a technology graduate, so because of that I can self-learn."* **(male, aged 32 years old)**

Training personnel is seen as experts who are entrusted with offering training to the lecturers. They are aligned to the lecturers' interests by making an impact on the training they offer so that it can become easy for lecturers to integrate into the classroom the technology they had training on. This can be seen through the following excerpts:

*"No I think it is important for someone to give us training. We don't really have time to waste time trying to figure it out by yourself."* **(male, aged 59 years old)**

*"…because it's always good to get information from the people [trainers] with the knowledge, the experts."* **(female, aged 46 years old)**

*"…it is always safer to have a real human being that can assist you with any difficulties that you might have in your classroom."* **(female, aged 28 years old)**

Inversely, the training personnel were seen in the following light by some of the lecturers.

*"…the students explain it to me far better than the trainers do, because they like to go a bit fast but they get it fast to me better than the training does…"* **(female, aged 60 years old)**

Technology is the centre of this research and is one of the main non-human actors in this study. The successful and effective use of technology, as well as what the actor offers is of central importance to the lecturers. The technology was seen by some as an *"aid",* an *"assistant"* and as a way to *"facilitate learning", "advance learning" and "reinforce content"*

Strategic plans in organisations are meant to administer the plans and objectives that an organisation envisages. They are locked into place by outlining the requirements and objectives which are meant to encourage the successful integration of technology into the classroom by the different lecturers.

Subject content is the foundation of why the lecturers are there in the first place. They transfer content and knowledge from themselves to the students within the network. Content needs to be familiar and understood by the lecturers in order for them to successfully transfer it to students, especially using technology. Content is aligned to the lecturers' interests so that they could easily transfer that knowledge to the students.

Processes and procedures are translated and locked into place when they give a clear directive for lecturers to integrate technology into their classrooms.

The process of interessement leads to the next moment of translation, that of enrolment, which is subsequently discussed in the next text.

### *iii. Enrolment*

Enrolment is the third moment of translation. This moment outlines the negotiations that take place in order to achieve the previous moment of interessement. This moment illustrates that success is not always guaranteed to get the actors interested, despite attempts and effort that can be undertaken by the main actor (Callon, 1986). Enrolment can only be achieved if interessement leads to successful results (Callon, 1986).

> *"...the fact that they have constant access to the internet, and if they don't know the answer to something they can Google and they all actually take part in the discussion and actually teaches them something new straight away."* **(female, aged 26 years old)**

According to Callon (1986), if students are to be enrolled, they must be willing to use the integrated educational technology to learn educational content and not to use the technology for their own personal reasons.

> *"...can hinder their engagement as well because they are on the tablet, I mean on social networks, or talking to other people via WhatsApp, it can be disengaging that happens, and trying to get off of it is pretty much impossible."* **(female, aged 26 years old)**

> *"It's very problematic for students calling, WhatsApp and personal gratification not for academic purposes."* **(male, aged 29 years old)**

Enrolment, however, requires the concept of negotiation. Callon (1986) asserts that enrolment requires negotiation with all the other object material to achieve success. In this study, it means the analogy for the negotiation takes place with the object material such as the infrastructure.

> *"...but the problem was the internet was always too slow. So everything would bomb out, something that should have taken two minutes to just type in search would have taken too long. And so it really hampered my ability to bring the real world into the classroom."* **(female, aged 31 years old)**

The negotiation with the above statement later gave favourable results and therefore paved a successful means to enable enrolment. This is seen in the following excerpt.

> *"Whereas now...,the internet its really connected, it's really fast I can go from my laptop, directly onto the computer and show them from the screen, or I can ask them to go and usually if they work in groups the internet is fast enough to get them information. And that is really enabled me as a lecturer to bring the real world into the classroom, which has made an unbelievably big difference."* **(female, aged 31 years old)**

### *iv. Mobilisation*

In this translation moment, the main actor constantly makes an analysis that the other actors' interest still aligns with theirs. This moment details the mobilisation of the allies within the network and determines the success of the network. The lecturers work together as colleagues and want the best ways to deliver content to the students. At times they recommend technologies to one another, technologies that are meant to make their work easier.

> *"I introduced that, yes and some other colleagues not the university. And also the narrative PowerPoint was an idea from a colleague because of these strikes..."* **(male, aged 44 years old)**
>
> *"...additional to that I have recently started using a game, an educational game called Cahoots-IT which I have also started to incorporate into my class..."* **(female, aged 28 years old)**
>
> *"...one of my colleagues, they had been using it for a while so she introduced me to it."* **(female, aged 28 years old)**
>
> *"And then for data mining there is specialised software that we use in the mining of data and it is called rapid miner." "... we, the lecturers recommended it, and my colleagues."* **(female, aged 43 years old)**
>
> *"I have used Socrative, Cahoots..." "...It wasn't prescribed ... we use it as a team actually in our teaching to come up with different things."* **(female, aged 60 years old)**
>
> *"My colleagues actually recommended the Socrative system. It's something we do by ourselves, it's not something that's required by the institution or the faculty, it's just something we have actually added ourselves to enrich our course."* **(female, aged 26 years old)**

The collaboration of ideas by some of the lecturers to use technologies that can enhance the delivery of content shows some alignment being established. The discussion of ANT's moments of translation is what eventually forms the basis of how the generational technology integration framework was formulated in the following chapter 5. The following section concludes this chapter of data analysis.

## 4.5 CONCLUDING SUMMARY

This chapter presented the analysis results produced by the Leximancer analysis software tool. The first part of the chapter outlined the educational institutions where qualitative data was collected in the form of semi-structured interviews with the 34 respondents from three different institutions. Besides the analysis produced from Leximancer, ANT was used to analyse some of the data results.

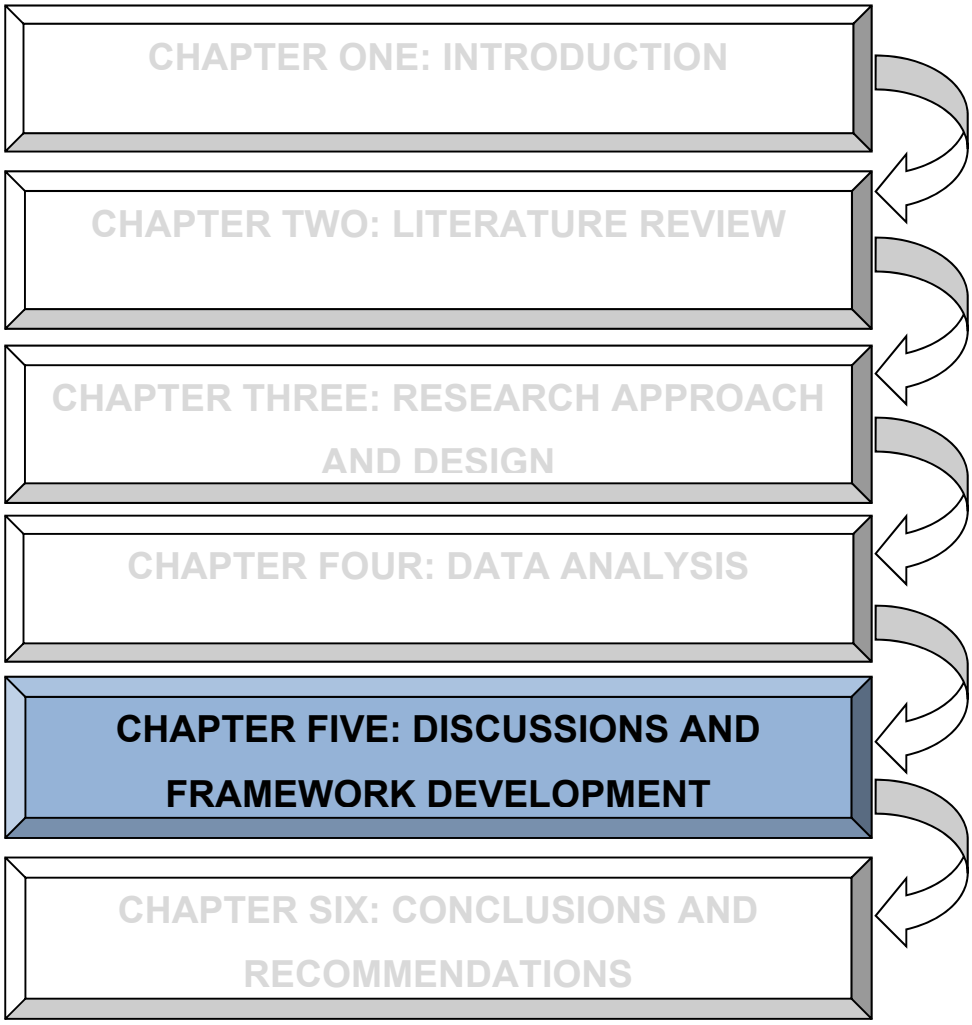
The data revealed that all of the respondents indicated that they had some level of interest in using technology in class for teaching. The data also revealed that all except one respondent pointed out that they felt they were competent with the use of technology, for personal use and in the classroom.

The results showed that some of the respondents have some challenges with the way their students use technologies in the classroom. Others indicated that the challenges they face with technology use for learning are related to issues such as inadequate infrastructure and facilities in their institutions. However, only one respondent indicated that she faced challenges because of the generation she belongs to. This is relevant to this study because generational issues form a significant part of this study.

The application of ANT to the results presents theoretical underpinning, which highlights the education sector as a network of human and non-human actors who function together in the network to achieve a particular goal. ANT's moments of translation, namely problematisation, interessement, enrolment and mobilisation were used to fit in the data. These moments work together to form a network that comprises human and non-human elements and also looks at how they influence one another. These empirical results are later used in chapter 5 to highlight how they informed the proposed framework.

The discussion in this chapter looked at the different sections of data, these sections were divided based on the questionnaire clustering of the research questions. A section represented one or more research questions, which were clustered together according to how they related to one another.

The next chapter discusses in detail the emergent themes and answers the research questions, as discussed in chapter 1. The discussion in chapter 5 will eventually lead to the development of the generational technology integration framework on the underpinning of ANT and the Generational Theory.


CHAPTER ONE: INTRODUCTION
CHAPTER TWO: LITERATURE REVIEW
CHAPTER THREE: RESEARCH APPROACH AND DESIGN
CHAPTER FOUR: DATA ANALYSIS
CHAPTER FIVE: DISCUSSIONS AND FRAMEWORK DEVELOPMENT
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

# 5 DISCUSSIONS AND FRAMEWORK DEVELOPMENT

## 5.1 INTRODUCTION

This chapter conveys the meaning of the data analysis outlined in the previous chapter. The previous chapter looked at the empirical results from the interviews conducted with the respondents in this study. This chapter, therefore, embarks on the interpretation of the results outlined in the previous chapter (chapter 4) and develops and proposes a framework based on the empirical evidence, Actor-Network Theory (ANT) underpinning and on the Generational Theory. Each sub-research question is discussed here and interpreted based on the empirical results outlined in chapter 4 and the literature.

The first part of the chapter discusses each research question about how empirical results and literature inform the question. The second part shows how the empirical research results in association with the underpinning theories of ANT and the Generational Theory informed the development of the framework. The last part concludes the chapter.

## 5.2 INTERPRETING THE RESEARCH QUESTIONS

Research questions one and two were addressed by questions asked in section B of the interview questions, a cluster called ***Integrating Technology into the classroom***, while research questions three and four were dealt with by the questions in section C (***Perception of educational technology***) of the questions. The last research question, question five, was addressed by the cluster named ***the education sector as a network.*** The Leximancer results were loaded per section and therefore the results for each section are directly related to the respective research questions. The following discussion addresses each research question with a note of how the data was analysed in the Leximancer tool.

### 5.2.1 Research question 1: Why do lecturers integrate technology differently?

The education sector has increasingly become technology-enhanced in recent years (Tummons et al., 2016; Adnan & Tondeur, 2018; Gasaymeh, 2018;

Erduran & Ince, 2018;  Piper et al., 2015) and the use of technology for teaching and learning is inevitable (Adnan & Tondeur, 2018). Despite the increased use in technology in the sector, research indicates that some instructors still struggle to integrate technology into the classrooms for teaching and learning  (Voogt & McKenney, 2017; Villalba et al., 2017; Adnan & Tondeur, 2018; Vongkulluksn et al., 2018). The challenge with integrating technology could be because of the different ways used by lecturers, sometimes because of the unwillingness to let go of old teaching practices (Voogt & McKenney, 2017) as well as the time it takes to integrate such technologies (Villalba et al., 2017).

According to Amiel et al. (2016), technology integration entails more factors than just the institution and teacher. The authors assert that technology integration in the education environment should be considered in a much wider framework, which includes internal and external aspects. Ryan and Bagley (2015) are of the view that these external and internal factors cause barriers that are difficult to overcome and can inhibit technology integration and often results in underutilised technologies which are meant for improving teaching and learning.

According to the interview results outlined in chapter 4, the differences in the way the lecturers integrate technology span across a variety of factors such as the lecturers' competence and interest in using technologies, the need to use technology in the classroom, whether it supplements or complements the actual content, if it is a requirement for the type of content being delivered, if it is helpful and whether it is viewed as an effective tool in the classroom environment.

