A framework for social software adoption in higher education systems

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DECLARATION

I, Kenneth Nwanua Ohei, with the undersigned signature hereby declare that I present the thesis titled:

A framework for social software adoption in higher education

for the degree of Doctor of Philosophy to the department of Information Systems of the North-West University. It is my own work and has not been submitted before by me for any degree at this or any other educational institution. All material sources or quoted used in this study from start to completion have been duly acknowledged.

Kenneth Ohei (20846444) 07 Nov. 17, 2017

Full name of candidate, signature and student number

Date

DEDICATION

This thesis is dedicated to God Almighty, who gave me the strength for this study and enabled me to blossom. Secondly, I dedicate this thesis to the loving memory of my late parents Augustine Ohei and Patricia Ijebuso-mma Ohei. Lastly, to the family Ohei.

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ABSTRACT

For decades, teaching and learning processes have centred on the traditional approach (Web 1.0) that promoted teacher-directed pedagogical practices. Currently, there is a realization that the traditional approach is not adequate to effectively address and improve all student learning outcomes. The subsequent incorporation of social software (SS) / semantic web (SW) and information and communication technology (ICT) web instructional technologies into higher educational system (HES) may serve as complementary technologies to support educational goals, offering students the opportunity to grasp content in a manner that fits a particular student.

The integration of these web technologies in HES has been pursued at the forefront of the education sector in recent years. Notably, the decision to use these web technologies enabled by Web 2.0 and Web 3.0 in classrooms are affected by educators' perceived beliefs, patterns of technological acceptance as opposed to educational needs. SS is progressively being used worldwide at several universities to support teaching and learning processes. Ultimately, the emergence of SW marked a change and a turning point with regard to how the "digital native" could benefit from a range of educational software personal learning environments (PLEs) or personal virtual environments (VLEs). It allows digital natives possibilities to obtain meaningful information, collaboration and data filtering to suit their needs.

This study provides a framework for SS adoption in HES to help facilitate business processes. The prime objective is to establish the probable features and capabilities of SS by exploring how the integration and adoption of SS/SW and ICT and web technologies into HES can improve learning enthusiasm, easy access, performance, quality and mode of delivery. SS can also improve students' learning interaction and collaboration and can build a social presence among students. A first step is to establish the extent of educators and students' ICT confidence and the challenges hindering SS/SW and ICT adoption in HES. The problem of training educators in the educational uses of web instructional technologies so that they can use it successfully in teaching and learning appears to be a key factor in almost every development plan for education and educational reform efforts.

Presently, only a few educators use ICT tools in their teaching. In spite of the efforts of institutions, educators still lack the ICT skills required to successfully administer lectures with web technologies. Subsequently, a Mixed Method Research (MMR) was adopted through the development of a comprehensive framework. The findings suggest that SS/SW and ICT tools should be adopted in HES to serve as complementary tools that support education. In addition, the findings suggest that these tools are useful and will impact positively on education, although there are challenges that may prevent the adoption process. These challenges are linked to human factors (technophobia, cultural beliefs); security issues (privacy and IPRs); ethical and legal issues; ICT infrastructures (cost implication, risk, ICT teaching facilities); and university policy frameworks. However, none of these challenges are insurmountable. Despite the challenges involved in the adoption of SS/SW and ICT technologies, Web 2.0 and 3.0 technologies offer HES new approaches of teaching and learning, which is crucial if institutions want to meet the essential needs of the citizens of information-age societies.

Key words:

Blended and integrated learning, collaboration, interactive and integrated learning, higher educational system (HES), information communication technologies (ICTs), social software (Web 2.0), semantic web (Web 3.0).

LIST OF ABBREVIATIONS AND ACRONYMS

HE	Higher education
HES	Higher educational system
HEI	Higher education institution
ICT	Information and Communication Technology (ICT)
IS	Information Systems
LMS	Learning management system
MMR	Mixed method research
MM	Mixed method
NWU	North-West University
ODL	Open distance learning
OWL	Ontology web language
PLEs	Personal learning environments
RDF	Resource description framework
RSS	Really simple syndication
SKOS	Simple knowledge organization system
SPSS	Statistical Package for the Social Sciences
SS	Social software
SW	Semantic web
SWBES	Semantic web-based education system
UNISA	University of South Africa
UP	University of Pretoria
VLEs	Virtual learning environments

WWW	World Wide Web

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CHAPTER 1

OVERVIEW OF THE STUDY

1.1 Introduction

The concept of information and communication technology (ICT) tools in educational systems has been prominent in the education sector in recent years (Jaffer *et al.*, 2007; Chetty, 2012). The choice of using these social software tools in education is determined by technological acceptance as opposed to educationally need (McLoughlin & Lee, 2010; Jaffer *et al.*, 2007; Chetty, 2012). Change is inevitable, and quite higher educational institutions are beginning to realize that new models of teaching and learning are needed to meet the essential needs of the citizens of information-age societies (Angeli & Valanides 2009; Minocha, 2009).

Social software (SS) is increasingly being used at universities worldwide to support teaching and learning processes (Hussain, 2012). The emergence of the semantic web has marked a turning point with regard to how the digital native could benefit from a range of educational software personal learning environments (PVEs) or personal virtual environments (VLEs). These environments allow digital natives the possibility of obtaining meaningful information, collaboration and data filtering to suit their needs (Hussain, 2012).

This study investigates the adoption, usage and integration of SS tools in educational systems at universities in an attempt to overcome the flaws of the traditional methods of teaching and learning, and to venture exclusively into ICTs enabled by the semantic web (SW) Web 3.0 and social software Web 2.0 technologies (Angeli & Valanides, 2009). Chapter 1 offers some background and discusses the research design. Thereafter it puts forward the study's layout, assumptions, and delineations. Subsequently, the chapter details the study's importance and significance. Chapter 1 closes with summary and conclusions of the chapter.

1.2 Background to the problem statement

Chetty (2012) avers that the key element of social revolution and transformation in educational systems is nothing less than equipping students with general ICT knowledge and skills. This includes technical exposure to inspire lifelong learning; making best and appropriate use of social software technologies for conceptualization, representation, communication; individual development and professional competence.

Several authors (Jimoyiannis *et al.*, 2013; Yusuf, 2005; Jaffer *et al.*, 2007; McLoughlin & Lee, 2008; Minocha, 2009; Gray *et al.*, 2010) confirm that social software tools can play a central role in universities. Web 2.0 technologies have the ability to transform, accelerate, develop, and improve skills; to encourage and involve learners to participate; to strengthen teaching; and to help universities change.

The evolution of Web 3.0 technologies was first envisioned by Markoff of the New York Times 2006. Web 3.0 (also known as the semantic web) promised to bring aid to the educational system and universities a whole (Davies *et al.*, 2007; Aghaei *et al.*, 2012; Badawood & Qureshi, 2013; Almeida *et al.*, 2013; Lefever & Currant, 2010; Lal, 2011), considering the nature of the services that universities have to render to their prospective students.

Lal (2011) mention that the adoption and incorporation of social software tools such as Web 2.0 and the semantic web (SW) technologies into web-based educational systems (WBES) for business administration processes are fundamental. These authors explain that Web 2.0/3.0 offers four basic characteristics that can help universities, namely intelligence, personalization, interoperability and virtualization to the learning context (Lal, 2011). These possibilities can enable a university such as the North-West University (NWU) to provide quality education and to gain a competitive advantage on its rivals (Arshad *et al.*, 2011).

Arshad *et al.* (2011) further point out that the quality of education at a given institution is vital, especially in a competitive market where a student's decision to stay or leave the institution is solely dependent on the facilitation processes and quality of education rendered by the university (Arshad *et al.*, 2011). In affirmation of these claims, Burdett (2003) argues that various universities are deteriorating or failing to provide good quality education that is accessible and deliverable in flexible manners.

1.3 Problem statement

Higher education institutions are confronted with several problems, both general and related to education specifically. The facilitation and learning processes should receive special attention. The South African higher education system has been experiencing pressure to meet the demands of social transformation and skills exposure needed for the new South Africa in recent decades. There is also the constant burden on improving on strategic policy and delivery performance (Tsiotakis & Jimoyiannis, 2016; Vrasidas, 2015; Jimoyiannis *et al.*, 2013; Jaffer *et al.*, 2007).

Training educators in the educational uses of social software tools appears to be a key element of almost every development plan for education and educational reform efforts (Davis & Falba, 2002; Dawson *et al.*, 2003; International Society for Technology in Education, 2002; Thompson *et al.*, 2003). Drent and Meelissen (2008) note that a national survey on the adoption and use of social software tools at universities shows that only two-thirds of the educators are optimistic about the potential of social software for education and business processes. This is an indication that the use ICT technology for learning purposes remains a challenge.

Conversely, only a few educators use ICT tools regularly in their teaching practices. These educators only use ICT predominantly to prepare lectures and to conduct tasks and activities. Students' use of ICT tools is restricted to word processing and searching for information. Very few educators inform students about educational social software tools. Most students are dissatisfied about this lack of information and knowledge regarding the possibilities of social software Web 3.0 technologies (Drent & Meelissen, 2008). Web 3.0 technologies should not just be viewed as tools that can be added to or used as replacements of existing teaching models. Web 2.0, in turn, is seen as an instrument to support innovative means of teaching and learning (Drent & Meelissen, 2008).

Authors argue that in spite of the efforts of researchers and educators to train educators in the educational use of social software tools over decades, educators still lack the skills and knowledge required to administer lectures with social software tools successfully (Koehler *et al.*, 2007). Angeli and Valanides (2009) emphasize how universities can scale up by leveraging the power of technologies. They further state that social software has pedagogical affordances and offer opportunities to reform the teaching and learning atmosphere when it is adopted successfully (Jaffer *et al.*, 2007).

While the use of social software technologies is perhaps not a remedy for most educational problems, it does directly or indirectly assist in improving educational standards (Jung, 2005; Bowes, 2003). Today's Web 2.0 technologies are special tools for facilitation and learning. In order to use these tools effectively and efficiently, educators require exposure to technologies so that they develop the skills to apply them. They need training and just-in-time support and time to experiment. Only then can educators be knowledgeable and self-confident in their use of new technologies (Jung, 2005; Bowes, 2003).

The general problem statement can be broken down into the following sub-problems that can each be subjected to empirical investigation:

- Educators have an inability to integrate social software and ICT tools in their teaching and learning practices successfully (Jimoyiannis *et al.*, 2013). In this educational transitioning age, learners are fascinated with the adoption of new generational technologies such as shared networks, text messaging, media distribution, blogs, wikis, and other semantic web technologies applications, to keep in contact with one another.

- The lack of ICT knowledge and skills among learners remain a major challenge that confronts many universities. South African universities face a situation where many learners who enrol at universities are novices when it comes to the use of ICT tools. For this reason, they require thorough support to bridge the gaps in the required knowledge and skills exposure (Ohei *et al.*, 2015; Jaffer *et al.*, 2007; Ohei & Lubbe, 2013; Paras, 2001).
- The growth of higher education means that it has become more challenging for educators to implement interactive facilitation strategies in large classes (Jaffer *et al.*, 2007; Nicol & Boyle, 2003) or to detect the difficulties that students encounter.
- Large class situations pose a serious threat to all students, but especially to students who are underprivileged with regard to the use ICT tools.

1.4 Research objectives of the study

This research study acknowledges that educators are a dynamic link in the education system as a whole and at higher education institutions. However, in keeping with the developments of the 21st century, they must start leveraging technology. More specifically, they should use and integrate older and more recent social software tools to improve the quality and to transform education. In an attempt to tackle some of these controversies confronting education systems and to remain abreast of the vast ICT tools advancements at universities, the primary objectives of this research are (Wastiau *et al.*, 2013):

- to explore how the adoption of SS/SW and ICT and web technologies in HES can improve learning enthusiasm, easy access, performance, quality and mode delivery in education;
- to establish the extent to which SS/SW and ICT and web technologies can incorporate the traditional approach, but serve as a complementary tool for supporting teaching and learning;
- to determine the educators' and students' ICT confidence, readiness and competence to ensure a systematic approach to supporting and sustaining technological innovation in HES;
- to identify the challenges that hamper educators' use and adoption of S/SW, ICT and web technologies and its applications in HES; and
- to develop strategies to support and train teachers and learners in ICT tools use in education.

1.5 Research Questions

In order to achieve the research objectives the following research questions were formulated.