With regards to the lecturers' confidence, which eventually outlines their competence in the use of technology, across all faculties and generations, lecturers feel they are competent enough in the use of different types of technologies, at work, or for personal use. Competency, in this case, is related to one's confidence in being able to have the technology and use it for several reasons including using it for teaching and learning (Table 4.4). Interest in using technologies for personal and professional reasons can also be a factor that can influence the integration of technology for teaching and learning.

To determine what could potentially influence one to want to integrate technologies into the classroom, their confidence, knowledge of what educational technology is as well as whether they felt they required the use of technologies in the classroom and issues around training in technologies introduced by their respective institutions were asked.

### *1. Confidence and competency to use technology*

Maharaj-Sharma et al. (2017) suggest that the level of competence of instructors is important with regards to the effort they make to integrate technology into the classroom. In this study, competence levels were gauged on how the interviewed lecturers responded to how confident they were with the use of technologies for personal and professional use. Lack of competence and confidence may lead to lecturers using their old ways of teaching (Maharaj-Sharma et al., 2017). However, in the study by Adnan and Tondeur (2018), despite competency to use technologies by educators, the study revealed that they were not able to apply that competency to use educational technologies in the classroom for teaching and learning. Tondeur et al. (2016b) outlined in their study that competency and efficiency in the use of ICTs do not necessarily translate into effective use of technology in the classrooms. To address this, Koehler and Mishra (2009) recommend that technology should not be separated from pedagogy and content knowledge as outlined by the Technological Pedagogy Content Knowledge (TPACK) framework.

The current study discovered that despite stating their competence and confidence to use technologies, some lecturers are not keen to use computer technologies in the classroom. One of the female lecturers aged 60 years old in institution A1, from the faculty of education indicated that she regards herself as competent in the use of technologies, and had a moderate interest to use them in her classes also later expressed that "*my current feeling is that anything technological now would create even more distance between me and the class." Despite rating herself as competent in the use of technologies she also felt that ""**Life was so much easier when Blackberry and Apple were still fruit**". I would like to use technology effortlessly, seamlessly, but it creates an immense*

*amount of stress for me…I know what to do but it still creates a lot of tension and then I get to a point where I get stuck it just feels like the chalk board is more reliable.*"

Another female lecturer aged 31 years old in institution A2, from the faculty of humanities indicated that she regards herself as competent in the use of technologies, and had a moderate interest to use them in her classes indicated that:

> *"I think I was a late adapter or I was bit itchy about the tablet at first, cause I didn't really see the use…I kind of got the grip with the value add because it is about adding value and enhancing the experience…I don't use my tablet anymore…My students use the tablet, but I don't…I hadn't used my tablet for six months and the battery went flat and it took like three days to charge. But then again in terms of how I use technology, my tablet is absolutely useless."*

This observation is echoed by a study done by Erduran and Ince (2018:556) which states that "*being able to correctly use technology does not guarantee that it can be successfully integrated into education."* It is under this premise that the findings in this study claim that competence and confidence to use technology do not necessarily cause a lecturer to integrate technology into the classroom effectively. Research from Ertmer et al. (2012) indicates that besides an educator's competence, their belief system is equally crucial for them to integrate technologies sucessfully.

Other internal and external factors could potentially influence a lecturer to integrate technologies for teaching and learning besides competency levels. These can be both internal and external issues. Looking at the evidence from this study, the respondents mentioned several issues such as their institutions' infrastructural challenges of slow internet connectivity, limited resources such as computers in the laboratories, lack of access to software and hardware they require in their classrooms and lack of competency by students to use technologies. The following excerpts are an indication of this:

*"Look I must say you get frustrated sometimes, especially, our infrastructure is not that supportive of using technology…"* **(female, 43 years old)**

*"I would include more hyperlinks, YouTube videos, but the few times that I did use it we had problems with the internet connection, and then I couldn't show it to them or the sound was not good enough."* **(female, 56 years old)**

Koehler and Mishra (2009) propose that to reach a balance between competency levels in technology and successful technology integration and use in the classroom, there needs to be a proper plan to reach a balance in technology, pedagogy and content.

***2. Knowledge of what educational technology entails presents a potential meaning that the respondents attached to the concept.***

Erduran and Ince (2018) suggest that it is important for the teachers to have a comprehension of technology they use in order to integrate it into the classroom effectively. This is echoed by Saxena (2017) who asserts that an educator is central to any integration plan in the education sector, including that of technology integration.

Table 4.6 highlighted the responses of what educational technology entails to the individual lecturers. The responses showed that the individual lecturers understand the meaning of educational technology and mostly the meanings they attached to their definitions. One of the respondents stated that educational technology means that because of all the technology currently available, it becomes imperative to incorporate technology into teaching. Educational technology was viewed as a tool that eases up the process of teaching and learning, also seen as a way to advance learning, to better the content, aid in teaching, as well as a way of "*facilitating the process of imparting knowledge".* Some of the keywords used by the respondents in their meaning of what educational technology entails, clearly demonstrated the value they attach to the concept. Examples of some of these words are: "***reinforce …my content"***, **"*aids education*"**, **"*assist…teaching or learning*"**, **"*support…teaching*"**.

The meaning behind what the respondents attached to educational technology concept, and whether that could potentially influence them to integrate technology and use in classrooms can be debated. This was revealed in this study when some of the respondents who indicated their knowledge of what educational technology entails still decided to revert to the use of paper in their classroom.

Despite the positive light in which educational technology was shown, there was a negative meaning attached to the concept by other respondents. One of them said that some of her students were not ready to use educational technology advances.

### *3. Training on technologies introduced at the institution level*

Training is one of the vital elements required to encourage a lecturer's use of educational technology in the respective classrooms. According to Saxena (2017), training educators and technology integration into the classroom has a direct relationship.

Lack of proper training can cause lecturers to integrate technologies into their classrooms differently from one another. Erduran and Ince (2018) suggest that technology training for teachers should be in line with pedagogical understanding to be successfully integrated into the classroom. However, from this current study, it is evident that training needs are often hampered not only by the people entrusted with providing such training but from some of the lecturers themselves. Evidence from the findings show that some of the lecturers indicate things such as lack of time on their part, lack of interest to attend offered training, being selective in what they want to train on depending on whether they feel it will be useful to them, and some feeling inclined to rather self-learn and not attend the offered training. For others, lack of proper communication by those offering the training sometimes makes them miss such training sessions.

Training in educational technologies is mentioned in Ertmer et al. (2012) as an external barrier that can influence a teacher to integrate technologies into the classroom successfully. In this study, for some respondents, training was a welcomed activity that helped them to understand educational technologies

better and felt there was always a need for them to get training on newly introduced technologies. Some of them viewed training as an activity that wastes time because it is not effective enough. Some felt that because of their knowledge in computers and technology, self-learning new technologies would be a better alternative instead of being offered training by someone else. This was explained by one respondent who said, *"basically it's because we are in IT environment, we are relatively IT savvy",* and this was echoed by other lecturers who said *"...there is no need for training, I see myself as a technology graduate, so because of that I can self-learn", "I think self-educating will do, we are talking about technology I am familiar with".*

Leximancer results that address this research question are discussed in sub-section 4.4.3.1 in chapter 4. This research question falls under the clustering section of ***integrating technology into the classroom,*** as previously discussed in chapter 4. The results indicate that ***training*** was one of the themes that emerged from the data. ***Training*** had a direct association to ***learn***, ***day*** and ***people*** sub-concepts.

Training sessions were conducted in a ***day*** or just a couple of hours in all three institutions. There were different perceptions regarding the length of this type of training. Some people felt that it was enough to make them understand and comprehend the technology, others said time was not enough, while others felt it was just a waste of their time. Some respondents felt it was the responsibility of those who received training to continue with practice afterward. Others pointed out that the content offered was sufficient enough and therefore required them to continue with some self-learning afterward, and only to contact training officials if something was not clear enough. ***Training*** is generally meant to help educators ***learn*** how to use educational technologies and therefore help them when integrating and using these technologies in their classrooms.

The TPACK framework discussed in chapter 2 (section 2.4) informed the discussions and interpretations and is used here to highlight the aspect of technology integration regarding pedagogy and content. Koehler and Mishra (2009) highlighted that the integration of technology should be considered in

relation to the subject matter known by the teachers and the methods, processes and procedures they use to apply such knowledge. In this study, the evidence from the results echoes what has been outlined by Koehler and Mishra (2009) that technology integration is ideally integrated and used concerning the context in which it is intended.

In this research question, the findings affirm that generational identities were not identified with what could influence a lecturer to integrate and use computer technologies into the classroom for teaching and learning. Other factors such as confidence and competency levels, knowledge of what educational technology entails, and training were identified as possible influencers of technology integration. In answering this research question, the discovery was that it is not necessarily a matter around one's age or the generation they were categorised into for this study that influences technology integration into the classroom for teaching and learning

### 5.2.2 Research question 2: What individual preferences cause differences in integrating technology into the classroom?

Technology use in the classroom is preferred by one lecturer (60 years old) because of the improvement it has made to her classes when she can show her students improved visuals. She indicated that *"I really believe that the reason my classes are much improved [is] that I have good visuals to show…"*

Most of the lecturers still prefer to use Microsoft PowerPoint in their classes. Additionally, there is a narrated PowerPoint and preference of some respondents to use YouTube videos as well. The use of the internet, especially the use of Google in the classroom to search for relevant information, was also a preferred choice. For one lecturer (31 years old), the use of the internet to do searches online is preferred because she feels her module needs current affairs that need to be applied in the classroom. She, therefore, specified that she encourages students to do online searches during class and find current relevant news and headlines to apply to the theory concepts being discussed in class. She particularly indicated that *"the core of public relations has to be the real-world*

*application"* and that *"if I teach them theory from my textbook all day long, it is not going to equip them."*

The study also found out that learner management systems are preferred means of communication with the students. The learner management system for one of the institutions became the only means of communication after the student's protests marred the institution. The system not only became the preferred choice but also became the only lifeline that the lecturers used to upload video lessons, assignments, notes, and to communicate with students.

The other preferred educational technologies used are clicker technology, Socrative and Kahoot. The study discovered that these technologies are used by lecturers out of their own free will to enhance the learning experience. Both of these advances are not prescribed by the institution but are used in class by lecturers who decided to integrate them because of the perceived benefits. They indicated that they learned about these technologies from their colleagues. Other respondents used technologies that were particularly specialised for the module they taught. For one respondent it is the use of rapid miner, software specific for a data mining course, another one uses Microsoft Visio for diagrams, mastering for physiology, InDesign and Photoshop for a communications and design courses, another lecturer preferred to use free online software for gene bank alignment, and another lecturer's course requires animal modelling training system (AMTS).

One lecturer (48 years old) from the natural and agricultural sciences faculty from institute A1 mentioned that they used to have specialised software technology before but they, as lecturers decided to discontinue its use because: *"…actually we prefer the students to all be in one group. We have a limitation of computer access by tutorials with the student and we can give them assignment where they use particular software packages but actually that's not what we want to teach them how to use because they tend to get stuck on the software. We want them to understand concept and so we go for, rather for paper based."*

This shows that for this particular lecturer, he reverted to using paper instead of technology for teaching and learning. An important point raised by the educator

about a limitation to computers for students can significantly influence the choice not to integrate technologies into the classroom. This point is outlined in Saxena (2017), that student-computer ratios can negatively influence an educator to choose not to integrate and use a particular technological advance in the classroom.

Another lecturer (59 years old) indicated that he would prefer to use specialised software technology to link geographical information systems (GIS) programmes but could not use such technology because of its inaccessibility at their institution (institution B1). This, according to Saxena (2017), is one of the causes that hinder educators from integrating technology into their classroom.

This cluster investigated the integration of technology into the classroom, with research questions one and two being investigated. The main emergent themes that resulted from the data in this section are ***use***, ***technology***, ***used*** and ***internet***, ***things*** and ***software*** and ***training***. The other themes that emerged, but that had a lower relevance were ***training, learn, stuff, doing, real, information*** and ***student.***

### 5.2.3 Research question 3: What other factors are responsible for technology acceptance in the education environment?

Based on the evidence from the data results, this research question was addressed through the following aspects:

- The correct use of technology in teaching and learning
- When technology helps with the outcomes of the lessons, when it helps *"solve real-life problems"*
- Technology is an assistant. One of the respondents indicated that *"it's like an assistant lecturer on its own"*
- Students love having technology in order to move away from the traditional teaching methods
- The nature of students is one of the driving factors for accepting and using technology in the classroom environment.

- Willingness to explore more so that students can benefit from what will be discovered.
- For one of the institutions where data was collected, there was a student protest at the very same time that data was being collected. For respondents at this location, accepting and using technological advances such as online video was a necessity. Due to time constraints in order to finish the year's syllabus, the use of technological means became the only option and accepting its use by both the lecturers and the learners became a crucial issue.

The main theme that emerged from the Leximancer analysis in this cluster was ***students***. From the responses in this section, there is much emphasis on students and their needs. The generational aspect that emerged as per the interview responses was that the current students in higher education classrooms are of a generation that understands and appreciate technological use in the classroom. The generational aspects were not geared towards the educators or lecturers but mostly towards the students. The respondents feel it is their responsibility to use technologies in class.

This is demonstrated by the Leximancer results in which ***students*** were the main emergent theme. According to Ryan and Bagley (2015), technology in the classroom can relatively promote how students engage in their learning. This can also be discussed from an angle of ANT as was outlined in chapter 4. The education network comprises human and non-human actors that should be working together to achieve the objective of effective and successful teaching and learning. Accordingly, ANT's four moments of translation aim towards achieving this goal. The translation occurs in such a manner that the main actor, represented by the lecturers, has to integrate and use technological advances in their classrooms to enrich the learning experience. The learners have to eventually be locked into place so that they use technologies effectively for learning, and for gaining valuable experience.

Based on the empirical evidence, the literature underpinning as well as theory backdrop, it is evident that the educator's main focus is on the students and how

they can improve their learning experience. The generational identity qualities mentioned in the data are mostly directed towards the students and not the lecturers. The respondents replied more towards the generation of their students than to their own generational identities. These findings echo what was mentioned in Prensky (2001) about the current generation of students. Prensky indicated that the current generation of students grew up exposed to technology and therefore became more comfortable with its use. This was a comment picked up from several participants in this study, who emphasised the need to integrate technologies for teaching and learning in order to accommodate the current calibre of students. Prensky (2001) had termed these students digital natives, acknowledging their technological savvy nature. This was evident from comments such as *"…I think it is a technologically savvy generation with whom we deal with now…", "in this day and age a lot of the students are technology savvy".*

Alternatively, the empirical evidence indicates that a major negative impact on technology acceptance is the frustration with technology. This is caused mostly by infrastructural challenges in these institutions. The internet connectivity issues were mostly raised as an obstacle that cause technology not to work as planned. This could potentially influence the decision to integrate and use technology in class.

### 5.2.4 Research question 4: What are the differences in perception and use of technological advances by lecturers of different generations across the different faculties or departments?

According to Maharaj-Sharma et al. (2017), instructors' perceptions of technology is one of the critical elements to consider when introducing educational technologies in education. This perception is crucial because it can negatively impact the adoption of technologies for teaching and learning (Piper et al., 2015; Saxena, 2017).

One lecturer who is 60 years old, teaching in the education faculty of her institution, sees technology as a tool that could potentially detach her from her students. She qualifies this with a statement that she does not work for a

distance learning higher institution, where lecturers do not have regular contact sessions with their students. For her, technology has added stress to her teaching life. She ascertained this with the following statement, *"Well, you can write down this little quote...'life was so much easier when Blackberry and Apple were still fruit'. I would like to use technology effortlessly, seamlessly, but it creates an immense amount of stress for me."*

For another lecturer (44 years old), technology use in the classroom has the potential to create learners who are globally ready and who can survive in the current digital global environment. For him, the use of technology in the classroom "...[is] *crucial so that learners are able to adapt to the fast growing globalised world."* This was echoed by another lecturer who feels that the current student generation requires the use of technology, and that using it in the classroom makes them comfortable. This was further pointed out by other lecturers who perceived technology as a tool that enriches the learning experience and makes it easier for the students to understand the content better.

One lecturer, however, mentioned that as educators, they need to apply their minds and therefore use technologies that apply to their classroom environments. He cautioned that technology use in the classroom should have an impact and be relevant and not just used for the sake of having it in the classroom. This was the sentiment of another lecturer who indicated that technology use and the choice of technologies is more important than just using it.

For another respondent, the nature of the course makes it impractical to use technology in the classroom. One lecturer also cautioned that technology needs to be used with care and requires a predefined structure.

Evidence from the study shows that perceptions of technology use in the classroom are:

- Perceived as an enabler for nurturing the kind of generation of students sitting in classrooms
- Technology as an enabler to perform duties effectively

- Makes life for some lecturers easy
- Makes lesson interesting

In this study, perception towards technology integration and subsequent use in the classroom as demonstrated by the empirical evidence and shows that generally, technology helps the lecturers to deliver content better. However, there are issues to be cautious of as a lecturer using technology in the classroom. In answering this research question, evidence from the empirical research results show that perception towards technology does not differ much across the different institutions, different faculties or departments, even across the differing generations of lecturers interviewed for the current study. Evidence gathered indicates a perception towards technology as an enabler, especially when used appropriately, and chosen to suit the circumstances in teaching and learning.

In this cluster, the prominent theme is ***student***, with associated sub-concepts of ***learn/learning, information, teaching, module***. ***Students*** have the highest connectivity percentage followed by technology, content, class, and then work. The other emergent themes such as ***classroom, time, able, learning, module, difficult, concept, slides*** and ***important*** have lower connectivity and relevance and therefore are not discussed concerning the findings in this cluster.

The ***students*** theme is directly associated with learning and teaching. For this cluster, the study shows that students are central to teaching and learning in the classroom. The lecturers demonstrated that they strive to use technology as a tool that can give them the ability to reach the current generation of students, who are technology savvy. Technology is used in the classroom in the hope that it will make students interested in lessons and will equip them to survive in the digital global environment. It emerged from this study that this was one of the motivations for lecturers to integrate and use technology in their classrooms.

Technology use is perceived as an enabler and an assistant for lecturers in the classroom environment. However, it is cautioned that it should be chosen well and used accordingly to achieve the required results. The use of technology allows lecturers to be efficient and able to perform their duties well.

To establish the answer to the main research question, and to determine *the generational identity elements that influence the successful integration of technology into the higher learning education*, this research study asked sub-questions and grouped them into two clusters of:

1. Integrating technology into the classroom
2. Perception of educational technology
3. The education sector as a network

Furthermore, questions were asked under each cluster to address the main research question. In answering these research questions, it is evident that generational issues were not mentioned as concerns for the lecturers. Only two respondents mentioned generational issues. The main generational issue revealed was towards the students. The respondents indicated that technology is integrated and used mainly because the current generation of students is perceived to relate and understand technology better.

The generation of students in classrooms today, just as the evidence is seen from this study, is the one which was mentioned by Prensky (2009). The generational aspect picked up from empirical results in this study indicates that the lecturers refer to this type of students as digitally savvy and that their needs for technology must be taken into account. The evidence here points to what was echoed by Prensky (2001) in his “digital native, digital immigrants” study.

In concluding this section, the researcher poses this question: *is there evidence to suggest that lecturers of different generations or ages perceive educational technology differently?* Evidence from data in this study are in line with what was affirmed by Constanza and Finkelstein (2015) that there is only small evidence to imply that generational variation in the workplace cause differences amongst such a workforce. This study replies that there is very little evidence that a lecturer aged 60 years (oldest participant interviewed) perceives educational technology any differently to a lecturer aged 24 years old (youngest participant in the study). Other factors such as the kind of students in classrooms, the correct use of technologies, willingness to explore technologies, training, the possibility

of differences across different faculties and other reasons influence the perception towards the integration and use of technologies in the classroom. The lecturers' perceptions highlight an important aspect of this study, which builds towards answering the main research question and addressing the problem. Another important aspect is the use of ANT to highlight technology integration in the education network and the next section outlines this aspect.

### 5.2.5 Research question 5: How can ANT explain generational identity aspects and technology integration in education?

This research question encompasses the development of the framework, which is addressed in the following section.

## 5.3 THE DEVELOPMENT OF THE FRAMEWORK

This section develops the generational technology integration framework, which highlights how the aspect of generations should be considered when integrating technologies for teaching and learning. Mishra and Koehler (2006) developed the TPACK framework that could be adopted by teachers as guidance for understanding the aspects of technology, pedagogy, content and knowledge, the framework in this study is aimed to expand an understanding of the education sector as a network that comprises generational humans and their subsequent interaction with non-human elements.

The framework has its underpinning from ANT, the Generational Theory and draws from the empirical findings. The sub-research question aimed to find out, ***"how can ANT explain generational identity aspects and technology integration in education?"*** Some aspects of this question were addressed in the analysis chapter using ANT. The development of the framework was initially built on considering only the first two moments of ANT, namely problematisation and interessement. The modified framework then added to the last two moments of enrolment and mobilisation. The translation moments, which are informed by the empirical evidence, are combined with aspects of the Generational Theory to produce the framework. The following discussion outlines the features of the Generational Theory that were considered for the development of the framework.

### 5.3.1 Elements of the Generational Theory

Studies on generations are numerous however, the Generational Theory devised by Mannheim (1952) remains prominent (Pendergast, 2009). According to Mannheim (1952:163), to study generational issues is to gain an *"understanding of the structure of social and intellectual movements".* He further stated that *"the sociological phenomenon of generations is ultimately based on the biological rhythm of birth and death. But to be based on a factor does not necessarily mean to be deducible from it, or to be implied in it" (*Mannheim, 1952:167)

Generational studies and definitions abound, this study utilises Mannheim's (1952) classification of generations. The following is a list of the tenets that make up a generation according to Mannheim (1952):

1. **<u>Generation Status (Generational Location)</u>** which the author explains as follows:

> *"In order to share the same generation location, i.e. in order to be able passively to undergo or actively to use the handicaps and privileges inherent in a generation location, one must be born within the same historical and cultural region." (*Mannheim, 1952:182):

Pendergast (2009) explains generational location as commonly placed individuals who share experiences and in turn have an influence on features that affect the way they think as well as their experiences. In this study, the generational location is associated with the higher learning institutions. It should be noted that the premise here is based on being in the *"same historical and cultural region"* as the higher learning institutions. The actors, regardless of their ages, share the same historical and cultural regions. As a result, the actors share the same experiences.

2. **<u>Generation as Actuality</u>**

According to Pendergast (2009), generational actuality entails being able to share and respond to the same social and economic circumstances, which ultimately influence how such events are experienced. Mannheim (1952:182) explains this tenet as an additional tenet to location which can be *"described as*

*participation in the common destiny of this historical and social unit."* In this study, the participants share a generational actuality.

### 3. Generation Unit

This generational tenet is said to be more concrete than the actuality component (Mannheim, 1952). Generational units are sub-groups within a generation (Pendergast, 2009). The generational units in this study can be seen as the different age classifications which were used to group different lecturers who participated in the study.

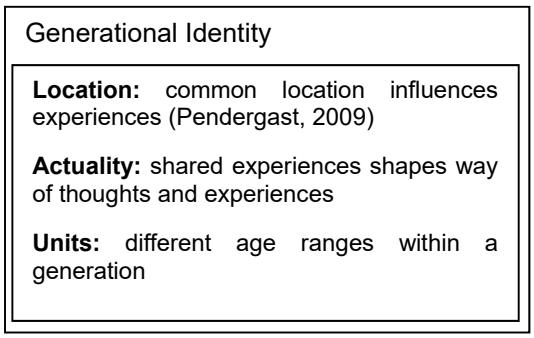



Figure 5.1 Generational identities. Source: Adapted from Mannheim (1952); Pendergast (2009)

Collectively, these tenets make up the concept of a generation as graphically presented in Figure 5.1. They make up the character of a particular generation and influences common patterns, attitudes, beliefs and value systems, especially in the workplace (Pendergast, 2009).

These tenets were subsequently combined with the ANT's moments as a reflection of what the generational lecturer entails. These Generational Theory tenets were incorporated based on how literature explains them, and not based on the empirical evidence. They were used as a way to enhance and reflect on the possible character of the generational lecturer in the education network. Twenge et al. (2010) assert that generational differences do exist, and can have an impact in the education environment. Clark (2017) identifies four possible generations who are in the workplace today. He specifies that these are veterans, baby boomers, generation X and generation Y currently employed. Once the generational identity has been specified, the next task is to determine the ANT's elements that make up the framework, and these are discussed in the following section.

### 5.3.2 Elements of ANT

The ANT elements are discussed on the foundation of the empirical results, which were discussed in chapter 4, as well as the literature which informs the theory. ANT authors deny the separateness of the social and the technical, and advocates that technology should not be viewed as a separate entity from the humans that use it. Both humans and non-humans should have the same treatment within a network that they exist in (Tatnall & Gilding, 1999). Latour (1996:370) asserts that technology and organisations are “ontological domains” that should not be viewed as related entities, and indicates that according to ANT, the two should be regarded as “phases of the same essential action”.

A network is described as a non-fixed structure that has actors who are forming alliances, in a structure which is unreliable and whose stability can be compromised (Tatnall & Gilding, 1999; Booth et al., 2015). The network can have new alliances being established between existing actors and those that are new in the network or even those who leave the network. This study views the education sector as a network that has a sub-network of the classroom environment. The alliances are formed between lecturers, students, training personnel, management, processes and procedures, subject content, strategic plans, generational construct as well as educational technology.

An important feature in the ANT theory is that the actors themselves should resolve the solution to a problem through negotiation and enrolment (Tatnall & Gilding, 1999). This is a process termed translation, which is the alignment of actors, a process that has four moments of problematisation, interessement, enrolment and mobilisation (Booth et al., 2015). The empirical results inform the proposed GTI framework by applying these results on the moments of translation and this as a way of addressing how the generational identity characteristics of the lecturers influence technology integration. This study, therefore, aims to deduce how technology integration can be influenced by the generational lecturers from aspects of the Generational Theory outlined by Mannheim as well as the aspects of ANT’s moments of translation.