- How will SS/SW and ICT web technologies help improve learning enthusiasm and ease access to education when it is successfully adopted. How can it help educators break away from the highly traditional and centralized model of learning?

- What are educators and students' views on the educational impacts of SS/SW and ICT web technologies in complementing the facilitation of learning and business processes?

- What are the extent of educators' and students' ICT confidence, readiness, and willingness to ensure a systematic approach in supporting and sustaining technological innovation in HES?

- What are the hindrances associated with the adoption of SS/SW and ICT web technologies and its applications in the teaching and learning environment respectively?

- What strategies could be put in place for teachers and learners as development support to prepare them in the use of SS/SW and ICT web technologies tools in HES?

1.6 Research design and methodology

Raddon (2010) states that research design plays a role in every research project undertaken. It enables the smooth completion of the various research endeavours, making the research as effective as possible while producing maximal information with minimal expenditure of effort, time and money. Conducting good research and choosing an appropriate research methodology simple means following the appropriate processes (Raddon, 2010).

Furthermore, Raddon (2010) refers to research methodology as steps taken to integrate the research questions and the objectives with the data collection, analysis and interpretation in a logical way. Many researchers use different approaches or methodologies for a particular research problem. Researchers must take into account the nature of the data that have to be collected to resolve the problem (Oates, 2008). Greener (2008) argues that a research method or strategy and a methodology are determined based on the nature and type of research problem at hand.

The study followed a mixed method research (MMR) approach, which is a combination of qualitative and quantitative approaches. A structured interview and questionnaires were used to gather data among educators and students from the North-West University (Mafikeng, Potchefstroom & Vaal Triangle Campuses), the University of South Africa (UNISA) and the University of Pretoria. The selection of the specific sample is discussed in the section on research methodology (Bhattacherjee, 2012; Buthelezi *et al.*, 2005). During data analysis, diverse software tools were employed, like the Statistical Analysis System (SAS version 9.3), Atlas.ti, Statistical Package for the Social Science (SPSS) and Microsoft Excel. Some of these tools were used for textual qualitative data analysis by means of searching (using phrases or words to find a text), coding (allowing one to employ personal coding for building blocks of text), data organization (enabling one to form a personal database), writing tools (allowing one make notes or memos), visual displays (to coordinate or gather segmented data) and exporting (enabling one to integrate data with data from other software tools) (Oates, 2008).

Furthermore, this study is aligned with the theory of planned behaviour as introduced by Ajzen (1991) and (Bhattacherjee, 2012), which holds that the theory in question can be employed to study a comprehensive collection of individual performances (Ajzen, 1991; Bhattacherjee, 2012). According to the theory of planned behaviour, behaviour (performance) signifies a conscious and structured choice formed by rational thinking and social weights. This theory aligns with the research objectives (Ajzen, 1991; Bhattacherjee, 2012).

1.7 Study layout

In an effort to achieve the objectives as stated above, this study is divided into eight chapters.

- **Chapter 1**

  Chapter 1 provides the background to the study. This is followed by the problem statement and the research objectives. Next, the research questions are stated. The significance of the study is subsequently noted, followed by a discussion of the research design and methodology. The limitations of the study are examined before the chapter concludes.

- **Chapter 2**

  Chapter 2 presents a literature review of the theoretical perspectives on the topic as found in the available body of research. The findings of other scholars on the problem at hand are considered in an effort to situate the study in the field.

- **Chapter 3**

  Chapter 3 provides a discussion of the theoretical framework presented by this study.

- **Chapter 4**

  Chapter 4 addresses the research methodology, research paradigms and the instruments and techniques used during the study. It also includes a discussion of research processes, approaches and theories relevant to the study.

- **Chapter 5**

  Chapter 5 examines the result of the first part of the qualitative research as these results relate to the objectives of the study. The results of the interviews are analysed and interpreted as part of this discussion. The results are presented using various techniques to answer the research questions.

- **Chapter 6**

  Chapter 6 deals with the second part of the qualitative research by offering a data analysis. The interviews responses are discussed extensively to derive the findings.

- **Chapter 7**

  Chapter 7 addresses the quantitative data. The analysis looks at the information gathered from the questionnaire administered at the selected universities.

- **Chapter 8**

  Chapter 8 concludes the study by revisiting the research problems. It presents conclusions in answer to the research questions based on the findings. The study ends with a general conclusion and recommendations.

1.8 The significance of the study

Universities have therefore far offered their students little choice concerning the modes of delivery and techniques used to present course content. Students have been forced to accept whatever is presented in whichever way it is presented, and universities have tended to adhere to the traditional modes of delivery (Moges, 2013). Globalization and development in the area of ICT devices have significantly challenged the quality of education that universities offer. The adoption of ICTs and educational software in education will improve students' possibilities and choices. This will mean that students would be able to choose how and where they want to learn (Moges, 2013) and so much more.

In addition to the above, higher education institutions have to ensure that alumnae demonstrate outstanding levels of information literacy, in other words the ability to find, classify, discover and assess information to resolve a problem in a certain context (Moges, 2013). The aim this research study is to promote the incorporation of the SS/SW, ICT and web instructional technologies in educational structures.

The semantic web is also referred to as Web 3.0 based on its semantic nature. Web 3.0 is an advanced version of Web 2.0 and Web 1.0 technology, with added characteristics like intelligence, personalization, interoperability and virtualization. Social software possesses possible features that can enable community-based sharing, user-created content and personalization (Moges, 2013). This begs the question of how the new wave of social software tools could possibly harness the power of technology. This could facilitate a break away from the highly traditional and centralized model of learning to individual empowerment through models that support collaboration, networking communication and an interactive environment.

The outcome of the study will advance the knowledge of this field and add to the existing academic literature on the combined adoption and usage of SS/SW, ICT and instructional web technologies and its applications to facilitate learning process. It will provide information for educators and students in education by creating awareness of the benefits of adopting interactive web technologies in education. They study could also aid an improved business management processes at an institution since it provides information on the threats and weaknesses that may hamper the adoption. Contributing factors include educators' readiness, confidence and ability to use social software tools in teaching and learning. Policy maker would also benefit from the results of this study in the sense that the information provided would support decision-making processes and enhance learner productivity. It is believed that the results of the study will inspire other researchers to investigate areas of research that are not covered in this study.

1.9 Chapter summary

This chapter outlined the foundations of research. The study is introduced in subsection 1.1. The research problem, research objective, and research questions are expounded in the subsections 1.2, 1.3 and 1.4. The chapter justifies the study in the context of relevant, contemporary research in the subsections 1.5 and 1.6, with 1.7 presenting the research design and methodology.

Social software uses Web 2.0 technologies and application to foster socialization, information sharing and collaboration for learning. This was followed by the evolution of the World Wide Web (WWW). The semantic web brings new features, such as personal assistants, intelligent agents, 3D-gaming, virtual worlds, open informative resources and quality data management (Chisega-Negrila, 2012). All these activities are made possible through the use of technologies such as RDF (Resource Description Framework), SPARQL (Query Language for RDF), OWL (Ontology Web Language) and SKOS (Simple Knowledge Organization System) (Hussain, 2012). These technologies help structure information so that programmes like web spiders and web crawlers can search, discover, collect and analyse information from the web (Hussain, 2012).

Given the distinguishing features of Web 3.0, educators, students and staff could become proficient in managing and administering their own teaching and learning practices, setting their respective ambitions and making sustainable decisions concerning education (Chisega-Negrila, 2012). The semantic web will indisputably impact on learners' performance, knowledge acquisition and advancement in ICT use. Ultimately, intelligent agents and personal assistants could be people's companions in education. Then, and only then, the semantic web will have become a reality.

Chapter 2 provides a literature review of a framework for SS adoption in HES, positioning the study in the context of relevant research. The chapter continues to analyse relevant concepts that emerge from the literature. It provides the foundation for demonstrating the study's original contribution to the academic body of knowledge.

CHAPTER 2

A LITERATURE REVIEW: A FRAMEWORK FOR SOCIAL SOFTWARE ADOPTION IN HIGHER EDUCATION SYSTEMS

2.1 Introduction

Chapter 1 explains the importance of the integration of ICT tools and the adoption of SS/SW technologies into educational systems to support teaching and learning processes. It introduces the probable benefits of adapting SS and SW tools for learning contexts and the threats and hindrances associated with the adoption of social software by looking at the strengths, weaknesses, opportunities and threats (SWOT) and the ICT tools that can be used in advancing quality education (McLoughlin, 2010; Jaffer *et al.*, 2007; Chetty, 2012).

Furthermore, Chapter 1 expounded the problem statement, research objectives and research questions. It indicated the relevance and importance of the study and highlighted the research design and methodology. Chapter 2 follows with a historical overview of a framework for SS adoption. The purpose of Chapter 2 is to develop a theoretical foundation by means of a descriptive literature review, in other words, providing a detailed explanation of the research available in the literature (Oates, 2008; Mouton, 2001).

In addition, this chapter covers literature matrix themes and concepts in sections and subsections. The first literature matrix theme is ICT, with the objective of answering the first research question, namely: how can SS/SW, ICT and web technologies help to improve learning enthusiasm and ease of access to education when it is successfully adopted? The question that follows on this is: how can these technologies help education institutions break away from the highly traditional and centralized model of learning? The second, third and fourth literature matrix themes are SS/SW adoption at universities; defining SWBES; and a SWOT analysis framework. These three themes share the objective of answering the second research question: what are educators' and students' perceived views of the educational impacts of SS/SW, ICT and web technologies in complementing facilitation of learning and business processes?

The fifth and the sixth literature matrix themes, namely controversies and educators' challenges with the use of SS/SW, ICT and web technologies in HES, serve the purpose of providing answers to the third and the fourth research questions, namely: what are the extent of educators' and students' ICT confidence, readiness, willingness to ensure a systematic approach in supporting and sustaining technological innovation in HES? and: what are the hindrances associated with the adoption of

SS/SW, ICT and web technologies and its applications in the teaching and learning environment? The seventh literature matrix theme is educators' and learners' development and support. This theme answers the final research question: what strategies could be put in place as part of a support system for teachers and learners to prepare them for the use of ICT tools?

A thorough delineation and a rationale for using the applied descriptive literature review process follows this introduction. The rest of the chapter expounds on the literature matrix themes in the sections and subsections to follow, namely: ICT; educators and learners' development and support; SS adoption at universities; defining SS/SW and web-based educational systems (WBES); educators' confidence, readiness and the challenges with the use of ICT tools; and future trends in education. Finally, the chapter draws conclusions from the aforementioned sections and subsections of the study.

2.2 Descriptive literature review process

According to Levy and Ellis (2006), it is crucial for the literature review process to be descriptive. This assists in identifying philosophies in the literature that justify the specific approach to the theme and the selection of methods. Not only does the literature review support the selection of appropriate methods, it enables the development of knowledge; simplifies concept expansion; and makes a meaningful contribution to the body of knowledge (Webster & Watson, 2002; Levy & Ellis, 2006). A descriptive literature review process unveils the key principles, variables and associations that relate to the research problem (Randolph, 2009). Therefore, a descriptive literature review establishes to what degree previous academic scholars have addressed a similar research problem (Klopper & Lubbe, 2011).

From the definition mentioned above, it is clear that an effective descriptive literature review process is fundamental during research activities because it:

- prevents repetition of previous research;
- prevents the mistakes made in previous research;
- allows innovative and unique research; and
- advocates that the research contributes to the body of knowledge (Kitchenham, 2004; Levy & Ellis, 2006; Hart, 2001).

This study presents a descriptive literature review in three stages (Levy & Ellis, 2006). The first stage is the input stage. This stage focuses on the descriptive literature review search mechanism or approaches. The second stage includes the processing stage, which entails establishing or discovering the literature matrix themes. During the final stage, namely the output stage, the actual write-up or documentation begins. All these stages are of importance, but most specifically the second stage, which deals with the evaluation activities of knowledge creation, understanding, presentation and scrutiny (Levy & Ellis, 2006). The continuous review of literature runs through the entirety of the study, although less intensively after Chapter 2.

2.3 Input stage: descriptive literature search mechanism

2.3.1 Justification

A descriptive literature search mechanism is an essential requirement for a descriptive and advanced literature review process (Dutta *et al.*, 2008). The purpose of a descriptive literature search mechanism is to unveil the key philosophies, variables and concepts associated with the literature (Webster & Watson, 2002; Kitchenham & Charters, 2007). Such a mechanism proposes openness for inspection and is rigorous and unprejudiced (Staples & Niazi, 2007; Brocke *et al.*, 2009).