The following is an account of ANT's moments of translation, which were adapted to create the framework. This section discusses how the empirical results inform the proposed framework.

### *Problematisation*

Problematisation is the first moment of the translation process and details how the main actor identifies the other actors who have the same interest (Booth et al., 2015). One of the important aspects of the problematisation moment is the establishment of the obligatory point of passage (OPP) or the "gatekeeper", a role assumed by the main actor, through which all actors pass (Booth et al., 2015). Figure 5.2 below outlines the identification of both the human and non-human actors.

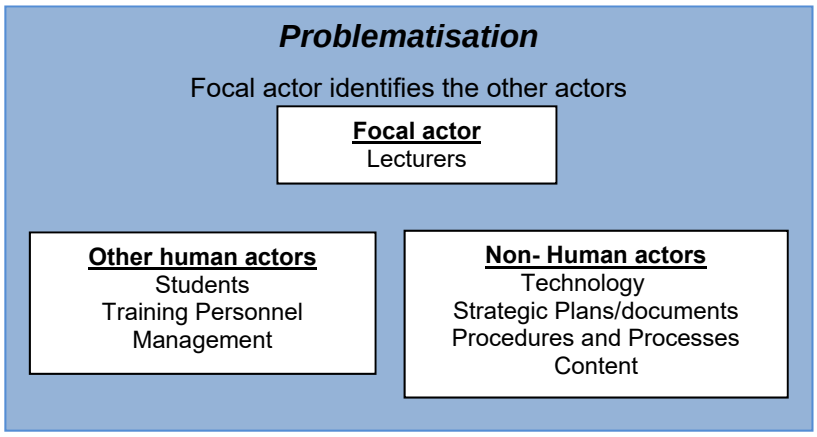



Figure 5.2 Problematisation: Identification of actors. Source: Adapted from Callon (1986)

The ***human*** theme emerged as prominent from the empirical results. This theme is directly linked to the concept of crucial in the Leximancer produced concept map in Figure 4.12 in chapter 4. This implies that the lecturers gave precedence to this element and viewed it as crucial within the actor-network. This view indicates that according to the participants even in the current digital era, the human aspect remains a crucial element. Comments such as the following validate this:

> "*…remember even if the technology exists, there has to fed content from somewhere, there has to be instruction from somewhere, some systems are already programmed but they still rely on humans to give content because it would never improve without humans…".* **(24 years, male)**

*"…there is always substitute for technology."* **(44 years, female)**

Some of the participants expressed that human and non-human elements play an equal role in the network. Out of the 34 participants in the study, 13 felt that both the human and non-human elements played an equally important role. The different generations of lecturers expressed this view, and no one generation dominated this view. They viewed these elements as *"interdependent", "intertwined", "interlinked", "integrated*", and that they *"co-existed"* because of the nature of the "interrelationship[s]" that existed between them. This is the view that is shared by the advocates of ANT, who emphasise the concept of symmetry, which states that the human and non-human elements assume an equal role or importance in the actor-network (Callon, 1986).

On the other side, some felt that even though they viewed the human element as more crucial, the non-human element would cause the most dysfunctional within the network if they were to be absent. This was evident in the following remarks:

> *"…given the era in which we are living in now, removing that non-human element would be disastrous…"* **(33 years, male)**
>
> *"…If we don't have non-human then how are you able to teach?"* **(32 years, male)**
>
> *"…We have been living without technology, but without technology now at this day and age we struggle a lot, so I feel like we need both…"* **(46 years, female)**
>
> *"…well I think both are crucial because I feel the one can't really function well without the other in my opinion, because if we were just looking at the human aspect alone without the non-human aspect the system wouldn't be complete, and the other way round as well…"* **(24 years, female)**

Only two participants felt that the non-human element plays a more crucial role in the education network. The following comments are evidence of this:

*"Non-human. It doesn't vary, it is what it is. It doesn't change, it doesn't have these feeling today and different ones the following day…"* **(46 years, female)**

*"But I too often feel that I am a victim or at the mercy of technology, it's like technology dictates to the human and I know it shouldn't be that way…"* **(60 years, female)**

The actors in this study are the following:

1. *Students:* they are taught the different subject content by the lecturers and use the technology as a medium for learning. Sometimes their use of technology in the classroom is debatable as it is often assumed that they sometimes use it for personal matters rather than for educational purposes. Technology use in the classroom environment is ideally meant to enhance their learning and make it effective, and make the delivery of content easy. The empirical evidence in chapter 4 has shown the student concept emerging as one of the main concepts from the Leximancer analysis results. This, therefore, reinforces the identity of this actor.
2. *Training personnel*: even though their role is not properly defined as the study did not put much focus on them. They are actors within this network as they are charged with the responsibility of training lecturers effectively on any educational technology used by the institutions. This actor is however mentioned on the basis of the provision of training on the new or emerging technologies. The training concept emerged as another important aspect of the empirical data and therefore reinforced the training personnel actor.
3. *Management*: these actors ensure that the strategic goals within the network are implemented effectively. This actor is not considered or mentioned much in the empirical evidence. However the researcher assumed that their role would be pivotal in the education network and therefore, would have to be included as an actor.

4. *Educational Technology/Technology*: a medium that is meant to deliver content for teaching and learning. The debate around the technology is whether it can be successfully integrated into the network to aid effective teaching and learning, and be the medium used to transfer content effectively. The analysis results indicated this actor as one of the main emergent concepts. This can be seen from the results in chapter 4.

5. *Strategy Plans*: are meant to be a direction which the network needs to follow in order to achieve its goals. The strategic plans play an important role because they were used as part of data for the content analysis. These were obtained from the websites of the institutions in this study.

6. *Processes and procedures:* are guidelines for effectively using resources within the network in order to achieve the strategic goals. Processes emerged as one of the concepts from the empirical results in chapter 4.

7. *Content:* this is meant to be delivered by educational technology and requires the lecturer who is competent and can use technology to effectively deliver content. Content was one of the emergent concepts from the data analysis.

Once the actors are identified, the OPP is established, which is the discussion in the following text.

***Obligatory Passage Point (OPP)***

According to Callon (1986) the OPP is the interest defined by the main actor, where all the identified actors taking part within the network need to pass through. Callon (1986) asserts that for the interest to be properly outlined, a series of questions need to be asked which correspond to each one of the identified actors. These questions eventually establish the identities of the actors and, therefore, the formation of the main actor as the OPP, the passage which the actors need to pass through in order to establish their goals (Callon, 1986). For this study these questions are as follows:

- **if the *students* hope to understand the content,**

  *"…it enables students to understand the content better…"*

  *"…can help them understand the content better…"*

  *"Students like it more, they become more interested in the content"*

- **if the *training personnel* hope to effectively transfer technology related knowledge,**

  *"They trained us on something specific…"*

  *"So we need a lot of training, so we can be able to use the equipment."*

  *"…continuous training. So that we do not lag behind…"*

  *"…there wasn't sufficient training…"*

- **if *management* hopes to achieve the technology/ICT related strategic goals,**

  *"The institution has opened an office locally… So that we do not lag behind…"*

  *"…they introduced this thing called Thuto. It has been quite useful, because I even hold discussions when I am at home…"*

- **if *educational technology* needs to be successfully implemented,**

  *"…so you sit with the process and it makes sense on paper, great everyone can use it and implement them correctly but after a while it serves no purpose…"*

- **if the *strategic plans* are to meet their strategic goals related to technology integration,**

  *"...ICT is an essential and important strategic resource for the University's scientific work…Accordingly, it is our aim to keep the University's systems abreast,…to deploy ICT as a strategic resource." (Institution A1)*

*"…increase student and staff technological competencies" (Institution B1)*

*"Develop and establish eLearning and mLearning…" (Institution A2)*

- **if *processes and procedures* are effectively followed in the use of technology,**

  *"…ways of communicating processes that open doors to understanding…"*

  *"…refine the processes and humans can simplify the processes and streamline the processes or procedures."*

  *"… the processes and the humans are equally important." "…the processes, are also just as important…"*

- **if *content* is to be successfully delivered using educational technology**

  *"…helps us to deliver content."*

  *"Without technology I don't know how I would deliver the content to the students."*

The actors must all establish whether the generational identity of the lecturers influences their contribution towards achieving the goal of successfully integrating technology into the classrooms for teaching and learning and that they all stand to benefit if they ally (Callon, 1986). This establishes the OPP of the network outlined in Figure 5.3.

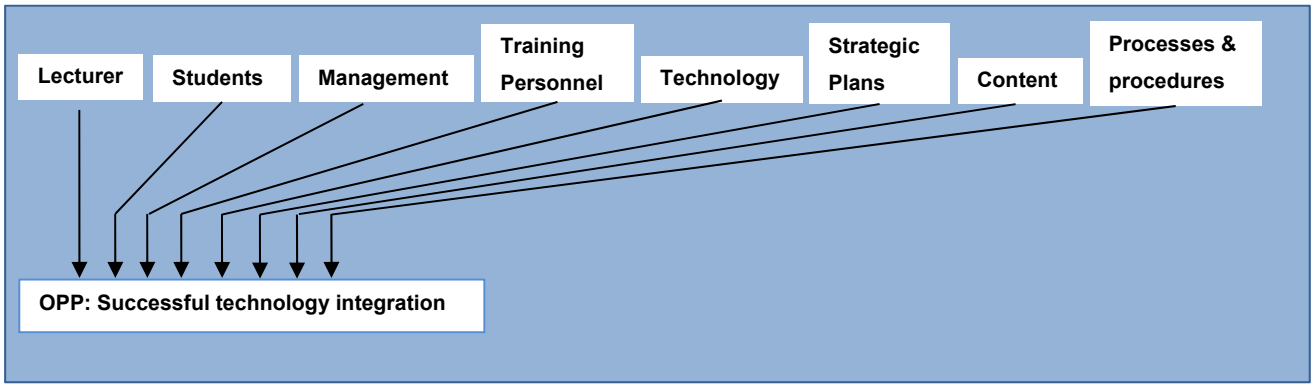



Figure 5.3 The Obligatory Passage Point (OPP). Source: Adapted from Callon (1986)

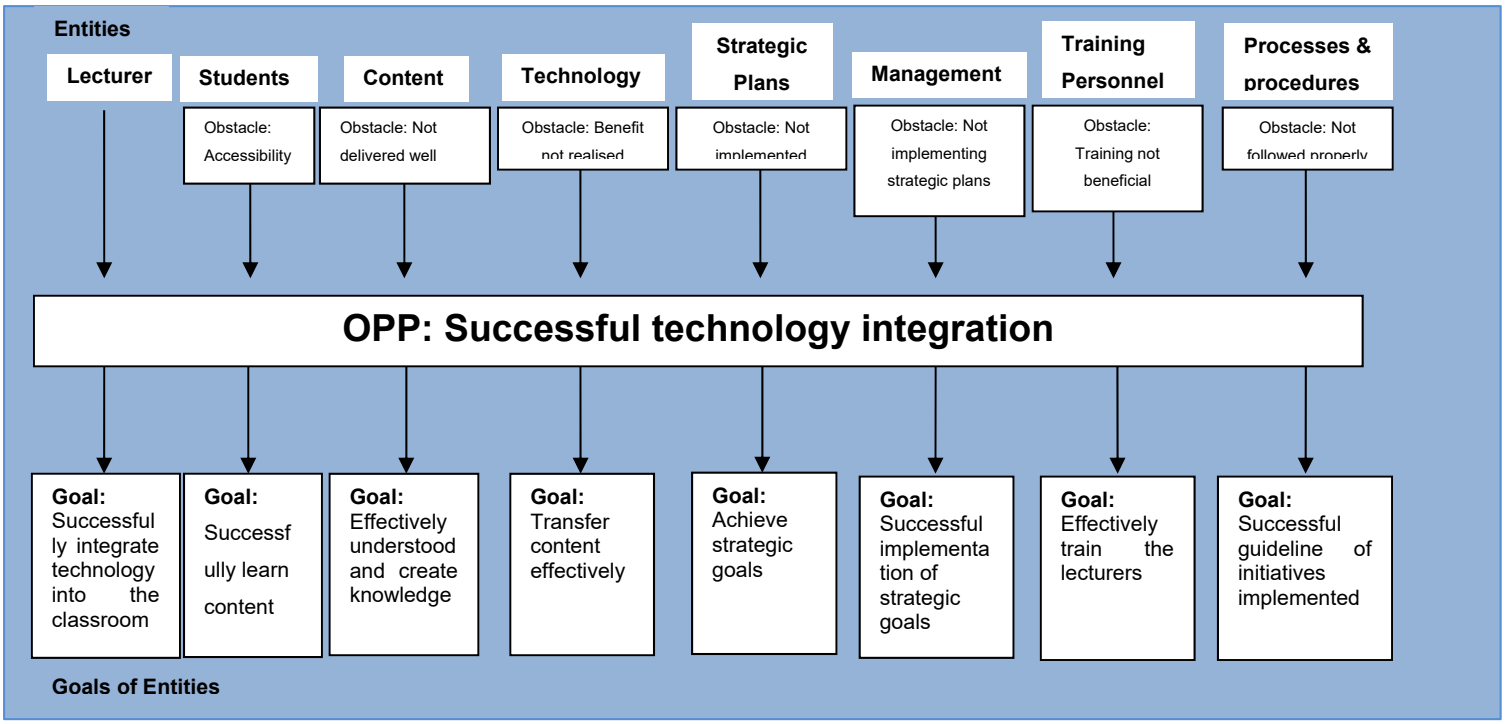



Figure 5.4 Alliances. Source: Adapted from Callon (1986)

Figure 5.4 shows how alliances and associations are established between actors within the network. The obstacles are indicated for each of these actors. The obstacles or problems can deter each of the actors from achieving their goals and therefore threaten the successful integration of technology into the classroom by the lecturers and threaten the stability of the network.

For the *students,* the goal is to understand the delivered content and gain knowledge from the content. However, their major obstacles are issues such as not having enough or sufficient resources, lack of accessibility, and not using technology as intended for the delivery of content. This can be seen from comments such as:

> *"…students nowadays they're distracted by elements that it, that technology brings, unless if they were restricted to do something else, to only focus on that meaning we have a network whereby certain things on their technology devices are restricted, then I would feel that it would be more effective…"*

For content, the obstacle could be an ineffective delivery and failure of students to understand and create relevant knowledge. *Technology* use in the classroom

network requires effective and proper use by both the students and the lecturers. The obstacle that may deter the success of technology use in the classroom can be that the benefit of such use is not recognised or is misunderstood. This can, therefore, affect how technology is used and negatively impact it from effectively transferring content into the classroom.

The *strategic plans* are created so that they can move an organisation forward strategically, but their lack of implementation can prohibit an organisation to grow in certain areas accurately. The greatest obstacle for strategic plans is lack of implementation or not being implemented properly which affects the achievement of the goals. The same can be said of *processes and procedures*. Their obstacle is when they are not properly followed, and this deters them from their goal of providing a guideline or roadmap for implementing and following initiates within a 'network'.

*Management* in any organisation assumes the role of leadership to drive the organisation into growth. It becomes a challenge when they do not successfully implement strategic plans, including effective technology use in the organisation. This prohibits them from achieving the strategic goals of the organisation.

The goal of the t*raining personnel* is to provide training to organisation's personnel, including the lecturers. This goal may not be recognised if the training offered is not effective or not beneficial to the intended trainees. This goal is related to the following excerpts:

> *"…prefer training, the reason why I say training is because it will eliminate a lot of time for me trying to learn on my own…"*

***Interessement***

The next phase in the translation process is the moment of interessement. The focal actor convinces the other actors that the interest they have set out for them is the acceptable one (Shim & Shin, 2016). In this study, the interest is the successful integration of technology by lecturers of different generations whose aim is to use that technology to deliver content effectively. Interessement is adapted into the GTI framework on the foundation of the "triangle of

interessement" as discussed in Callon (1986:63). This concept outlines how the focal actor locks the other actors into place by putting strategies and plans in place to block them from being interested in any other object's interest except their own. This is illustrated by Figure 5.5 below.

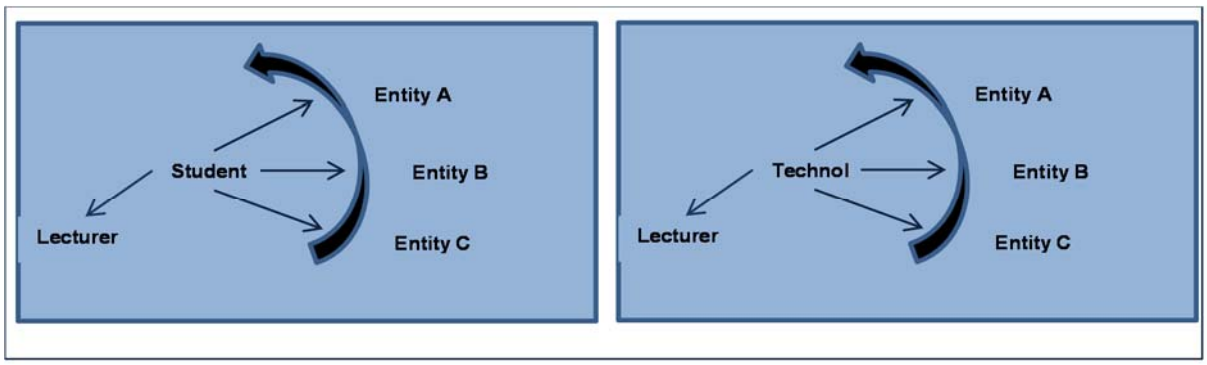



Figure 5.5 Interessement of actors. Source: Adapted from Callon (1986)

Figure 5.5 is a representation of what interessement would look like. This diagram demonstrates only two actors of student and technology as an example of how the process would look like. The diagram illustrates what Callon (1986) defines as the moment of interessement, and more specifically, the triangle of interessement. The bold curved arrow between the actor "student" and entities A, B and C is any form of strategy that the main actor "lecturer" uses to block the student actor from having any alignment with any one of the entities on the other side of the curved arrow. It should be noted that entities A, B and C could be represented by any interest besides that of the main actor. These entities are named A, B and C only as an illustration of the possible entities that may want to influence the student or technology actor. Callon (1986) also cautions that the numbers of entities being blocked off with the bold curved arrow can be more than the number represented in Figure 5.5, or they may be less or even none at all. It is also important to note that the figure only shows two actors being locked into place, and excludes all the other identified actors in this study simply because of a limitation of space. All the other actors have been shown in Figure 5.7. The following are some of the excerpts that were evident from the empirical data.

> *"It just to increase the interest of the students, to enhance it, to make it more interesting or attractive to the students..."*

*"...if you don't use technology to keep up, the students are just going to lose interest, because you just can't compete with Twitter and Facebook and Instagram."*

The discussion above was an outline of how the ANT's moments would be presented in the proposed framework in Figure 5.7. This was an account of how the empirical work informed the framework, as well as how ANT is explained in the literature.

Collectively, these actors make-up the actor-network. They form alliances specified by the main actor, the lecturer, who is defined by the generational identity, who locks them into place and specifies the interest for all of them. Figure 5.6 below outlines a high-level view of the problematisation and interessement. It reviews what is shown in detail in Figure 5.7.

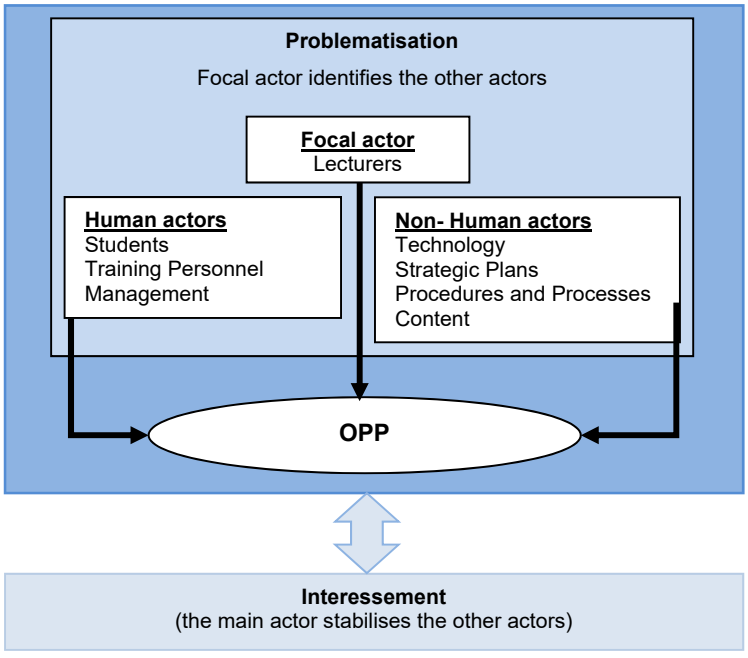



Figure 5.6 Problematisation and interessement diagram. Source: Adapted from Callon (1986)

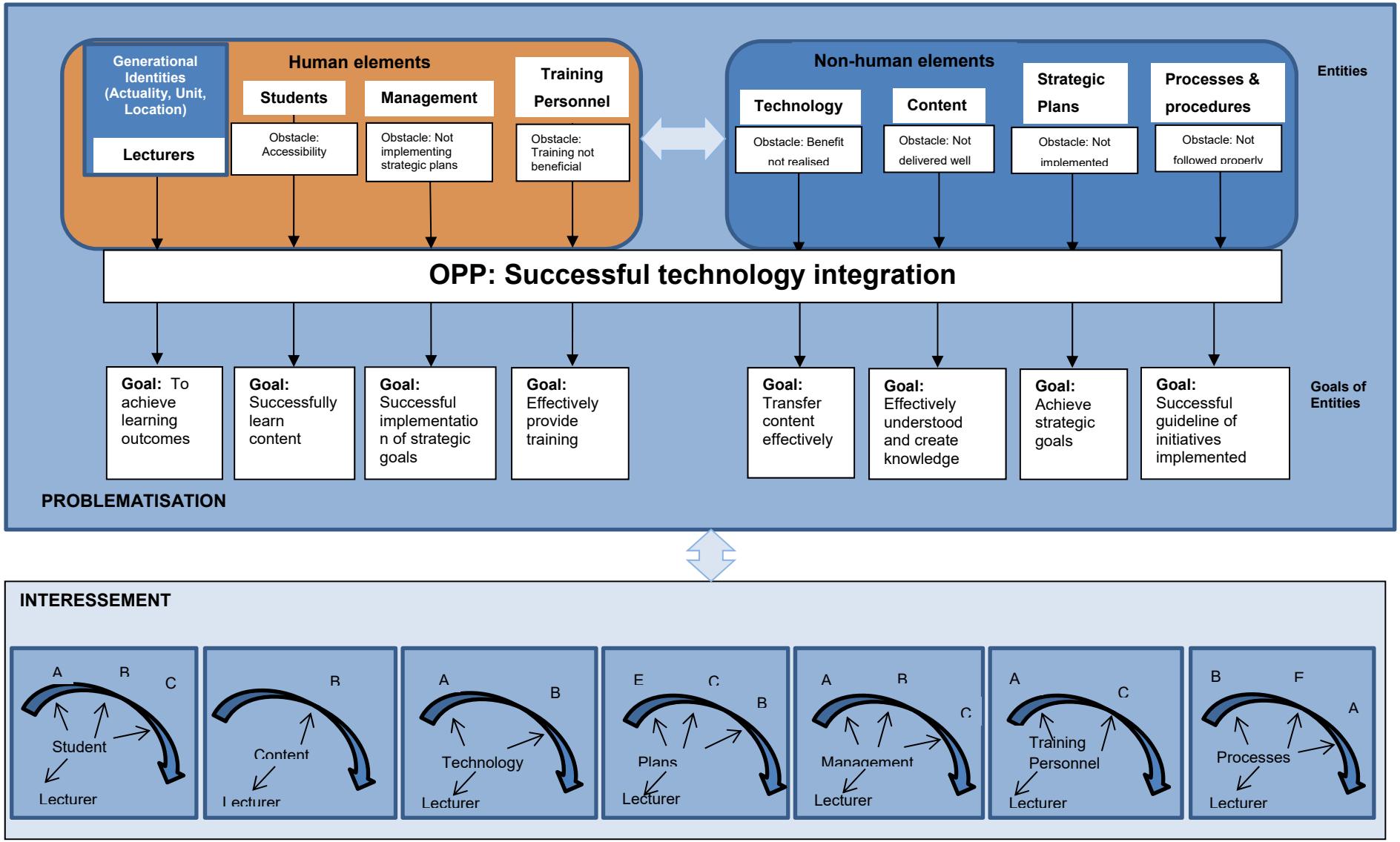



Figure 5.7 Generational technology integration framework. Source: Adapted from Callon (1986); Mannhein (1952); Pendegast (2009)

Figure 5.7 graphically outlines the generational technology integration framework. The figure shows a network of human and non-human actors. The first part of the figure is the problematisation of the network. It highlights the main actor, being the lecturer, who is characterised by the generational identity, being the one that becomes the OPP with the interest of the successful integration of technology into the classroom. The OPP is the gateway through which all the other actors have to pass, with their interests being aligned to that of the main actor. The problematisation moment highlights the obstacles that each actor may face once their interests have been aligned to that of the focal actor. The figure also shows the goals that each actor hopes to achieve once they have aligned their interests with that of the focal actor by passing through the OPP.

Once the actors have been through the problematisation moment, the next moment in the framework is the interessement moment. At this moment, the focal actor locks the other actors into place by blocking them off from having any alignment with any other entity and therefore stabilising them. This way the focal actor makes sure that the other actors' interests are kept in alignment with their own. The network stability depends on this because once the other actors' interests are not aligned with the focal actor's interests, this can destabilise the network. The framework is built on the background of the focal actor, being the lecturer, having generational identities, having an interest of successfully integrating technology into their classroom within the education network.