2.3.2 Keywords

The descriptive literature review search mechanism begins with the development of the keywords. Keywords are the words or terminologies that form the foundation for subsequent electronic literature searches. Most authors are of the opinion that keywords permit readers the platform to choose whether or not a research study covers material applicable to their topic of interest (Brocke *et al.*, 2009; Dutta *et al.*, 2008). It enables readers to use appropriate terminologies in web database searches to discover other sources on similar topics. These keywords are derived from the research problem and from the initial set of keywords. The problem statement acts as a filter for concepts that are applicable to the problem being investigated (Klopper & Lubbe, 2011; Brocke *et al.*, 2009; Dutta *et al.*, 2008; Smallbone & Quinton, 2011; Saunders *et al.*, 2007).

The original set of keywords derived from the problem statement tends to contain synonyms, acronyms, alternative spellings, singular/plural, related terms, and related parts of terms (Kitchenham, 2004; Brocke *et al.*, 2009; Dutta *et al.*, 2008). The keywords are identified based on appropriate literature, especially from the keywords, abstracts, introduction and conclusion sections (Petersen *et al.*, 2008).

2.3.3 Web-based databases and search mechanisms

In web-based search mechanisms, keywords are used to gather electronic literature from the web-based databases. In this study, the researcher selected multiple search approaches, while other researchers may choose to use or follow a different approach. In any research activity, the choice of search mechanism is vital, simply because it influences what kind of literature will be obtained and made accessible for the subsequent stages of the descriptive literature review. This study made use of Google Scholar, the AIS Electronic Library and the DuckDuckGo search engines of the library of the North-West University (NWU) in South Africa.

2.3.4 Literature evaluation

It is important for academic writers to bear in mind that published resource materials differ in quality and relevance. Each search can possibly yield several results. In an effort to retain only literature that is applicable to the research study (Kitchenham, 2004) and that is adequate in quality (Levy & Ellis, 2006), the researcher should evaluate the literature material. The process of literature evaluation entails scanning each literature item's title, keywords, abstract or summary, introduction and conclusion sections for significance in terms of the research topic (Klopper & Lubbe, 2011; Brocke *et al.*, 2009; Brereton *et al.*, 2007), and where suitable, scrutinizing an entire literature item. The significance of this evaluation is an individual decision by the researcher (Floridi, 2008). Literature is said appropriate when it addresses the research problem (Brocke *et al.*, 2009; Levy & Ellis, 2006).

Another central aspect of evaluating the quality of literature is that the process involves inspecting the publisher to confirm that each item has gone through a rigorous peer-review process. Literature that has not been peer-reviewed or are practitioner-oriented have restricted use in the next stages of the descriptive literature review processes (Levy & Ellis, 2006). Most journals that are highly esteemed by professional bodies undergo a rigorous peer-review process and have the required quality for inclusion in the subsequent stages of the descriptive literature review (Levy & Ellis, 2006). It a literature item is evaluated and found to be appropriate and of good quality, it is retained for the next stages of the descriptive literature review and stored with the title or a shorter equivalent as the file name (Levy & Ellis, 2006).

2.3.5 Search mechanism

The search entailed three sequential stages. After the first iteration is done, any of the stages can be re-executed in any form. This stage of the descriptive literature review process is completed once a theoretical conceptualization has been completed, in other words no new ideas arise from the discovered literature (Webster & Watson, 2002; Levy & Ellis, 2006).

The first stage is referred to as iterative as it involves using the established keywords and chosen search parameters of the selected search mechanism and web-based databases, and then evaluating any discovered literature. Each sequential search is refined by filtering and is developed accordingly. Search alteration is a fundamental part of the search process. The alteration involves using keywords and parameters to reduce or advance the search scope and it entails keyword combination choices (Levy & Ellis, 2006; Holbrook, 2007).

The second stage applies backward and forward search mechanisms on literature gathered from the first stage (Webster & Watson, 2002; Levy & Ellis, 2006). A backward search entails discovering appropriate and quality literature from the references cited, title, writers, and keywords in obtained literature. This stage is efficient for finding other relevant and quality literature.

Finally, the third stage is aimed at publication unfairness and searching for appropriate and quality literature that is not obtainable from the web-based databases. This stage embraces hand searches where applicable, electronic searches of older literature, and automatic searches of conference proceedings. It may include contacting professionals, librarians, and academic scholars whose research field is within that domain (Kitchenham, 2004; Egger *et al.*, 2003; Dyba *et al.*, 2007; Webster & Watson, 2002). In this regard, the researcher is involved with the Association for Information Systems (AIS), where knowledge and material is exchanged and where there is access to professionals who specialize in this field. All literature that is discovered during a search undergoes the processes mentioned above before it is used in the subsequent stages of the descriptive literature review.

2.4 Processing stage: literature matrix themes/concepts

The processing stage necessitates that assessment be realistic in terms of the ideas and concepts, and that it recognizes facts within the obtained literature. In so doing, the cognitive activity of assessment is reinforced by the cognitive activities of information gathering, understanding, presentation, scrutiny, and synthesis (Levy & Ellis, 2006). All these cognitive activities are active throughout the three stages of the descriptive literature review. However, in stage two, these cognitive activities result in literature matrix themes/concepts. The literature matrix themes/concepts can be presented in the form of a table that shows the main themes/concepts associated with the study's problem statement alongside the available literature (Klopper & Lubbe, 2011; Levy & Ellis, 2006). Importantly, the literature matrix themes/concepts support the structuring of the literature around the study's objectives (Rowley & Slack, 2004; Holbrook, 2007). Also, the literature matrix themes/concepts ensure a quality literature review (Webster & Watson, 2002).

2.5 Output phase: literature review

The output stage is the actual documentation of the literature review, presenting the themes/concepts and literature from stage two (Klopper & Lubbe, 2011). Stage three is vital as it includes critical comparative evaluations of all the literature under each theme to reveal and discover expert opinion (Klopper & Lubbe, 2011; Holbrook, 2007). This stage includes critical comparative scrutiny, argumentative scrutiny, and assessment to support the accomplishment of the descriptive literature review objectives (Levy & Ellis, 2006; Hart, 1998).

The following sections discuss the literature matrix themes that emerged from the literature and that relates to the study's problem statement. The themes include ICT; SS adoption at universities; defining SS and SW-based educational systems (SWBES); swot analyses; controversies; educators' confidence, readiness and challenges in the use of ICT tools; educator and learner development and support; privacy and policy issues governing ICT adoption, and future trends in education.

2.6 Information communication and technology (ICT)

The concept of ICT is an essential leading concept for this study (Jaffer *et al.*, 2007). Accordingly, the objective of this subsection is to answer the first research question, namely: how can SS/SW, ICT and web technologies help to improve learning enthusiasm and ease access to education when it is successfully adopted? How can it help education institutions break away from the traditional and centralized model of learning? This section explores the significant benefit of ICT for the education system as it develops in the 21st century (Noor Ul Amin, 2013; Moges, 2013; Madhukar, 2013; Nwosu & Ogbomo, 2012). ICT has the power to inspire directly how learners learn and are taught (Moges, 2013; Madhukar, 2013).

Based on the activities and practices that are routinely carried out at education institutions, the advancement of ICT at such institutions will have an effect the facilitation of learning and business processes; quality and ease of access to education; learning enthusiasm, learning environment and ICT usage (Moges, 2013; Noor Ul Amin, 2013; Madhukar, 2013). This could be achieved by making more education resources available; promoting flexibility in the sense that students can gain access to education despite time and geographical barriers. This section provides a detailed discussion of the four concepts of ICT that can act as technological tools to assist in improving easy access to education; learning enthusiasm; increased education opportunities; and quality delivery of education at any given universities (Quadri & Olaojo, 2013; Moges, 2013; Noor Ul Amin, 2013; Madhukar, 2013).

2.6.1 The role of ICT in improving easy access to education

Within the context of education technologies, the focus in recent years has been on the advancement of ICTs for the virtual learning environment (VLE, also referred to as LMS, learning management system) (Wilson *et al.*, 2007). There has been improved development and considerable merges and consolidations (for instance the merging of WebCT and Blackboard), modernization and conformance administrations (for instance IMS, SCORM, and open-source versions of VLEs such as Moodle and Sakai). Quite a few of the collaborative ICT tools are thriving. Peer-to-peer systems, weblogs, wikis, and social software have concurrently been embraced and adopted by various universities. Yet these education tools have in many cases also been downgraded, unsupported or even banned (Quadri & Olaojo, 2013; Moges, 2013; Noor Ul Amin, 2013; Madhukar, 2013) at education institutions, despite the increased awareness of the potential and capabilities of ICT tools among education technologists. For example, ICTs bring us closer to the ideal of lifelong and personalized learning.

With the successful integration of ICT tools into education systems, learners can confidently source and browse e-books and have easy access to educational resources and personnel (resource persons, mentors, experts, researchers, professionals, and peers from all over the world) (Madhukar, 2013; Moges, 2013; Bonifacio, 2013; Noor Ul Amin, 2013; Yuen *et al*, 2011; Bottino, 2003; Sharma, 2008). The use of ICT can improve performance, teaching, administration, and the development of relevant skills in the disadvantaged communities. It also improves the quality of education through facilitation of learning by doing self-learning, problem solving, information seeking and analysis, critical thinking, as well as the ability to communicate, collaborate and teach (Madhukar, 2013; Moges, 2013; Bonifacio, 2013; Noor Ul Amin, 2013; Yuen *et al*, 2011; Bottino, 2003; Sharma, 2008).

ICT has the ability to improve access and the methods through which education is offered so that learners are able to access information at any given point in time or place. This has a direct impact on the ways in which learning is transferred to learners (Madhukar, 2013; Moges, 2013; Bonifacio, 2013; Noor Ul Amin, 2013; Angeli & Valanides, 2009; Jaffer *et al.*, 2007). Therefore, ICT-supported education will ultimately lead to the democratization of education (Madhukar, 2013). This in turn develops learners for lifelong learning. Madhukar (2013), Moges (2013) and Bonifacio (2013) state that the ultimate contribution of ICT tools in the context of education is easy access to learning, particularly in emerging countries such as India. India has over a billion citizens and a high proportion young people and it has a large recognized education system (Madhukar, 2013; Moges, 2013; Bonifacio, 2013).

There are controversies in general education in South Africa and all over the world (UNESCO, 2002a, 2002b), and appropriate ICT use can actually resolve such controversies. ICT usage has grown exponentially (Madhukar, 2013; Moges, 2013; Bonifacio, 2013; Noor Ul Amin, 2013) as it has been deployed in solving such challenges as low rate and poor quality of education in South Africa. Furthermore, ICT enhances the creation of digital resources (digital libraries) where learners, educators and professionals can access academic resources from any place at any time (Madhukar, 2013; Moges, 2013; Bonifacio, 2013; Noor Ul Amin, 2013; Bhattacharya & Sharma, 2008; Cholin, 2005). Such creations allow information sharing and distribution of academic resources. Such facilities reduce replication of work (Cholin, 2005). ICT reduces time barriers in education for learners and educators and subsequently offers new educational approaches (Noor Ul Amin, 2013; Sanyal, 2001).

2.6.2 The role of ICT in improving learning enthusiasm

ICTs are transformational tools which, when adopted efficiently, can enhance students' learning enthusiasm by improving collective learning motivation and engagement and enabling the acquisition of general basic skills and techniques (Madhukar, 2013; Moges, 2013). Moges (2013) maintains that ICT plays an essential role. It not only affects how learners learn, but it also brought a shift in curricula from content-centred to competence-based. Courses distribution has now shifted from an educator-centred form of distribution to a learner-centred form of distribution (Moges, 2013).