## 5.4 VALIDATION OF THE CONCEPTUAL FRAMEWORK

Validity in qualitative research studies is not as straight forward as it is in quantitative studies (Creswell & Miller, 2000), because qualitative research lack structured procedures related to validation (Golafshani, 2003). Literature suggests several strategies that can be used by qualitative researchers to achieve credibility in their studies (Morse et al., 2002) due to the importance of verifying the quality of research (Golafshani, 2003). The emphasis of validation in qualitative studies is placed on assuring valid research that can be relied on (Maxwell, 1992). To validate a research study is a way of presenting the findings

of a study in a manner that accurately reflects the true nature of the phenomenon being investigated (Golafshani, 2003).

The framework was validated by being presented to three expert reviewers in the field of IS. These are lecturers, each of whom fits into one of the three generational groupings previously shown in chapters 3 and 4. These reviewers had not participated in the initial data collection of the study. This was to ensure that they could provide an objective view and yet critical feedback of the study and the proposed framework. The following is an account of their feedback and comprises of their suggestions and comments. After an overview of the feedback, the next section is incorporation of their reviews and the subsequent modification of the GTI framework.

### 5.4.1 Comments and feedback from reviewers

The framework was presented to the reviewers on a one-on-one basis, a discussion, question and answer session took about 45 minutes with each reviewer where the general study and the initial framework were presented. The reviewers are labelled as reviewers 1 to 3, with reviewer 1 representing the generation of people aged 20 to 35 years old, reviewer 2 for the 36 to 50 years category and lastly reviewer 3 for the generation of people aged 51 years and above. The following is the feedback on the framework.

> *"…that* ***aspect [the other two moments of translation] needs to be addressed*** *because these [the first two moments] sets the scene, as if we have identified the actors" "…ANT needs to address the environment, just general environment…."* **(Reviewer 1)**
>
> *"…from the human aspect in the education system, the goal of the lecturer will be to successfully convey content in such a way that students will be able to meet their learning outcomes.* ***How they do that is by using technology and how I choose to do that is dependent on me, and so the Generational Theory will then tell me what makes me, me.*** *So that depends on my experience, my exposure to technology, how I feel about technology, how I have used it before or haven't used it, and then it will also be about the type of content that we need to convey,*

*and is it possible to, how can we experiment with the different types of technology to use to convey the message…"* **(Reviewer 2)**

*"one thing I am missing there, and I am thinking now of another model we have build, we do have the training personnel there, but one thing that's very important to me in terms of how people deal with technology, and how easily they would accept it is their own level of knowledge….you can say there,* ***level of knowledge and experience****…if its not there you can try to integrate it into your model…"* **(Reviewer 3)**

The discussion below outlines the reviews about the different components of the framework:

The Actors:

**Actors**

*"There is an actor missing, and you might tell me where they would fit in,…the* ***provider of the technology****…and in our case we interact a lot with whoever provides the technology to ensure that the technology enables you to do what you need to do. In our case this would be people who work in the lab to make sure that the functionality is included…the training specialist to me is different, there is people who need to train you how to use the technology, and the people who need to make sure that they provide the infrastructure" "the provider is an important aspect because the provider…management will interact with the provider to say that we have a need for this technology and therefore bring in that technology with the following specs…and the ability of the provider to satisfy the technological requirements determines how able you are to achieve your goals…but then on top of that, once you have the technology intact, technically the technology is able to give you what you need, then you need the training personnel or specialist to help you understand how to use it."* **(Reviewer 1)**

The following reviews were done with regards to technology:

*"the availability and also the readiness of the technology, what I mean by availability I mean that things are working…if it is not working it becomes the lecturers' problems because then the students will come to complain on the technology, which you tell them to use…"* **(Reviewer 3)**

*"…you get to a point where you tell the people [students], let's go back to the basics, and ignore the technology because it's giving us trouble…"***(Reviewer 3)**

*"we are talking about two extremes, we got low tech and high tech, the high tech is the place to go, because we all want to use high tech, good technology, advanced technology, to make our lives easy and that of the students, but the more problems you got with this high technology environment, the more you move to low tech, eventually back to paper work, it's not good to do that but it's one of the reasons why people go low tech, is because of the possibility of a very negative environment, where the technical support, there is no training, the training is poor, so what you do as a lecturer, … so what you do is, the moment they struggle, …eventually they just go as low tech as possible, in order to cut out trouble…it impacts on you"* **(Reviewer 3)**

Reviews of the content:

*"it depends on the content, in our case the technology significance becomes a lot higher because or more important due to the nature of what we are teaching, vis other modules, that technology just becomes an enabler or another channel through which you impart the content, whereas in our case the technology is one of the only ways, we need the technology otherwise we wouldn't be able to successfully get the content across."* **(Reviewer 1)**

The general generational aspect from the reviewers was:

"…*I think so, yes [it has to do with the generation of the lecturer],…like me for example, you get to a point where you don't want to struggle with these things [technology]…" "…sometimes you get the feeling that*

*my work becomes a lot because of the technology…my message to students now is, I want a hard copy and then I can mark it…sometimes I hate to mark on the screen I prefer a document in front of me…so it differs from generation to generation, you see my son would love to work on the screen, he hates paperwork, so I think yes, generations do have a preference in terms of that…*" **(Reviewer 3)**

The different reviews from the lecturers who took part in the validation process are outlined in the previous excerpts. The result of the review of the GTI framework is the addition of an actor as per reviewer 1's suggestion. This means that the framework will have an extra human actor called ***"provider of the technology"***. This additional actor's role would be to liaise with the trainer and management. This actor would need to provide the technology and even provide training for the institutions' training personnel. The identification of this new actor occurs and becomes part of the problematisation moment.

Another significant suggestion was that there needs to be a "feedback" loop that needs to be considered in the third moment of translation. The details about this loop are provided in later text.

***Interessement***

One of the comments was to explain what the main actor blocks in place on the basis of the "triangle of interessement" which entails the main actor locking other actors in place by blocking them off from being interested in other interest except that of the main actor (Callon, 1986).

To encompass this question, the following are some of the comments from the empirical data that explain how the "triangle of interessement" was informed by the data. One of the ways to "lock" students into place is evident through some of these comments:

*"…certain things on their technology devices are restricted, then I would feel that it would be more effective…"*

*"…students have access to technology, and if that access is not guided, it doesn't really result in learning, it results in abuse…"*

Students need to be blocked off from distractions that would inhibit them from using the successfully integrated technology for other reasons other than learning. Lecturers need to be able to find ways that would reduce the chances of distraction that can be brought about by the integrated technology into the classrooms. One of the ways mentioned is the restriction of certain elements in their technological devices as well as proper guidance from the lecturer.

The following is a suggestion from one of the reviewers on how management can be "locked" into place.

> *"…let's say how the lecturer blocks off management interest from those interests of the students to make sure that the management is still hitting its target and students are still heading towards their goal in terms of the specific successful technology integration objective…."* **(Reviewer 1)**

***Enrolment***

The initial framework excluded the last two moments of translation (enrolment and mobilisation). All of the reviewers suggested that these last two moments should be incorporated into the revised framework, and this section outlines how literature and the empirical data informs these two moments and their eventual addition onto the framework. As indicated in chapter 4, enrolment entails the process of constant negotiations between the main actor and the other actors (Callon, 1986). One of the reviewers (reviewer 3) suggested that enrolment could be reinforced with a "feedback" loop. In this way, the loop allows further negotiations and an understanding of what can keep and lock the other actors into place. The reviewer explained it in the following way:

> *"…you need to have a feedback loop…you have student, and you have lecturers…you need a sort of a feedback loop, where the lecturer is learning the technology, which he or she is integrating and using and the students as well…if you get feedback, as you are going through the learning experience as well and then you become more familiar with the technology it becomes…an ongoing learning circle to you and the student, which is also important." (***Reviewer 3***)*

The enrolment phase informs the framework in the following ways:

***Students*** need to be negotiated into using the integrated educational technology for learning content and not for their reasons.

> *"...can hinder their engagement as well because they are on the tablet, I mean on social networks, or talking to other people via WhatsApp, it can be disengaging that happens, and trying to get off of it is pretty much impossible."*

***Management*** negotiations take occur through the constant strive to enforce the ***strategic plans*** through the use of proper ***processes and procedures***.

***Training Personnel's*** role is to provide up-to-date training on latest available educational technology constantly.

***Technology*** the negotiation could take place with the object material such as the infrastructure.

> *"...but the problem was the internet was always too slow. So everything would bomb out, something that should have taken two minutes to just type in search would have taken too long. And so it really hampered my ability to bring the real world into the classroom."* **(female, aged 31 years old)**

***Content*** is delivered through technology platforms and is, therefore, negotiations include constant updates on content to keep abreast with sufficient and required knowledge.

The process of enrolment is informed by the negotiations that the main actor has with the other actors. Enrolment entails that the actors' roles are defined and coordinated (Tatnall & Burgess, 2002) and can only be achieved if interessement leads to successful results (Callon, 1986).

***Mobilisation***

The constant analysis of the initial agreement with the actors. How the lecturer would manage the relationship with all the other actors. The following is an account of how each other goes through the mobilisation process.

***Student:*** making sure that technology is used for disseminating content and not social use.

***Training Personnel:*** continued training to enhance knowledge and skills.

***Management:*** constant enforcement of the strategic plans.

***Technology***: new and upcoming technologies.

***Strategic Plans:*** constant familiarity.

***Processes and procedures:*** adherence to them in order for successful technology integration and use.

### 5.4.2 The modified GTI framework

The initial GTI framework was outlined in Figure 5.7 and only used the first two moments of translation. The modified GTI framework is shown in Figure 5.8 and encompasses all four moments of translation. The modified framework includes an additional actor suggested by one of the reviewers in section 5.4.1. He suggested that this actor is the "*technology provider*" who provides the technology to the educational institutions. This actor has constant interact with the training personnel, technology as well as the management in the institutions.

The modified framework encompasses the last two moments of *enrolment* and *mobilisation*. Enrolment entails that the main actor constantly negotiates with the other others to re-affirm their roles within the network. One of the reviewers suggested that this could be in the form of a feedback loop. Mobilisation on the other side is how the main actor keeps constant analysis of what was initially agreed on between the main actor and all the other actors. An outline of the modified framework is shown in Figure 5.8 below.