In addition, authors claim that ICT tools such as 3D wikis, intelligent tutoring systems, digital libraries, systems, blogs, podcasting and streaming video services, multimedia computer software, and virtual world and avatars can be integrated to provide inspiring and reliable content that will engage the learners in the education process (Maged *et al.*, 2007; Madhukar, 2013; Moges, 2013). Madhukar (2013) asserts that research evidence shows that students are more likely to be motivated given the aforementioned tools as opposed to traditional method of learning or the stereotype 45-minute lecture. Learners were of the opinion that a mode of learning that involves ICT tools would be much more favourable and effective than the monotonous monologue lecture situation where the educator just presents lectures from a raised podium and the learners just listen to the educator. On the same note, ICT performs the task of facilitating intellectual advancement, improving the acquisition of generic intellectual capabilities as needed for life in our information society. ICT allows learners to explore and discover, rather than merely listen and remember (Madhukar, 2013; Moges, 2013; Bonifacio, 2013; Noor Ul Amin, 2013; Bhattacharya & Sharma, 2008; Cholin, 2005).

2.6.3 The role of ICT in increasing educational opportunities

The awareness of increasing educational opportunities and educational relevance goes with the importance of increasing scholastic opportunities for those who are most vulnerable due to global changes. This includes developing countries large low-income groups, girls and women, and low-skilled workers in particular (Wood, 2015; Abdullahi, 2014). Global changes also put pressure on groups to continuously keep abreast of changes and to learn different skills. Open universities therefore allow the development of opportunities for individuals who are underprivileged and have been kept from education due to environmental, cultural, and social barriers: minorities, gender, rural populations, and ethnicity.

2.6.4 The role of ICT in improving quality education

Wood (2015) and Abdullahi (2014) assert that teaching and facilitation that involve diverse instructional conveyance approaches provide learners with the ability to absorb instructional content in a way that fits a distinct learner. Today's learners thrive on digital technologies. However, many educators are not on par with their learners with respect to digital language. The pedagogical problems that arise with the use of ICT tools by educators who are digital immigrants, therefore affect the facilitation approaches used in education (Wood, 2015).

Several authors in turn argue that the benefits of the use of ICT tools for improving quality education abound, offering learners the ability to choose when to learn, notwithstanding their situation (Wood, 2015, 2011; Jimoyiannis *et al.*, 2013; Madhukar, 2013; Moges, 2013; Bonifacio, 2013; Noor Ul Amin, 2013; Nwosu & Ogbomo, 2012; Dotsika, 2012; Lal, 2011; Woo *et al.*, 2011; Deng & Yuen, 2011; Ching & Hsu, 2011; Tse *et al.*, 2010; Bolliger & Shepherd, 2010; Yang, 2009; Zorko, 2009). ICT also empowers learners to uncover and introduce new concepts or innovations from professionals worldwide through the use of the enabling ICT tools. The presence of ICT at an education institution plays a crucial role in assisting educators with monitoring a learner's development and evaluation, which may have done frequently. Nwosu and Ogbomo (2012) highlight even more benefits that may be derived from the use of ICT for better quality education. These authors speak of active, collaborative, creative and integrative learning through the use of ICT to improve the quality of education.

Active learning: ICT-improved learning supports a learning culture by offering a basis for learner examination, scrutiny and construction of new information (Nwosu & Ogbomo, 2012). Learners learn as they do and, at any time suitable, work on actual problems in depth, making learning less of abstraction and more pertinent to the learner's life situation. In this regard and in opposition to memorization-based or rote learning, ICT improves learning and stimulates increased student engagement. ICT can be referred to as "just-in-time," meaning that a student could possibly choose what to absorb, when and where they need to acquire learning.

Collaborative learning: ICT-supported learning cheers collaboration, interaction and teamwork among learners, educators and professionals notwithstanding their location (Nwosu & Ogbomo, 2012). Apart from modelling real-world collaborations, ICT-improved learning provides learners the opportunity to work with people from different cultures, thereby helping to enhance learners' teaming and communicative skills as well as their global awareness. It models lifelong learning by expanding the learning space to include not just peers, but also mentors and experts from different fields. Nwosu and Ogbomo (2012) and Kreijns *et al.* (2003) affirm that collaborative learning leads to a reflective level of learning, critical thinking, collective comprehension, and long-term retention of the material. It also offers opportunities for building social and communication abilities, building optimistic attitudes towards peers and learning material, and building social interactions and group cohesion (Kreijns *et al.*, 2003).

Creative / integrative learning: ICT-improved learning promotes the manipulation of existing information and the creation of real-world products rather than the regurgitation of received information (Nwosu & Ogbomo, 2012). Such learning endorses a thematic, integrative approach to facilitation and learning. This tactic reduces the artificial separation between dissimilar domains and between philosophy and exercise that embodies the traditional classroom method. ICT-improved learning is student-directed and diagnostic. Compared to the static, text- or print-based education technologies, ICT-improved learning acknowledges that there are many diverse learning pathways and many diverse articulations of knowledge. ICTs give learners room to discover and explore, rather than just listening and remembering.

This subsection has achieved the objective of exploring the significant benefit of ICT tools in education systems in the 21st century (Noor Ul Amin, 2013; Moges, 2013; Madhukar, 2013). The research examined above show that ICT has the power to directly affect how learners learn and are taught (Moges, 2013; Madhukar, 2013). ICT tools can be beneficial for education by improving ease of access; improving learning enthusiasm; and increasing education opportunities and quality education by means of active, collaborative, creative and integrative learning. The next literature matrix theme is SS/SW adoption at universities with the objective to ascertain the level of SS/SW adoption and to identify examples of institutions that have adopted ICT in their administration process.

2.7 SS/SW adoption at universities

In the context of IT, authors (Pereira *et al.*, 2013; Chatti *et al.*, 2007; Chen *et al.*, 2009; Roberts & McInnerney, 2007) are confident that systems such as LMS/PLE are just not sufficient to support students with a collaborative and informative learning process. They additionally argue that the failure of education technologies to support uninterrupted social interaction was due to the fact the focus is directed at content as opposed to people. The aforementioned authors continue to recommend SS/SW as a stimulating application to support learning in an informal context when mixed with pedagogical technologies to improve social interaction and users' enthusiasm.

In this modern civilization with a high level of connectivity and pervasive, goal-driven learning, there is a necessity for education institutions to develop pedagogical vision so that learners are vigorous participants as opposed to passive consumers of content (McLoughlin & Lee, 2010, 2008, 2007; Klamma *et al.*, 2007). Several authors are of the opinion that the emergence of new semantic Web 3.0 and Web 2.0 technologies are opening doors for effective learning and have the potential to support lifelong competence development (McLoughlin & Lee, 2010, 2008, 2007; Klamma *et al.*, 2007).

The semantic web, known as Web 3.0, plays a vital part in enhancing universities' business processes towards information management, decision-making, integration of knowledge creation and use (Davies *et al.*, 2007). Aghaei *et al.* (2012) and Davies *et al.* (2007) assert that Web 3.0

attempts to link, combine, and analyse data from several data sets to attain a new information stream. It is capable of increasing data management and sustaining accessibility, provides creativity, innovation and improves clients' satisfaction.

Furthermore, Web 2.0 technologies are becoming affordable, efficient, cloud-based, global, standardized, and mobile, but also more personalized and more effective in meeting individual and educational needs. It supports group interaction towards establishing communities and creating and exchanging content. In general, the increased use of social software by firms is often the result of a strategic imperative for more openness to the outside, including universities, suppliers, customers, users, etc. (Von Krogh *et al.*, 2012; McLoughlin & Lee, 2010, 2008; Haefliger *et al.*, 2011; Fuchs *et al.*, 2010).

The trend is to adopt a combination of Web 2.0 and Web 3.0 technologies in education due to the possible features of community-based sharing, user-created content and personalization (McLoughlin & Lee, 2008, 2010; O'Reilly, 2005). Tools such as blogs, wikis, media-sharing applications and social networking sites are capable of supporting and encouraging informal conversation, dialogue, collaborative content generation and the sharing of knowledge, giving learners access to a wide range of ideas and representations. Used appropriately, they have the potential to make student-centred learning a reality by promoting learner agency, autonomy and engagement in social networks that straddle multiple real and virtual communities independent of physical, geographic, institutional and organizational boundaries (McLoughlin & Lee, 2008, 2010; O'Reilly, 2005).

Minocha (2009) avers that social software tools encourage a wider variety of expressive capability in the sense that it provides learners with new opportunities to be self-determining in their study and research. The importance using social software tools and technologies as an educational platform cannot be over-emphasized. Various universities have adopted social software tools into higher education. Crook *et al.* (2008) mention how UK universities continued vigorously by integrating both blogs and wikis (e.g. Newport University). This medium delivers an online learning environment for learners, giving proper detailed information about the university activities, study material, email, file storage, library resources and frequently ask question (FAQs). The University of Warwick adopted blog space in 2004. It is available to all students, teachers and staff. According to Minocha (2009), the logic behind the publishing of this blog space was that learners' blogging would perhaps build a community and foster collaboration. However, many students do not blog.

McLoughlin and Lee (2008, 2010), Haefliger *et al.* (2011), and Klamma *et al.* (2007) furthermore provide examples of pedagogical innovation and universities that incorporated and adopted social software in the administration and facilitation processes. Their findings agree with that of Minocha

(2009). These findings are backed by the recent research focus that attests to a rising appreciation of learner control over the whole learning process. Evidence suggests that SW and SS can improve learning effectiveness by giving the learner control over and responsibility for their own learning (see Annexure K). There are countless examples that demonstrate the power of SS innovation to support learner-centred approaches in educational systems (McLoughlin & Lee, 2008; see Annexure K).

Crook *et al.* (2008) describe how UK campus universities have willingly adopted and incorporated both blogs and wikis. The Newport University's site, called Mylearning essentials offers an online learning environment for learners by delivering university information updates, study and library resources, and news about the university services with distributed photographs. Sharma (2008) reports on the use of Elgg at Athabasca University, Canada's open university. The author discusses social network tools such as Elgg (this framework for social networking adoption was considered essential and convenient for education given its many e-learning features). The research reports on social presence as the ability of students to arrange themselves socially and affectively into a community of inquiry. Social interaction is associated with learner fulfilment and increases performance on learning outcomes. It cannot be overemphasized that the use of SS grants the student some form of liberty as with other distance training programmes, a right of space and time, freedom to pace, choice of learning means, the individual over the subject, and an opportunity to engage in a learning relationship with peers.

Minocha (2009) points out that it is difficult to measure precisely how largely online forums, wikis, blogs, podcasts, and so on, are actuality fused in virtual learning environments (VLEs). There is also ongoing debate as to whether initiatives using SS should be concealed behind the structures of an institutional VLE, or whether they should be openly published on the Internet for the benefit of students everywhere. McLoughlin and Lee (2008) consider the representations and the discussions. There is no doubt that the learning process occurs in a socio-cultural system in which students use diverse technological tools and several platforms to engage to produce collective activity, enabled by technology affordances.

McLoughlin and Lee (2008), in conjunction with several authors (Read, 2005; Lee *et al.*, 2006; Evans, 2006; Miller, 2006; 2007; Edirisingha *et al.*, 2006; Sener, 2007; Wenzloff, 2005; Richardson, 2006; Yew *et al.*, 2006; Boulos *et al.*, 2006), demonstrate the power of SS/SW innovation to support learner-centeredness in educational systems. Many universities have incorporated and adopted technological applications as part of teaching and learning. British universities such as Newport University and the University of Warwick, to mention but a few, have willingly adopted and incorporated both blogs and wikis and the advent SS/SW for collaborative learning. Annexure K provides an insightful example of educational innovation and of institutions that have incorporated SS/SW in the administration and facilitation processes. It is crucial to discuss and elaborate on the existence and usefulness of these applications in our next section to determine how best it can be in utilized to foster quality education delivery. The first part provides a short introduction and defines SS/SW. The second part discusses web-based education systems and all their attributes, characteristics and features in relation to the educational context.

2.8 Defining social software (Web 2.0) / semantic web (Web 3.0) and web-based educational systems (WBES))

Over the past decades, social software technologies tools, specifically blogs, wikis, e-portfolios, social media, podcasting, social networking, to list but a few, have gained strong education awareness. They are used for diverse learning groups, from primary and secondary education (Tse *et al.*, 2010; Sheehy, 2008; Woo *et al.*, 2011; Jimoyiannis *et al.*, 2013) to higher education (Bolliger & Shepherd, 2010; Ching & Hsu, 2011; Deng & Yuen, 2011; Jimoyiannis *et al.*, 2013; Yang, 2009; Zorko, 2009), vocational training (Marsden & Piggot-Irvine, 2012) and teachers' professional development (Doherty, 2011; Wheeler & Wheeler, 2009; Wopereis *et al.*, 2010).