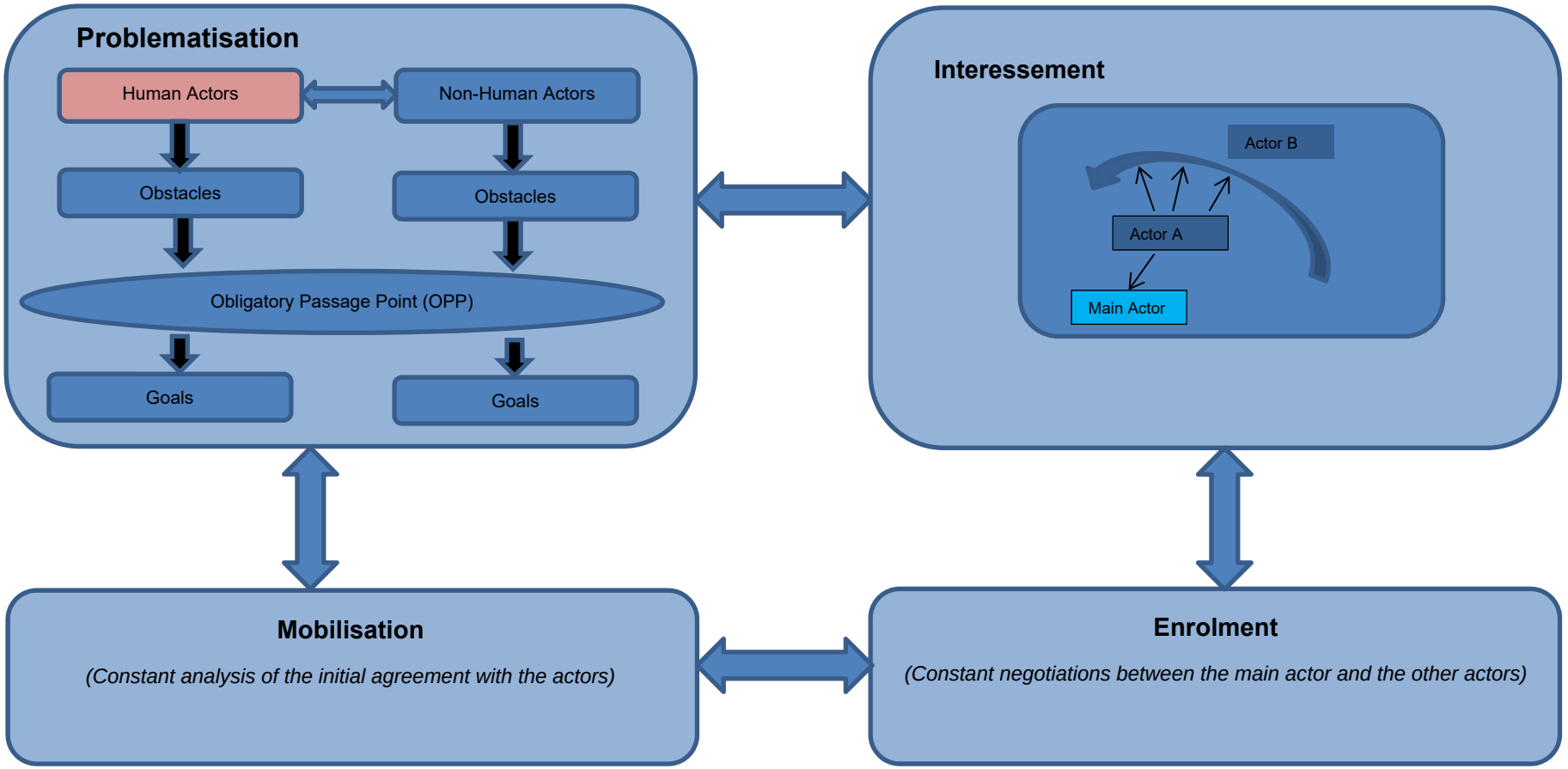
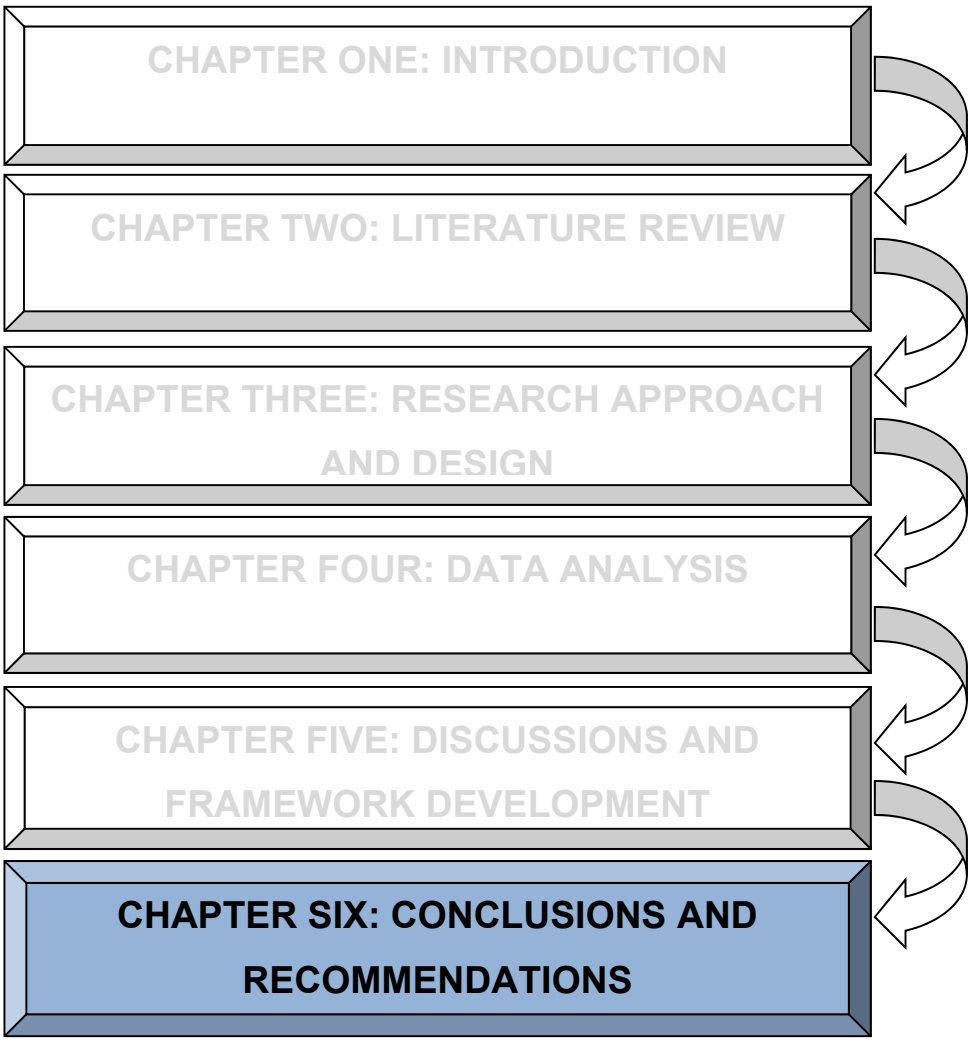



Figure 5.8 Modified generational technology integration framework. Source: Adapted from Callon (1986); Mannhein (1952); Pendegast (2009)

## 5.5 CONCLUDING SUMMARY

The use of technology differs across the different faculties, with other faculties using it more than the others. This research study discovered that based on the comments of the lecturers of differing age groups, there was not a huge difference in how they integrated technologies into the classroom for teaching and learning. Just as echoed by Nakai (2015), this study found out that there was not much of a difference in the way the various lecturers integrated and used technology in the work environment for teaching and learning. It was a range of other factors discussed in the previous sections that had an impact on how lecturers of differing generations used educational technologies. This is also evident in the study by Constanza and Finkelstein (2015). These authors assert that there is evidence from empirical studies to suggest that there is a difference in how different generations perform their duties in the work environment. This is also seen in the study by Biermeier-Hanson and Baltes (2016) which investigated generational differences in attitudes at the workplace.

This chapter developed the generational technology integration framework. The framework is adopted from aspects of ANT and Generational Theory. The framework highlights the different actors within the network and how they form alliances based on the OPP. The OPP assumes the role of the gatekeeper, a role that was taken by the lecturer, who is also the main actor. The initial framework used the first two moments of ANT and was eventually modified to include all four moments of ANT's translation. This was done after a consultation session with three reviewers who were consulted to review and validate the study, with special attention to the framework.


CHAPTER ONE: INTRODUCTION
CHAPTER TWO: LITERATURE REVIEW
CHAPTER THREE: RESEARCH APPROACH AND DESIGN
CHAPTER FOUR: DATA ANALYSIS
CHAPTER FIVE: DISCUSSIONS AND FRAMEWORK DEVELOPMENT
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

# 6 CONCLUSIONS AND RECOMMENDATIONS

## 6.1 INTRODUCTION

This chapter summarises and concludes the findings of each secondary research question, as well as the overall summary of the main research question. Recommendations for future research are then presented and then the summary of the chapter and concluding remarks are addressed.

The purpose of this research study was to investigate the influence of generational identities of lecturers on the integration of educational technologies for teaching and learning and, ultimately, the development of a conceptual framework as a contribution towards knowledge. The investigation was carried out by examining the various ways in which the different generational lecturers integrate different technologies, mainly educational technology into class. Furthermore, an investigation into the different perceptions about educational technologies was carried out and finally an inquiry into the education sector as a network that comprises of human and non-human elements.

To achieve the objectives of this study, an interpretive case study, based on three educational institutions based in two South African countries was carried out. Data was collected through semi-structured interviews with the lecturers of various generations who are teaching different subject disciplines. Actor-Network Theory (ANT) was used as a theoretical underpinning and to analyse the data. ANT and the Generational Theory were adapted to develop the ***generational technology integration*** conceptual framework. To achieve all of this, the following main research question and five sub research questions were asked:

**Main research question:**

*"What is the influence of the generational identity elements on a lecturer's ability to successfully integrate technology into the higher learning education?"*

Sub research questions:

- *Why do lecturers integrate technology differently?*

- *What individual preferences cause differences in integrating technology into the classroom?*
- *What are other factors responsible for technology acceptance in the education environment?*
- *What are the differences in perception and use of technological advances by lecturers of different generations across the different faculties or departments?*
- *How can ANT explain the generational identities and technology integration in education?*

This chapter outlines the concluding remarks for each of the sub research questions and eventually shows how they all contributed towards answering the main research question. This is discussed in the following sections.

## 6.2 CONCLUSIONS TO SUB-RESEARCH QUESTIONS

To carry out an investigation of this study, the sub research questions were split into clusters. Questions one and two were addressed by interview questions in section B, where the objective was to establish how technology is integrated into the classrooms. Sub questions three and four were in section C, which dealt with the perception towards educational technology by the different lecturers. Section D of the interview questions addressed the ANT related questions whose inquiry was to understand the education sector as a network of human and non-human actors and the subsequent development of the framework.

### 6.2.1 Research question 1: Why do lecturers integrate technology differently?

According to the empirical results of this study and the reviewed literature, several reasons can lead or encourage a lecturer to integrate educational technology differently from another lecturer. Firstly, competency levels indicated by lecturers did not translate into motivation to integrate and use technologies into the classroom. This study discovered the competence to use technologies in general. All, except for one participant in this study, viewed themselves as competent to use technology in and out of the classroom. Competency levels were considered on conditions of self-efficacy of each participant to assess whether they felt competent and therefore felt

confident to integrate and use technologies in their respective classes. The findings indicate that self-efficacy towards the use of technology does not necessarily translate to interest and ultimate use of educational technology.

Secondly, an understanding of educational technology and the meaning attached to the concept was established. According to empirical findings, the meaning attached to educational technology reveals that the individual lecturers view technology as a tool that eases the process of teaching, a way of advancing the learning process, a way to better content delivery as well as a tool that aids teaching. The various descriptions indicated the value that some of the lecturers placed on educational technology.

Thirdly, the study showed that training on educational technology was perceived differently by different lecturers. Literature suggests that sufficient training enables an appreciation of technology and can encourage trained teachers to integrate technology into their classrooms (Adedoja & Abimbade, 2016; Saxena, 2017; Soleimani & Arabloo, 2018). Additionally, training should be offered on the actual educational technology being introduced, as well as training on how to integrate the technology into the classroom (Adedoja & Abimbade, 2016). In most cases, training is offered for technology comprehension and not on how to integrate it (Zhao & Bryant, 2006).

This study discovered that training, as one of the emergent themes had a direct association with learn as a sub-concept on the Leximancer produced concept map. This association signifies that training offered on educational technology is related to learning. In general, training for lecturers is perceived as a way for them to learn how to effectively use technology. Despite this, the study discovered that some lecturers felt that training was a waste of time, while others felt they were competent to self-train because they are technology savvy and do not need anyone else to teach them on new technologies. Other lecturers revealed that besides being in technology-related discipline, they still require some form of training and then to self-teach and practice on their own at a later stage.

This research question aimed to address the following objectives which were outlined in chapter 1:

- *To explore if generational differences influences the way the lecturers engage and interact with educational technology.*

and to:

- *To understand the different tenets of generational identities that can impact the ability to explore and integrate complex components of a technological initiative.*

Empirical evidence suggests that generational differences have little influence in the way lecturers engage and use technology. The first objective was visibly addressed and, therefore, indicates that generational differences do not influence technology integration and use. This means that the second objective could not recognise the generational identities that could potentially impact technology integration. The empirical evidence indicates that generational differences do not impact technology integration.

The lecturers were each asked to indicate their competence and interest to use technology in and outside class. The responses to these questions are outlined in chapter 4, section 4.4.1, in Table 4.4. The general findings indicate that generational differences do not have an impact on the competence and interest of the different lecturers. In terms of self-efficacy, the results did not link generational differences to either competence or interest to use technology.

Two participants mentioned the generational aspect and how lecturers interact with technology. One participant, aged 33 years old, who is in information technology discipline, indicated that because she is younger than her colleagues, the digital era that she grew up in gives her more leverage in terms of technology comprehension and use. On the other hand, another female lecturer, aged 31 years old, in a humanities discipline indicated that she is personally a late adapter, therefore takes time to comprehend and use technologies in her capacity as well as in her classroom.

The aspect of generations was mostly highlighted regarding the students. This study discovered that generational issues are mostly linked to the students since they are a generation surrounded by technology, therefore, technology integration and use engages and keeps them interested in the content.

The third objective addressed in this question aimed:

- *To explore the advanced and complex components of educational technology*

This objective was addressed to a certain extent. This is because, despite the inquiry about the advanced and complex educational technology use, only a few lecturers use advanced technologies in the classroom.

The advanced and complex technologies refer to the specialised technologies that are integrated and used by the different lecturers in the classroom. Findings indicate that most lecturers use Microsoft PowerPoint slides for projecting (with only a few using narrated PowerPoint slides), YouTube videos, and the internet for searching for information. Out of the 34 respondents, only a few used specialised technologies, mostly in the form of software packages. These included rapid miner for a data mining module, software for simulation in electronics, Adobe Indesign for a graphics and communications module, animal modelling and training systems (AMTS) for animal science course and Microsoft Visio for information systems. One lecturer indicated that he would prefer to use specialised GIS software but did not use it due to a lack of access. One other lecturer pointed out that he used to have specialised software in his genetics module but decided to discontinue its use because they felt as a department that there was no need for the use of specialised technologies in their classes.

***Specialised*** emerged as a sub-concept directly linked to the emergent theme of ***use***, as well as a direct association to the sub-concept called ***software***. Educational technology is predominantly in the form of software packages. The study revealed that only a few lecturers use specialised or advanced technologies, while others have decided to stop using such technologies in the classroom. Basic and administrative technologies are still predominantly used.

### 6.2.2 Research question 2: What individual preferences cause differences in integrating technology into the classroom?

The findings for this question revealed a variety of preferences by the lecturers in relation to technology use in the classroom. The most preferred technology used emerged as Microsoft PowerPoint for projecting, YouTube videos and the use of the

internet to search for information. Individual preferences that emerged from the findings include, for example, one lecturer indicating that technology use has improved student interest in her classes due to use of improved visuals and internet searches for current affairs have made her course relevant and current, while most of the lecturers indicated that learner management system (LMS) is the preferred platform to communicate with students and to transfer resources.