In the education context, there are shifts in the visions of what education is for, with more and more discussions on the need to allow and support not only the ability to grasp information and knowledge, but rather to advance the skills and resources that are essential for social software and technological changes to improve learning throughout life (McLoughlin & Lee, 2008, 2010; Owen *et al.*, 2006). Dotsika (2012) highlights the technological aspect of SS/SW and its applications. The present applications that support knowledge distribution and interoperability among incompatible information repositories depend on annotating data and preserving a syntactic reliability. Web 2.0 (SS) and Web 3.0 (SW) are two distinctive approaches to web information technologies, even though they stem from the same needs. They meet certain needs and embody two diverse, but equally prominent trends (Dotsika, 2012).

Web 2.0 (O'Reilly 2005) was named as such by Tim O'Reilly in 2005 and is a collection of technologies and applications rather than an architecture (Dotsika, 2012; Ciccarese *et al.*, 2011; Conole & Alevizou, 2010; Fuchs *et al.*, 2010; Nikolov, 2007). Its emphasis is on community collaboration, end-user participation and knowledge distribution. The evolution of social media and other SS/SW technologies is unprecedented (Tess, 2013; Lenhart *et al.*, 2010). Social media is a term that is broadly used to label any number of technological systems related to collaboration and community (Joosten, 2012; Kaplan & Haenlein, 2010). In this section of the study, the researcher will use the terms SS and SW interchangeably. Social media technology has turned out to be an essential part of individual life, as learners create content, share photos, or interrelate in a game. The ubiquity of social media and other SS/SW is nowhere more apparent than at university where the technology is revolutionizing the ways learners interconnect, work together, and learn. Tess

(2013) avers that even as today's contemporary university learner experiences a variety of classroom forms, such as multimedia platforms and virtual game world, the notion that social media could be an effective tool for educational purposes has received recent attention.

Berners-Lee announced the SW in 2001 as a form of web content where knowledge representation is standardized and relies on languages expressing information in a machine processable form by means of a framework based on RDF (resource description framework) and ontologies (Tess, 2013; Dotsika, 2012; Lenhart *et al.*, 2010). The information modelling is predominantly top-down and it is done formally, without the participation of end-users. The educational aspect of the SW is based on system interoperability and adaptive, personalized information access.

Interoperability addresses heterogeneity issues present in data and administrative processes and it ensures information integration across systems, a process too costly for any institution. Interchange, distribution and creative reuse are an SW-inherited standard, while scalability is dependent upon increasingly powerful implementations (Ankolekar *et al.*, 2007). Adaptive technologies facilitate the tailoring of information access according to given user profiles. Intelligent information integration and agents such as information brokers, filters, personalized search agents and knowledge management services are examples of innovative applications (Tess, 2013; Dotsika, 2012; Lenhart *et al.*, 2010). The SW framework consists of XHTML, XML, the resource description framework (RDF) and the web ontology language (OWL). The resource description framework (Tess, 2013; Dotsika, 2012; Lenhart *et al.*, 2010) is an XML-based, standardized semantic annotation method, and, as such, interoperable. The RDF schema (RDFS) adds basic ontology description power to plain RDF and many of its components are included in OWL. Together with RDF, they form the semantic web's RDF layer, which adds semantics to web content and enhances machine processability. The model is scalable and searches are improved as the information can be processed in relation to the modelled relationships between data and/or resources. The SW framework is occupied by ontologies; sets of shared, explicit and formal concepts used to organize and classify content (Tess, 2013; Dotsika, 2012; Lenhart *et al.*, 2010). From an educational point of view, ontologies are used to model originality of information and processes accurately and consistently, enabling automatic reasoning, concept-based searches, process composition and knowledge discovery by means of intelligent agents. The OWL (Dotsika, 2012) is a family of languages built using XML/RDF syntax.

Student-centred learning is an approach that allows the use of technology that revolves around flexibility privileges, choice and an improved knowledge of ownership and empowerment over learning (Lefever & Currant, 2010). It entails the development of a WBES architecture that considers a whole range of requirements and provides the needed functionalities based on the facilities of the Web. Bittencourt *et al.* (2009) aver that the development of SWBES is a multifaceted undertaking which faces several issues with regard to software engineering and synthetic intelligence parts, including extensibility; interoperability; contextualization and reliability of metadata; active structure of learning and contents; incorporation and reusability of content and artificial intelligence techniques; distribution of services and new models of learning. All these concerns have been affected by the intention of demonstrating information on the Web in such a manner that computers may comprehend and be able to make use of such data. Therefore, SWBES are the innovative leap of SWBES that practises semantic web technologies to produce more custom-made, flexible and intellectual education systems (Lefever & Currant, 2010; Bittencourt *et al.*, 2009).

Learning with Web 3.0 technologies involves the active involvement of internet users and collaboration within societies through social software such with blogs, wikis and social networking (see Table 2.1) (Lal, 2011). The application facilities and tools of Web 3.0 technologies introduce open approaches to learning. The semantic web technologies offer various tools and services for educational activities and web applications on internet, as illustrated in the diagram below. Some these tools are briefly discussed to gain insight into the incredible features that Web 3.0 provides (Lal, 2011).

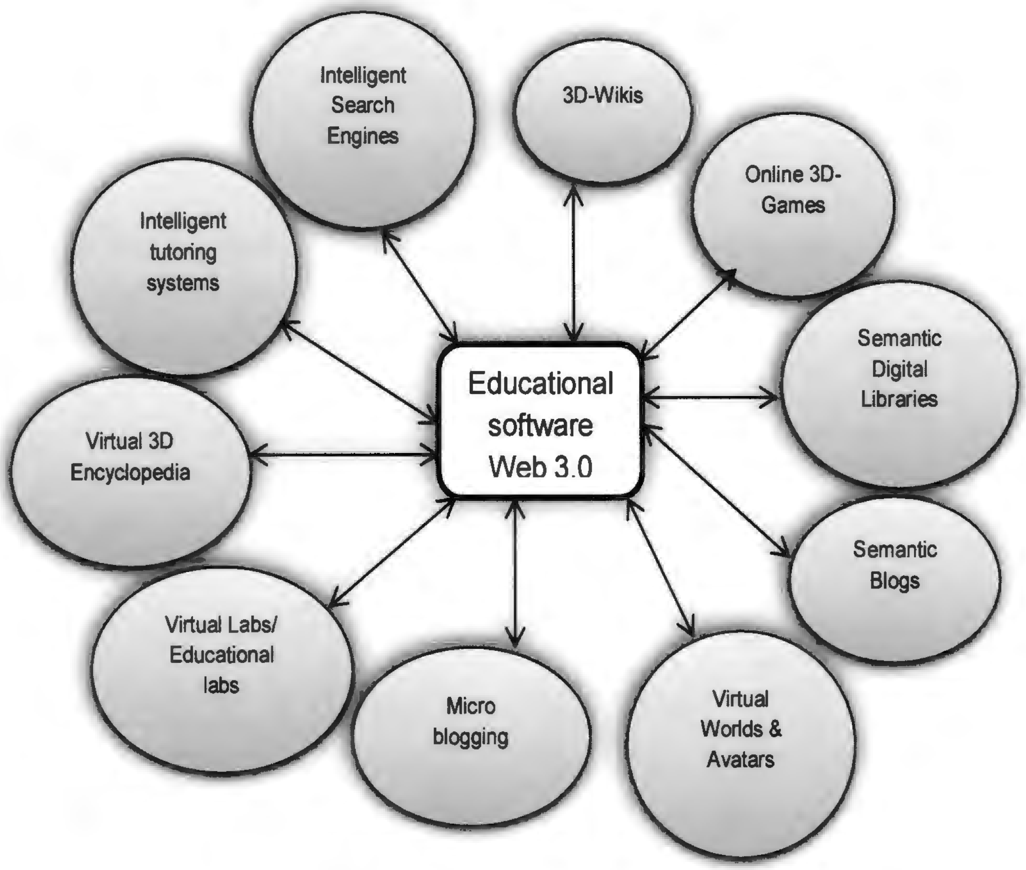


Figure 2-1: ***Social software in education (adapted from Lal, 2011)***

The educational Web 3.0 and Web 2.0 contain collections of educational tools that enable end-user communication and sharing of data with other peers, mainly through networks (Minocha, 2009). As seen in the Figure 2.1 above, blogs, wikis, social networking websites, such as Facebook and Flickr, and social bookmarking sites, such as Delicious, and 3D environments such as Second Life are examples of some of the tools that are being used to distribute and collaborate in pedagogical, social, and business contexts. Moreover, the outstanding feature of these tools is that it includes broader involvement in the construction of collective information (Minocha, 2009). The sections below briefly describe some of the tools and services that are useful for the educational environments and research.

2.8.1 Learning with 3D wikis and virtual 3D encyclopaedias as part of an educational platform

Three-dimensional wikis (3D) is a kind of a wiki system that enables one or more students to build shared knowledge in a form of interlinked web pages by means of creating, inserting and editing web pages. According to Aghaei *et al.* (2012), wiki is a network page (or set of web pages) that can easily be altered or edited by an individual who has the privilege to access it. As opposed to blogs, it has distinctive features, namely wiki mark-up language, simple site structure and navigation, simple template, ability to support multiple users, built-in search features and simple workflow. Wikis can play an essential role in content creation, publishing, editing, revising, and collaborating for knowledge creation. This implies that students are able to carry out their learning activities collaboratively (Lal, 2011; Chisega-Negrila, 2012; Andriole, 2010). Lal (2011) argue that a virtual world is the combination of 2D and 3D gaming technology, amplified reality, and virtual environment, power-driven with internet technology where users relate through movable avatars. Learners can create their own avatars on the web and reside in these worlds. Virtual worlds can herald a new era of e-learning as they offer learners the opportunity to do role-play, 2D/3D demonstrations, simulations, creativeness and to actively participate. There is a great need for research related to the pedagogical benefits of teaching and learning in 3D virtual worlds. Recently, several web-based 3D virtual worlds, such as Second Life, IMVU and Active Worlds, have gained the attention of the students and teachers for education and learning worldwide (Lal, 2011).

The features of virtual 3D encyclopaedias enabled by SW means that these tools may possibly improve constructivist learning enthusiasm, most especially for distant learning (Vrellis *et al.*, 2016). Nevertheless, the 3D virtual worlds do not provide the full abilities of virtual reality (VR), although research shows that the pedagogical use of virtual 3D would support students with the capacity to view an object or situation from several dimensional viewpoints. Considering the nature of 3D, Warburton (2009), Schroeder (2008), and Smart *et al.* (2007) affirm that virtual environments and virtual technologies should be described as a virtual representation that compels the student (or students) to gain a logical view presented in a given setting as opposed to the setting they are really in by allowing learners to interact with that environment and giving the learner a strong sense of being there. Lal (2011) imply that educators can facilitate several different kinds of classes by means of the settings in a 3D virtual world. The students can interact as if in a reality-like environment. Educators and students may jointly engage in collective sessions from geographically circulated settings in a pooled virtual 3D space. Most importantly, this tool can grant the educators and students the platform to schedule meetings, conferences, presentations, and digital displays. The integration of 3D virtual worlds can be very helpful when combined with a variety of programmes (Lal, 2011).

2.8.2 Intelligent search engines

In the past few years, the diffusion of the web has allowed a whole new pedagogical progression where there are more flexibilities for retrieving the resources for learning (Lal, 2011). The WWW has come to be a valuable, convenient and frequently used source of information. Intelligent search engines help us to manage the massive volumes of data and information on the web efficiently. They emerged to help with the activities of filtering and retrieving meaningful, suitable and relevant information in multimedia form for its end-users (students). In the Web 3.0 era of agents-based search engines, they can find not only the keywords in your search, but also interpret the context of your request. It would return relevant results and suggest other content related to your search terms. Professionals are of the opinion that Web 3.0 offers end-users richer and more appropriate experiences. That means that if two different students each conduct an internet search using the same keywords and the same service, they would receive different results. This is because every end-user will acquire a unique internet profile based on that user's browsing history. Learners can also be advantaged by the information structuring driven by the SW. An SW intelligent agent-established search engine can return local lectures, relevant blogs, books and television programmes about the topic to the student. The ontologies aspect of the SW can connect the student's requests and individualistic characteristics so that tailored agents can search for studying resources constructed based on the student's needs and requests (Lal, 2011).

2.8.3 Online 3D virtual labs / educational labs / simulations or 3D web

The rich online 3D user platforms or interfaces that use graphical representation serve as a dynamic interface for the learners. They can actively participate in and execute collaborative activities, distribution of results and exchanging data among various participants in a more accepted way. The following are some of the examples of 3D virtual labs/educational labs/simulations or 3D web-based applications that will shape future education (Lal, 2011; Passant *et al.*, 2008). The application of an online 3D virtual lab can enable a class to visit different places, for instance ancient places that students cannot reach in a small space of time. Students are able to see the Egyptian pyramids or visit an Egyptian community by means of a 3D simulation. With this method, students can work on tasks together and they are capable of experiencing learning at a distance. Virtual science laboratories where students can do experiments can perhaps also be beneficial to learners. Students may choose to go offline into a real science lab to perform the correct experiment and to see how it works. High-level scientific experiments can be carried out virtually and technical exercises requiring a great level of skill can be given (Lal, 2011; Passant *et al.*, 2008).

2.8.4 Learning with a semantic blog/micro-blogging

Micro-blogging is the most recent SS/SW sensation. Minocha (2009) and Passant *et al.* (2008) point out that the innovative practices of semantic/micro-blogging such as blogs, wikis, podcast and social networking sites, Facebook, Twitter, Flickr, and social bookmarking sites such as Delicious, enable end-users to put their thoughts online to an open podcasting platform where end-users record it. There is even videoblogging (also known as vlogging) where the sender delivers messages in video. Micro-blogging allows individuals to exchange short messages within their community or simply to write in brief to the general public on the web. This new form of blogging permits individuals to broadcast short and brief text to multitudes on the web by different communication means. The sections below briefly explore some of the micro-blogging application tools for advancing teaching and learning in an educational scenario (Minocha, 2009).

2.8.4.1 Blogs

Lal (2011) state that blogging is a platform for online diaries. It offers a friendly interface for convenient broadcasting and distribution of e-content online. It may include photos as well. Blogs offers features that allow the user to add comments posted by readers. Community blogs provide shared authoring. Technological advancements allow easy updating with text, images and video, direct from mobile phones. In a scenario where a group of bloggers write on the same subject in collaboration, they can build up a collection of pieces of knowledge by combining posts and comments received from users. Such groups may consist of learners in a subject area and may be cheered and supported by educators etc. Educators can frequently provide feedback to learners and learners can fellow peers. Lal (2011) ascertain that a blog may be used as an effective tool for educational delivery in distance learning. It offers the opportunity for prolonged discussions outside the classroom and for queries that may be answered by guest speakers or subject matter experts.

Tess (2013) and Aghaei *et al.* (2012) further argue that weblog is a captivating form of online journaling where a number of contributors participate by dialoguing about a particular topic or focus. Like other social media, blogs allow users to post personal content, to comment on and connect to other media sites, and to make observations about other users' posts. Tess (2013) offers an extensive review of the empirical research on the use of weblogs in higher education settings, revealing that a majority of students agree with the idea that blogs are easy to use and should be used more as a learning tool, especially for formative purposes. The students who stated otherwise tended to dislike writing, had worries about privacy issues, and were unfamiliar with the technology.

2.8.4.2 Wiki

A wiki is a system that allows one or more people to collect knowledge together by using a set of interlinked web pages and a process of creating and editing pages (Lal, 2011, Anderson, 2007). Wikis play a crucial role in content creation, broadcasting and reproducing, editing, reviewing, and collaborating for information creations. Wikis are essentially used for sustaining and constructing a repository of content and material. In an education setting they may be used for the creation of annotated reading lists by educators or subject matter experts; bookmarking or class activities that are based on the incremental addition of knowledge by a group; the production of collaboratively edited material, including material documenting group projects; instructor/teacher-led writing activities, and; empowering learners through a more democratic, open philosophy of learning and sharing.

2.8.4.3 Podcasts

With regard to advancing teaching and learning through micro-blogging, podcasts may be used to deliver introductory resources or material before lectures or, more predominantly, to create a record of lectures and to give students an avenue to listen to the lectures again and again. Podcasts help in distributing and sharing educational media and resources (Lal, 2011/ Anderson, 2007). For example, in a lecture a topic related to agriculture, the learners could have access to a set of previous works via a photo or a presentation sharing system. Podcasting provides facilities to comment and criticize. The podcasting is the grouping of audio and/or video content, with RSS, downloads, and playback programs, while videocasts are video versions of podcasts. Podcasting offers viewers the ability to stay up-to-date with recent audio or video content on topics relevant to them. Videocasts are suitable in the circumstance of pedagogical delivery as part of a distance learning approach. For instance, were videocasts may be deployed to channel supporting videos of experimental actions before lab sessions. In addition, an instructional video or conference records may be presented on video distributing schemes (Lal, 2011).

2.8.4.4 Twitter/Facebook and other social networking sites

According to Tess (2013), Twitter is a social networking site that is often termed a micro-blogging service. In contrast to Facebook or MySpace, Twitter limits posts or updates to 160 characters. Some have recommended that the use of Twitter makes communication much faster approach because of the relatively short posts. The average blogger may update every few days, whereas the average micro-blogger will update several times a day (Tess, 2013; Mix, 2010). While on the other hand, McCarthy (2010) suggests that Facebook is the ideal host site for a blended learning environment. In contrast, Tess (2013) emphasizes that some academics have acknowledged the prominence of Facebook for social networking, and have also alerted over-use of the site when it comes to actual pedagogical purposes. As pervasive as it may be, the majority of British students signifies that use of Facebook as a teaching tool is not preferable. However, the students portray the use of Facebook as central for social reasons or potentially for informal learning purposes (Tess, 2013).

As discussed above, social networking sites make provision for collective individual to facilitate connections among themselves on the networks (McLoughlin & Lee, 2008, 2010). These platforms embody what is referred to as the responsiveness spaces, where diverse individuals gain both communal and communicative skills, and at the same time become involved in the sharing culture of SS/SW. In so doing, learners get the platform to participate in convenient learning, reproductive and communicative forms of performance and identity seeking, while building a range of digital literacies. McLoughlin and Lee (2008) note that information distribution is fostered by a wide range of SS/SW applications, which enables students with vast knowledge and those that are novices to broadcast or make their work available to the rest of the online world, enabled by blogs, wikis and podcasts. In this way, students with related interests can learn from each other. The massive uptake of really simple syndication (RSS) and related technologies such as podcasting and vodcasting (which involve the syndication and aggregation of audio and video content, respectively), is indicative of a move to collecting material from many sources and using it for personal needs.

These affordances stimulate the development of a participatory culture in which there is genuine engagement and communication, and in which members feel socially connected with one another (McLoughlin & Lee, 2008). Having said this, one cannot assume that just because SS/SW provides affordances, it is all that is required for effective learning. Careful planning and a thorough understanding of the dynamics of these affordances are mandatory. Moreover, the deployment of ICT tools for learning must be underpinned by an explicit learning paradigm and informed by pedagogies that support learner self-direction and knowledge creation (McLoughlin & Lee, 2008).

The adoption educational software such as where SS and SW are combined is more associated, open, and intelligent, with semantic web technologies, shared databases, natural language processing, machine learning, intelligent machine reasoning, and autonomous mediators. Minocha (2009) and Crook *et al.* (2008) conclude that there is little disbelieve that Web 2.0 and 3.0 learning practices encourage a more collaborative approach to study. However, they are a few issues associated with these educational software tools. One issue is the pressure to manage the balance between the opportunities provided by exposing learners to the open internet content and the comparative safety of the VLE of the institution. The next section of this study presents a framework for a SWOT analysis of adopting SS/SW in education with the objective to explore authors, educators and students' views of social software and how best the use of SWOT could reveal the flaws and the effectiveness of SS/SW in facilitating learning and business processes.

2.9 SWOT analysis framework

With the notable awareness of the incorporation of social software and semantic web tools in educational systems, an increasing number of studies have attempted to explore the credibility, reliability and roles of these tools (Chisega-Negrila, 2012; Andriole, 2010; Schroeder *et al.*, 2010b; Brown *et al.*, 2008; Cain, 2008; Mann, 2008). Nonetheless, few insights have surfaced on the threats and shortcomings of these technological tools in the education context (Schroeder *et al.*, 2010a, 2010b). However, a SWOT analysis may be used as standard to discuss the risks of the acceptance of these social software as part of teaching and learning and the university itself. This may enable the educators to be aware of the strengths, weaknesses, opportunities and threats associated so that they can address some of the risks (Chisega-Negrila, 2012; Andriole, 2010; Schroeder *et al.*, 2010b; Brown *et al.*, 2008; Cain, 2008; Mann, 2008).

2.9.1 Strengths of SS/SW in education

This section describes the internal characteristics of SS and SW to identify the strengths and weaknesses. The strengths can be divided into three categories. The potential capability and ability of Web 2.0 and Web 3.0 technologies to support the development of shared interactions, to advance learning, and to improve collaboration between students and educators (Schroeder *et al.*, 2010b).

With combined learning, students are able to build social relationships through reflection, creative thinking, collective knowledge, and long-term retention of the academic material (Schroeder *et al.*, 2010b; Garrison, 2009). This platform also offers prospects for developing shared interactions, building confidence and optimistic approaches to course programmes. In so doing, students are able to overcome interactive barriers, which sometimes advance a community spirit among students (Schroeder *et al.*, 2010b; Garrison, 2009).

The findings of a study conducted at University of Birmingham reveal that students adopted the use of wikis to capture and present work in a discussions forum to viewers, who would read it and make their comments (Schroeder *et al.*, 2010b; Garrison, 2009). This provides the opportunity to bring together new and advanced learning for students to assimilate a new viewpoint into their group by encouraging them to be more reflective in their learning (Schroeder *et al.*, 2010b; Garrison, 2009). Improved collaboration among students and education is acknowledged as an additional major strength of social software and the semantic web in education (Schroeder *et al.*, 2010b; Garrison, 2009). Educators may choose to follow their students' online space interactions and contributions to intervene, mentor or provide directions when necessary. Subsequently, it may enable the educators to interact and contribute to the overall learning experience with their respective students (Schroeder *et al.*, 2010b; Garrison, 2009).

2.9.2 Weaknesses of social software and semantic web in education

The section in 2.8.1 highlighted categories of how social software applications are a vital contribution to building shared interactions among students (Schroeder *et al.*, 2010b); advanced learning and enhanced collaboration between learners and educators. This section explores the weaknesses of deploying social software semantic web tools in teaching and learning course environment (Chisega-Negrila, 2012; Andriole, 2010; Schroeder *et al.*, 2010a, 2010b; Brown *et al.*, 2008; Cain, 2008 Mann, 2008).

The ambiguity surrounding the proprietorship or ownership of task assessments were one of the issues raised by likes of (Schroeder *et al.*, 2010b; Brown *et al.*, 2008; Cain, 2008; Mann, 2008). This section discusses some of these issues, which includes massive workload, the inadequate quality of communication, as well as uncertainty about the ownership and assessment issues. As much as the SS and the SW play a role in providing academic support and improved business processes, the adoption of these application tools into a learning context creates additional workloads for students and educations (Chisega-Negrila, 2012; Andriole, 2010; Schroeder *et al.*, 2010b).

In Schroeder *et al.*'s (2010a) study educators expressed their frustrations with initiating and successively administering web technologies to students. Monitoring their contributions creates an immense workload. SS tools demands intensive time and effort, most specifically when used for the first time (Chisega-Negrila, 2012; Andriole, 2010; Schroeder *et al.*, 2010b; Brown *et al.*, 2008; Cain, 2008; Mann, 2008). The weaknesses that students are likely to encounter in the use of these applications would be where students find it difficult to manage appropriate forms of interaction in social communal environments (Schroeder *et al.*, 2010b). This becomes a challenge as not all learners have equal experience in the use of these applications. Therefore, misinterpretations and difficulties with communication will arise with students not using the right tone for positive feedback (Chisega-Negrila, 2012; Andriole, 2010; Schroeder *et al.*, 2010b; Brown *et al.*, 2008; Cain, 2008; Mann, 2008).

Schroeder *et al.* (2010b) deduce that in a learning context where students' performance and achievement is often based on knowledge creation and validation, it is challenging to identify students' individual contributions and hard work. Most students believe that the nature of wikis will cause students to be inactive. On the other hand, educators state that there is a sense of ambiguity about the appropriate means of evaluating students' contributions in a collaborative environment (Schroeder *et al.*, 2010b; Brown *et al.*, 2008; Cain, 2008; Mann, 2008).