The findings further discovered that some lecturers prefer to use technologies that have been recommended by their colleagues with the belief that such technologies will enhance the way they interact with students and how they deliver content in their classes. Examples of these technologies are Socrative and Kahoot. This research question's objective was:

- To explore the different ways used by lecturers to integrate technology into classrooms for teaching and learning.

The goal of this objective was realised when it was evident that the lecturers integrate technologies into the classroom based on the requirements of the subject being taught and on the basis that the technology would enhance and improve student interest in the subject matter.

### 6.2.3 Research question 3: What other factors are responsible for technology acceptance in the education environment?

The findings for this question showed that the following aspects sometimes influence technology acceptance:

- When technology is used correctly, it is seen as a useful tool that can enhance and promote effective teaching and learning.
- Technology can be an assistant to the lecturers and therefore help them to solve problems that they face, which in turn becomes practical for them to use it in their classrooms.
- The nature of the current students in classrooms today and the realisation that most of them have an adoration for technology which has moved from the

traditional teaching methods can be an incentive for educators to accept and use technology in order to keep abreast with their students.

- Willingness to explore more technologies so that students can benefit from what will be discovered.
- When faced with challenges such as prolonged protests that inhibit access to the physical classroom, technology can become the only life-line which would allow learning and teaching activities to continue. For one institution, this became a reality when students had a protest and access to the university campus was restricted. The use of technological means became the only means of communication, transferring learning resources such as notes, assignments and tests.

This question aimed to address the following objective:

- To determine the effective way of integrating technologies with existing pedagogy and content.

Empirical evidence from this study suggests that lecturers see the integration and use technology in their classes as a useful tool that can assist them to deliver content effectively. Technology can also aid in the learning process particularly during protests, which inhibit the direct physical interaction with the students. The effective way suggested by the research is to ensure that technology is used correctly and that it is in-line with the needs of the students by exploring more available technologies.

### 6.2.4 Research question 4: What are the differences in perception and use of technological advances by lecturers of different generations across the different faculties or departments?

The technology was negatively perceived as a tool that adds immense stress for one lecturer who felt that she would have liked to use technology without effort but finds it stressful to use in her classes.

Positive perceptions about technology included the following aspects:

- To use technology allows students to get more engaged with the content and also enriches the learning experience for them.

- Globally ready students who can thrive in the current digital global landscape.
- A tool that enriches the learning process.

The objective linked to this question was:

- To determine the influence of perceptions and the ability and willingness to integrate technology into the classroom environment.

Technology is perceived as a way that can help engage the students better in their learning process.

### 6.2.5 Research question 5: How can ANT explain the generational identities and technology integration in education?

The objective of this research question was:

- To explore the education system as a 'network', on the foundations of the Actor-Network Theory (ANT) moments of translation.

To discover answers to this question, the questions that were asked, were grouped under the "education sector as network" cluster. The empirical results from the data showed that the human theme emerged as the most prominent theme. In this background, it would, therefore, appear that the participants consider the human element as more crucial within the actor-network. This assumption is because a sub-concept called crucial was directly linked to the human concept.

To further address the objective of this research question, the generational technology integration framework was developed to explain the aspect of technology integration. The education network was explained as an environment that is comprised of symmetrical human and non-human elements that pass through the obligatory passage point (OPP) with their goals being aligned to that of the focal actor. This question was answered mainly by adapting the two moments of ANT's translation into a framework that mapped out how the theory can explain the integration of technology into education.

This question collectively with the other four aimed at addressing the main question, which is dealt with in the following section.

## 6.3 CONCLUSIONS TO THE MAIN RESEARCH QUESTION

The work environment is today predominantly comprised of three generations of the baby boomers, generation X and millennials/generation Y (Lu & Gursoy, 2016; Pendergast, 2009; Twenge et al., 2010). These generations are named in a variety of ways and the ages range differently throughout literature studies. This study opted to classify the respondents into three groups of ages that could be representative of the current workforce.

To address the main research question, empirical results from the analysis, literature review, and ANT theoretical foundation were triangulated to answer the question and to develop the generational technology integration framework. The framework was developed on the underpinning adapted from two of the four ANT's moments of translation to outline the different actors and the process that they go through in the education 'network' to achieve the goal of successfully integrating technology for teaching and learning.

The cluster of ***integrating technology into the classroom*** which comprises sub research questions one and two investigating possible generational issues and their possible impact on the successful integration of technologies into the classroom. The themes that emerged from the data and eventually formed the findings in this cluster and the literature suggests that belonging to a particular generation does not impact the way one integrates technology into their classes.

Instead of issues about generational differences, other factors emerged that can potentially affect one from successfully integrating and using technologies for teaching and learning. ***Use*** and ***technology*** emerged as the prominent themes in this cluster. Findings indicate that confidence in the use of technology, the meaning attached to educational technology, training issues, perception related aspects such as technology being perceived as an enabler, and an assistant were discovered.

The second cluster of ***perception of educational technology*** consists of sub-research questions three and four. The inquiry under this cluster was to establish whether perceptions of the different generational lecturers suggested that they view technology use in their classrooms on the backdrop of their generational identities.

Technology in the classroom was perceived as an assistant, a way to create globally ready students, a tool that could potentially enrich the learning experience by improving the delivery of content, but no indication suggested perception of technology is based on one's age or the generation they belong to.

It was indicated by other lecturers that technology use in the classroom should be used with caution and that lecturers still need to apply their minds and to choose appropriate technologies for the classroom environment. One observation showed that technology use in the classroom could create a barrier between the lecturer and her students. Empirical findings indicate that ***students*** are the central focus of the lecturers. Most lecturers perceive technology as an enabler that allows them to deliver content effectively and easily.

The framework outlines how the education sector becomes a 'network' of human and non-human elements, working together to achieve the aim of the successful integration of technologies in the classroom. The main actor, who is the lecturer, aims at integrating technology into the classroom for the delivery of content. The lecturer becomes the OPP, which all actors have to pass through in order to achieve their goals. The lecturer becomes the OPP by associating their interests with those of the actors so that their interests are aligned.

## 6.4 RECOMMENDATIONS FOR FUTURE RESEARCH

This section outlines recommendations for future research. The following is a list of recommendations from this research study:

- A study based on institutions based in non-urban areas, with limited ICT infrastructure, is recommended.
- This study focused on the component of age or generations. A study that focuses on the aspects of gender and subject knowledge of participants is recommended for future research.
- One of the findings from this study was that technology use in the classroom could cause a distraction for students. Further research can be carried out to investigate how to manage the use of technology in the classroom once it is integrated.

- A comparative study is recommended, one which will focus on technology use and integration between private and public institutions of higher learning.
- A study that uses the GTI framework as an analysis tool.

## 6.5 CONTRIBUTION TO KNOWLEDGE

- An academic contribution to knowledge in the discipline of informatics in the focus area of education and the integration of technology into the classroom in higher institutions in Southern African countries.
- A limited number of studies have addressed the issues of generations and the integration of technology in higher learning environments, which this study was able to achieve.
- The conceptual framework developed uses the tenets of Generational Theory and adopts ANT's moments of translation to create the generational technology integration framework, which is a framework that aims to explain the process of technology integration by lecturers with generational identities engraved in location, actuality and units. These actors exist within an actor-network of human and non-human elements.

## 6.6 SUMMARY OF CHAPTER AND CONCLUDING REMARKS

This research inquiry aimed to determine the generational identities that can potentially impact the integration of technology into the classroom for teaching and learning. The empirical findings from the analysis of the semi-structured interviews data suggest that there is no evidence to suggest that the generational characteristics of an individual have an impact on how they integrate, perceive and eventually use technologies in their classrooms. This study echoes what was implied by Constanza and Finkelstein (2015) that generational differences in the workplace do not mean that individuals work differently. This research suggests that belonging to a certain generation does not make one integrate technology differently from another person from another generation. Other factors as outlined in the study, affect the way an individual may choose to integrate and use technology for teaching and learning.

The investigation carried out in this study is not without limitations, and therefore, the researcher accepts them and suggests the indicated recommendations for future

research. One of the main limitations of this study is the lack of in-depth exploration of the complexities of technology used in education. The inquiry made a limited examination of the advanced and complex technologies being used. The study is also limited in its probe about what and how educational technologies are used in education.

Indeed:

*Teachers need to integrate technology seamlessly into the curriculum instead of viewing it as an add-on, an afterthought, or an event.* **Heidi-Hayes Jacobs – recognised education leader.**

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# APPENDICES

## APPENDIX A

Interview Questions

**Section A: Demographic Information**

Gender: ___Male

___Female

Age: _____Years

Race: _____

Academic Rank: _____

Highest Academic Qualification: _____

Faculty/Department/Discipline: _____

Number of years as a lecturer: _____Years

**Section B: Integrating Technology into the classroom**

1. Use the following scale to rate yourself in confidence to use computers and any other form of technology?

    - Highly competent (I consider myself a professional in the use of technology)
    - Competent (I can do a lot with technology)
    - Intermediate (I can find my way around using technology)
    - Poor (I struggle to use technology effectively)
    - Very Poor (I am not able to use technology at all)

2. Use the following scale and rate yourself on your interest to use technology in your classroom.
    - Extremely interested
    - Highly interested

- Moderate interest
- Not interested
- Not interested at all

3. Do you have any idea of what educational technology is?
4. Do you use any specialised software or technology in your classroom?
5. If yes to number 4, was this prescribed by the institution or did you as a lecturer recommend this technology?
6. If no to number 4, do you think there is a need for you to use specialised technology in your classes?
7. Are you currently using any technology for teaching and instruction?
8. Do you think you require to use any form of technology in your module?
9. Has your institution introduced any new technological advances in the last 12 months?
   - 9.1 If so, are you competent in the use of this new technology?
   - 9.2 Did you receive any training to be able to use this technology?
   - 9.3 How many days of training did you receive?
   - 9.4 Do you think there was a need for the training or not?
   - 9.5 Is the new technology enabling you to be more efficient in the way you delivery content for your module?
   - 9.6 What has been the perception or feelings of students about this new technology?
10. Is there a need for extensive training for use of educational technologies, or do you think it is better to self-educate and learn new technologies on your own?

**Section C: Perception of educational technology**

**Research Questions:**

11. Do you believe/think that technology use in the classroom enhances the content of the module you teach?
12. Do you think the use of technology in the classroom allows students to learn more effectively?

13 What mechanisms do you think enable you to be efficient in the teaching of your module? Examples: group work/discussions, distance teaching, forums etc.

14 Does technology enable you to be more efficient in how you teach the module?

15 Do you view technology as a tool that enables you to teach your module well?

16 Would it make you work easy or difficult if you had no technology?

17 What is your overall experience with the use of technology in the classrooms for teaching and learning?

**Section D: Education sector as a network**

18 If you were to visualise the education sector as a network that comprises of human (people) and non-human (machine, technology, procedures) elements, which elements would you consider to be crucial in the network?

19 Which elements do you think would make the sector dysfunctional if they were to be absent?

# APPENDIX B

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

**Faculty of Economic and Management Sciences**

**Letter of Introduction and Informed Consent**

**Dept. of Informatics**

Exploring different generations of lecturers and how they integrate educational technology in higher educational institutions in South Africa and Lesotho

Research conducted by:

Mrs. L.E. Letsie (04428374)

Cell: 078 402 3440

Dear Participant

You are invited to participate in an academic research study conducted by Likeleli Letsie, Doctoral student from the Department Informatics at the University of Pretoria.

The purpose of the study is to evaluate the impact that the different constructs of generational identities can have on a lecturer to be able to successfully integrate sophisticated and more advanced emerging educational technology into the classroom.

Please note the following:

- This is an anonymous study interview as your name will not appear on the questionnaire. The answers you give will be treated as strictly confidential as you cannot be identified in person based on the answers you give.
- Your participation in this study is very important to us. You may, however, choose not to participate and you may also stop participating at any time without any negative consequences.
- Please allow me the time to conduct a face-to-face interview. This should not take more than 45 minutes of your time
- The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.
- Please contact my study leader, Professor, H, Gelderblom, and 0124203352/ Helene.Gelderblom@up.ac.za if you have any questions or comments regarding the study.

Please sign the form to indicate that:

- You have read and understand the information provided above.
- You give your consent to participate in the study on a voluntary basis.

_____ _____

**Participant's signature** **Date**

# APPENDIX C

P.O. Box 11111
Maseru 100
27.09.2019

Prof. C. de Villiers Head

Department of Informatics

University of Pretoria

Dear Madam

**Editing of Likeleli Letsie's Thesis**

This letter serves as proof that I initially edited Likeleli Letsie's thesis. I was conscious in my editing that drastic changes were not made which could affect the original document.

I am Karabo Thamae employed by MK Training and Management Consultancy. I usually edit students' assignments, dissertations and thesis.

Kind regards

Yours faithfully

MK TRAINING & MANAGEMENT
BOX 11111 MASERU
+266 5884 1394/ 5966 4456
karabot2000@yahoo.co.uk

DATE:.....

Karabo Thamae.