2.9.3 Opportunities of SS/SW in education

The SWOT analysis is used to carefully evaluate a specific situation with regard to its internal strengths and weaknesses, and its external opportunities and threats. This method of systematic analysis provides the possibility to select suitable approaches for adopting the strengths, addressing the weaknesses, exploiting the opportunities and mitigating the threats (Chisega-Negrila, 2012; Andriole, 2010). Schroeder *et al.* (2010a) for instance describe the external characteristic of opportunities in the context of their study as showcasing student work and the creation of ongoing communities and exploiting opportunities.

Semantic web technologies create a sustainable platform for knowledge showcasing and collaboration among various students. The showcasing of activities may be aimed at large audiences or even involve the wider public (Hosein, 2013; Schroeder *et al.*, 2010a, 2010b; Brown *et al.*, 2008; Cain, 2008 & Mann, 2008). As far as showcasing student activities, social software application tools offer new prospects for activity creation, modification, and broadcasting across temporal and spatial boundaries (Hosein, 2013). Moreover, it offers capabilities that help students overcome their knowledge sharing and interaction difficulties (Hosein, 2013).

When using technological tools in education, students often receive login credentials, build individual profiles and on some application platforms, they also form relationships (Chisega-Negrila, 2012; Andriole, 2010; Schroeder *et al.*, 2010b; Brown *et al.*, 2008; Cain, 2008; Mann, 2008). After such online personal profiles have been created, they can still be used inside and outside the course environment after the course programme has ended (Schroeder *et al.*, 2010b). Showcasing students' activities and work provides substantial opportunities for education institutions to achieve supplementary exposure and to develop the prestige of a particular course or programme (Schroeder *et al.*, 2010b).

2.9.4 Threats of SS/SW in education

According to Chisega-Negrila (2012) and Andriole (2010) the threats that stand out relate to the support and reliability of the applications, illegitimate use and mitigating threats.

Research reveals some issues regarding the reliability and inability of assuring support with the use of tools in the open domain (Chisega-Negrila, 2012; Andriole, 2010; Schroeder *et al.*, 2010b; Brown *et al.*, 2008; Cain, 2008; Mann, 2008). As a matter of fact, the challenges related to the use of application tools in the public sphere are listed by London South Bank University [LSBU]. For an instance, where a photo-sharing web page was set up for learners to upload and demonstrate their photography assignments, a learner observed that his user account was suspended and images deleted. Any institution's IT department is limited with regard to the extent to which they can provide assurance and maintain support of the applications, or ensure their existence (Chisega-Negrila, 2012; Andriole, 2010; Schroeder *et al.*, 2010b; Brown *et al.*, 2008; Cain, 2008; Mann, 2008).

Another important threat that has emerged involves the illegitimate use of social software applications in an unlawful purpose (Andriole, 2010; Mann, 2008). Students may possibly use their access to these applications to create inappropriate content or for devious conduct. Such an event could definitely affect the trustworthiness of the education institution and universities should therefore ensure that they consider appropriate uses of these tools (Chisega-Negrila, 2012; Brown *et al.*, 2008).

SS/SW has generated significant interest in the further and higher education systems. In adopting these SS/SW tools or applications in higher learning can activate major educational innovation. Judged by its benefits, SS/SW encourages new methods of interactive and collaborative learning. As much as there is evidence that focuses on the characteristic features of these applications, Schroeder *et al.* (2010b) affirm that there are flaws and possible threats that are interlinked with these technologies. This section explores the flaws of SS/SW by performing a SWOT analysis.

In conclusion, SS/SW and ICT instructional web technologies and application promises new approaches towards learning practices, regardless of the threats that it poses. There are quite probable benefits that abound and the affordances of SS tools mentioned above in this study (McLoughlin & Lee, 2008, 2010). The next section addresses educators' confidence, readiness and challenges with the use of ICT tools to determine the hindrances associated with the adoption and use of SS / ICT tools in a teaching and learning environment. The section relates most specifically to the various controversies and challenges that higher education institutions have encountered with SS adoption.

2.10 Controversies

Schroeder *et al.* (2010) argue that the legal aspects associated with the use of SS/SW in the public domain should be considered. Interacting with students in the public domain raises the issue of data protection and privacy, as it is the duty of the institutions to protect students who have to use public tools for student assessment (Schroeder *et al.*, 2010b). Dotsika (2012) argues that in as much as there are issues that arise from the use of SS/SW, any participatory and collaborative platform would have problems, just as the information modelling with folksonomies have quite a few quality issues. Dotsika (2012) further sustain that institution-centred criticisms relate to technology dependence, security issues and information overload. Ethical and legal issues such as anonymity, reputation, intellectual property ownership, patent violations, monetary function and trust are other controversies that are highlighted (Dotsika, 2012). He claims that these controversies of SS/SW commonly appear to be technical in nature and the result of difficulties related to its technologies. Dotsika (2012) avers that the establishment of RDF is particularly problematic. Any development of RDF/RDFS or OWL entails dedicated expertise and this means that there can be limited widespread adoption.

Pereira *et al.* (2013) maintain that cultural issues such as privacy, reputation and identity, have raised notable concerns among academic writers. In cultural concern that should be critically considered during SS/SW design and integration is that these technologies cross people's cultural boundaries to permeate over every aspect of their lives. This involves personal affairs, work space and education (Pereira *et al.*, 2013). Arguably, Sellen *et al.* (2009) contend that the digital native basically lives with technology, do not just use it. This undoubtedly signifies that a wider set of dynamic factors will emerge. This can range from emotion, sociability and human values, to issues of scalability, security and safety. All these factors have an effect on how people interact with and by means of computers. Pereira *et al.* (2013) attempt to justify the extent to which cultures and people's values are affected. What is more, Pereira *et al.* (2013) and Schwartz (2012) denote that values are bound to culture. They are intertwined and therefore differ in significance, status, and priority according to the philosophy being analysed and the time and space.

One cannot overemphasize that recurring uncertainties, specifically those created by the application tools enabled with SS/SW, concern widespread communication online. These worries tend to be focused on the identical issues of falling victim to predatory unidentified outsiders online and augmented victimization by peers. There is an indication that most individuals are somewhat more naïve about the internet and its potential dangers than what the documented reports assume (Crook, 2008; Yan, 2006). Wolak *et al.* (2008) critique a few statements regarding the nature of the jeopardies/dangers emerging from these online applications. However, there are presently countless false ideas about the dynamic of this dilemma. This phenomenon should be better understood for the sake of effective education on safe behaviour. While the unwelcome phenomenon of student bullying has received much attention, it is crucial to note that learners are capable of using SS/SW application tools to bully their educators and peers. There have been instances where learners have posted uncomfortable video clips on a media-sharing domain or make unsuitable entries on sites that request learners to rate their educators. Elham *et al.* (2014) and Stollak *et al.* (2011) add that inappropriate use of SS/SW application tools in education has been investigated. Elham *et al.*'s (2014) study established that learners' performance deteriorated due to the extensive use of these application tools and using social networking sites. Therefore, spending more time on Facebook appears to result in a deterioration of student scores. In addition, some learners do not use systems such as e-learning correctly, which also results in failure (Pituch & Lee, 2006).

SS/SW raises a number of other issues, for instance intellectual property rights and control (IPR), as noted by Dotsika (2012), and many other related issues (Crook, 2008; Minocha, 2009). Minocha (2009) and Franklin and van Harmelen (2007) reveal that the matter of content ownership seems to be frequently investigated. Questions such as who owns the content when it was collaboratively generated come to the fore. Issues of content ownership may also raise questions like who the authors are, to which institution the content belongs, and finally, who the inventor of the system is. Ownership may be clear when all the inventors are members of the same institution, but what happens if the system is publicly available to individuals who are not affiliates of the institution or if the system is not hosted by the institution? Few systems address these controversies by establishing beforehand who the owners are and what rights people have on all systems by for instance making use of one of the creative commons licenses (Minocha, 2009; Franklin & Van Harmelen, 2007).

The concerns stated above have previously been examined, but are worth reconsidering briefly. Dotsika (2012) argues that with SS/SW application tools such as blogs, wikis, data distribution and social book marking, there are legal, ethical and realistic issues with respect to regulating the environmental space. As soon as there is some mechanism that ensures restraint, the institution can be sure that the information that is published is safe (Minocha, 2009). Similarly, there are worries about control and academic freedom with respect to restraint, a matter that cannot be clarified with absolute certainty. In addition, there are significant other issues, especially IPR. The SS/SW education tool provides learners with the platform to work collaboratively and interactively for data dissemination and repurposing. The controversies may be related to IPR, as such application tools could involve plagiarism.

The adoption of SS/SW as an instructional tool in a pedagogical setting is a cause that attracts much attention (Crook, 2008). While the case for the acceptance of SS/SW and ICT tools seems convincing, it is appropriate to take a closer look at what this entails. Carmichael and Jordan (2012) reflect on issues such a data sharing and publishing; ontologies/technical and metadata schemes; ease of use and prospects with regard to user engagement.

Table 2.2 summarizes the issues and concerns authors have. Authors have not yet addressed such issues as cost, benefits, flexibility and risk as part of SS/SW & ICT investment. These areas should still be explored. No one author can claim that his or her theory or approach is the most accurate one, nor could they offer decisive evidence of the accurateness of their respective approach.

Table 2-1: Summary of the issues and concerns related to SS/SW

Author (s)	Year	Key words	Journal	Central argument
Downes	2005	Educational blogging; e-learning	E-learning research	The use of blog and podcast posts for learning. Information is disseminated in different ways as opposed to being composed, organized and packaged
Downes	2010	Web 3.0, the way forward	AQGQR Research International	Lifelong learning
Anderson	2007	Social learning 2.0	JISC	Accessing Web 2.0 ideas, technologies and implications for education
McLoughlin & Lee	2007	Social software and participatory learning: Web 2.0	Proceedings ascilite	Digital tools and affordances call for a new conceptualization of teaching
McLoughlin & Lee	2008	The 3 P's of pedagogy for the networked society	Journal of Teaching and Learning in Higher Education	Directed on participation in communities and networks for learning, personalization of learning tasks and production of knowledge
McLoughlin & Lee	2010	Students as producers	Proceedings (ITHET)	Personalized and self-regulated learning
Minocha	2009	Role of social software tools in education	Open Research Online	A review of literature on the role of Web 2.0 or social software tools in education
Lubbe	1994	IT investment	M – dissertation	IT investment measurement
Moges	2013	ICT enhancing quality education	Journal of Research in Commerce, IT & Management	The role of information and communication technology (ICT) in enhancing education

Author (s)	Year	Key words	Journal	Central argument
Hosein	2013	Social Technologies and informal knowledge sharing	Studies – Dissertations	ICT conditions to integrate differences in learning: Contextual learning theory and a first transformation step in early education
Schroeder *et al.*	2010b	SWOT of using social software in education	Journal of Computer Assisted Learning	Explore the various implications of introducing social software into a course environment in order to identify the associated benefits, but also the potential drawbacks.
Lal	2011	Web 3.0 in education & research	Journal of Information Technology BVICAM	The benefit of Web 3.0 in education alongside the potential characteristics; the intelligence, interoperability, personalization and virtualization
Mukhopadhyay *et al.*	1995	IT benefits	2nd Henley Conference	Problem – impact of IT analysis of cost & benefit
Ciccarese *et al.*	2011	An open annotation ontology for science on web 3.0	Journal of Biomedical Semantics Proceedings	An investigation to ascertain whether the annotation ontology meets critical requirements for an open, freely shareable model in OWL, and annotation metadata created against scientific documents on the Web
Almeida *et al.*	2013	e-Commerce business models in the context of Web 3.0 paradigm	IJAIT	Web 3.0 promises to have a significant effect on users and businesses

Author (s)	Year	Key words	Journal	Central argument
Hussain	2012	E-Learning 3.0 = E-Learning 2.0 + Web 3.0?	Conference (CELDA)	The study describes the way both previous generations of e-learning (1.0 & 2.0) emerged with the prevalent technologies in their kin web versions (1.0 & 2.0 respectively)
Loureiro *et al.*	2012	Embracing Web 2.0 & 3.0 tools to support lifelong learning	Procedia – Social and Behavioural Sciences	Learning in a digital age
Aghaei *et al.*	2012	Evolution of the World Wide Web	IJWesT	Provides a background of the evolution of the web from web 1.0 to web 4.0

The table above and the literature review shows that there has been substantial activity in IS research. The research was carried out at several strategic institutions around the world. Up to this point now there has not been a single exceptional theorist who has been able to consolidate all the different trends in the research (Esther & Brooke, 1995). Investing in the adoption and combined integration of SS/SW and ICT tools in higher educational systems has been motivated based on the business processes. The reasons why institutions or organizations finance ICT investments are as follows: to establish quality service delivery; to invent new products or to improve on the existing services/products (expansion); to replace or upgrade facilities and assets that have become obsolete (maintenance/upgrade); to reduce costs on current or future expenses (cost displacement); to change the old-style or traditional mode of operation (transformation); and most prominently, to meet the fast changes in technology. In this case, this study investigates the adoption of pedagogical technology for the purpose of maintenance/upgrade, expansion, cost effectiveness and transformation.

There are four components of investment assessment, namely costs, benefits, flexibility and the risks (software crises). These components are not fully addressed in the discussions by other authors. The issue of the risks related to software crises has not yet been resolved. Haigh (2010) notes that the term "software crisis" was coined in 1968 at the NATO conference on software. A software crisis forms when there is not an adequate budget, proper design and execution, when there is low productivity, a lack of quality in the software and inability to meet users' expectations (Colburn *et al.*, 2008). Much research has been done on the causes, effects and solutions for the crisis, but to no avail. IT projects tend not to be delivered on time, within budget or at the stage when it is needed in the organization. Kennedy (1999) and Guerreiro (2015) feel that perhaps the issues of the cost implications, benefits, flexibility and risks of Web 2.0/Web 3.0 and IT investment has been underemphasized.

Esther and Brooke (1995) argue that managers disregarded the issue of returns on their ICT investments in the late 1960s, the 1970s and early 1980s. It was commonly assumed that the expenses incurred on hardware and software quickly yielded capital for themselves as ICT computerized basic functions. In the 1980s, ICT expenditures increased immensely, leaving managers with the challenging problem of not being able to realize any gains as a result of their ICT investments. In most cases, institutions or organizations are not receiving a reasonable financial return on their ICT investments for a variety of reasons. Generally speaking, traditional investment evaluation systems, which includes payback, accounting rate of return (ARR), net present value (NPV) and internal rate of return (IRR) as universal, are not just effective when used to evaluate the various benefits of ICT investments. These investments are purported to yield tactical or strategic business advantages. It has therefore become a challenge to realize a change in the business processes (Kennedy, 1999).

In spite of the claim that ICT investments yield competitive benefits, Qureshi (1993), Haywood (2009), Porter and Millar (1985), Lefever and Currant (2010), Whitton (2009), Strassmann (1985), Haigh (2010), and Colburn *et al.* (2008) all acknowledge the cause for concern about the state of ICT assessment. This concern is the result of several cases where assessments produced unsatisfactory results. Research indicates that 70% of organizations assert that their ICT system is not returning on the company investment because ICT expenses are always more than estimated. Thirty-one per cent of organizations' records reflect successful ICT investments, while 20% of what is spent on ICT investment is lost. Thirty to forty per cent of ICT developments realize no net benefit at all. Ninety per cent of organizations lack a systematic assessment process and 24% of organizations investigated reported an above average return on money from their ICT investments. It is clear that the problem of software crises has not been resolved and these statistics justify careful consideration of the adoption of SS/SW and ICT in education and for education institutions' business processes. The statistics provided may be subjected to scrutiny, especially when considering the time, location and the year in which the statistics were released. Moreover, the intention behind this report is to emphasize how most institutions or organizations neglect costs implications during ICT investments processes.

Kennedy (1999) adds that most organizations are not able to assess the costs, benefits and risks of ICT accurately. Consequently, they make poor investment choices. This is supported by Lefever and Currant (2010) and Reushle and Loch (2008), who add that when assessing value for money, it is certainly not just about getting involved with the initiative or access to resources. Organizations or institutions should reflect on the unforeseen costs of adapting and preparing staff, as well as benefits such as time saving on for instance responding to queries or improving one-on-one basic maintenance support, the simplicity of use for learners and the prospect of retention progression from tracking those struggling. Chan and Lee (2005) argue that podcasts are predominantly cost effective, especially for large groups, and technology (Kadirire, 2007; Little *et al.*, 2008) is constructive for advancing student numbers for easy access. Ferrell *et al.* (2007) suggest the probable benefits associated with potential use SS/SW in general. They assert that ICT tools and applications have the potential to educate a more diverse student body; could provide savings in staff time; could increase pass rates and student performance; and above all, could enable cost savings and resource management.

The research listed in Table 2.2 does not place much emphasis on the productivity aspect of ICT investments. Authors suggest that the ICT managers of any organization should concentrate on advancing business efficiency, quality and competitiveness. The concern regarding ICT investment centres on saving costs. Some authors (Qureshi, 1993; Haywood, 2009; Porter & Millar, 1985; Lefever & Currant, 2010; Ward *et al.*, 2002; Whitton, 2009; Strassmann, 1985; Haigh, 2010; Colburn *et al.*, 2008) also claim that technology changes core business processes and that this is a process that organizations could exploit. The emphasis is on financial criteria. Managers should look into various aspects to arrive at a holistic view. This is because ICT is an integral part of a system and benefits should be carefully chosen without trying to determine how to measure each one individually. Lefever and Currant (2010) and Haywood (2009) are of the opinion that IT efforts (budgets, equipment and resources) are often misdirected and this conversely leaves IT departments with little time to react to users' needs for new applications.

The objective of this section is to critically analyse the issues that arise during the adoption and integration of SS/SW into an education system. It is clear that quite a number of issues have emerged. Academic writers have raised issues such as privacy, reputation, identity, other cultural crises (beliefs, behavioural patterns). The issues of costs implication, benefits and risk associated with a software crisis and flexibility are widely considered in the literature. ICT investment should be financed in the most appropriate way so that it would be value for money, ROI, would have benefits and would transform the competitive edge of the business. The next section introduces problems associated with educators' inability to use and adopt SS/SW and ICT web technologies into HES.

2.11 Educators' Challenges with the use of SS and ICT tools

Several research studies have shown that effective teacher preparation is an important factor for successful integration and for the sustainability of ICT tools usage in education (Hennessy *et al.*, 2007; Davis *et al.*, 2009). Most ICT teacher professional development initiatives tend to focus on technical aspects (i.e., how to use various tools) while pedagogical and instructional issues (i.e., why and how to use the tools to enhance learning) are often taken for granted (Jimoyiannis *et al.*, 2013; Noor Ul Amin, 2013; Moges, 2013; Madhukar, 2013; Nwosu & Ogbomo, 2012). As a consequence, the adoption of ICT tools in educational systems has been determined by the affordability of technology rather than by the demands of pedagogy and didactics of particular subject matter.

In this context, it is important to conceive the educational use of Web 3.0/2.0 not in terms of a special event or an extra tool supplemental to the traditional instruction, but in terms of well-defined pedagogical dimensions (Jimoyiannis *et al.*, 2013; Wastiau *et al.*, 2013). Jaffer *et al.* (2007) argue that educators' choice to select a suitable teaching and learning activity is solely dependent of factors such as the curriculum specifications or module objectives, the aim of the facilitation and learning, the educator's favourite teaching styles, the instructional learning approach of the learner and the nature of the curriculum content (Jaffer *et al.*, 2007). Educators should make use of a method of delivering learning content that suits their paradigm of facilitating learning. It is often said that the educational use of technology offers educators the chance to traverse an entire continuum of possibilities as may be proper to their teaching requirements (Jaffer *et al.*, 2007).

Due to the prominence of SS/SW and ICT tools in educational settings and society, it is perhaps important to highlight the possible challenges that educators face with regard to the integration of these tools in education (Bingimlas, 2009). The challenges can be divided into several categories. Bingimlas (2009) mentions that various research studies have emerged that categorize these challenges into two main categories, namely extrinsic and intrinsic challenges. Extrinsic challenges include access, time, support, resources and training. Intrinsic challenges are cited as attitudes, beliefs, practices and resistance (Bingimlas, 2009).

Additional challenges found in the literature could be divided into educator-level challenges and institutional-level challenges. Al-Alwani (2005) views extrinsic challenges as related to organizations as opposed to individuals and intrinsic challenges as related to educators, management and individuals. Bingimlas (2009) further classifies and groups the challenges according to its applicability: whether it relates to individual (educator-level challenges), which involves a lack of time, lack of confidence, readiness, and resistance to accept change; or to the institution (institutional-level challenges), such as a lack of effective training in solving technical problems and a lack of access to resources.

In an effort to establish educators' confidence and readiness for the use of SS/SW and ICT tools in education, the researcher briefly explores all of these categories. First, the research explores educator-level challenges, lack of confidence among educators, followed by resistance to accept change and a lack of educator competence. Second, the researcher looks into the institutional-level challenges. The research briefly discusses a lack of time, lack of effective training, lack of accessibility to resources and lack of technical support.

2.11.1 Educator-level challenges

Regardless of increased computer access and technology development support, technological tools have not been fully harnessed to administer the types of teaching that is supposed to be most influential (Ertmer & Ottenbreit-Leftwich, 2010). Regrettably, research shows that the use of ICT tools tends to be of a poor standard (Maddux & Johnson, 2006). In this section, the researcher observes the incorporation of SS/SW and ICT tools through the lens of the educator as mediator of transformation. There is no doubt that educators have improved their individual and skilled uses of computers (Ertmer & Ottenbreit-Leftwich, 2010).

2.11.1.1 Educators' lack of confidence

The most prevalent challenge that most educators commonly face with when using ICT tools in lecture halls is linked to a lack of ICT confidence (Wood, 2015). Bingimlas (2009) relate this issue of educators' lack of ICT confidence as a background factor that becomes a challenge. Much of the research advocates that one of the reasons for the lack of confidence found in educators was fear of inappropriate use or failure to use ICT tools. Balanskat *et al.* (2006) support this by adding that another factor that hinders educators from using ICT tools teaching and learning is ICT knowledge, which makes them nervous about using technological tools in facilitating learning. Bingimlas (2009) concludes that educators who do not have confidence in themselves or who are not skilled in the use of ICT tools has this fear or anxiety and nervousness to make use of SS/SW tools in front of their subjects (student). Perhaps they fear that their subjects may be more knowledgeable than they are in lecture halls.

Research identifies most specifically that educators fear entering the lecture hall with minimal knowledge about ICT. A lack of confidence and inexperience with the use of technological tools such as SS/SW and ICT tools affects educators' enthusiasm to teach using these tools (Bingimlas, 2009). Educators who have confidence when using ICT tools realize their usefulness. Ertmer and Ottenbreit-Leftwich (2010) believe that if educators want to prepare their students for lifelong learning and being technologically skilful, these educators should at least have basic ICT skills. This is one of the part of the requirements as reflected in the NETS-T [teacher/educator] criteria (Ertmer & Ottenbreit-Leftwich, 2010; ISTE, 2002).

Ertmer and Ottenbreit-Leftwich (2010) assert that where educators have acquired the relevant knowledge, confidence, and belief, they will have powerful skills that would allow them to integrate technology into their lecture halls in significant ways. However, for a majority of educators, this is still not enough, as research shows that advanced teachers are easily overwhelmed by pressure to fit in (Roehrig *et al.*, 2007). Educators are not "free mediators," and their use of ICT tools to facilitate learning is dependent on the interconnecting cultural, social, and managerial contexts in which they live and work (Somekh, 2008). The next section highlights the lack of ICT competence among educators.

2.11.1.2 Lack of educator competence

Hooker *et al.* (2011) describe competence as the capability to syndicate and apply appropriate characteristics to specific tasks in certain contexts. These characteristics comprise high levels of understanding, high standards, skill, individual dispositions, thoughtfulness and competencies, and the capacity apply combinations of these characteristics in practice in an applicable manner. In pedagogical terms, ICT competence refers to what an educator should be acquainted with and be able to do with technology in professional practice. The lack of ICT competence is another challenge that educators face in the use of ICT for teaching purposes. It is in turn linked to educators' confidence. A research study conducted in Australia reveals that many educators lack skills and knowledge, although this report differs from country to country (Bingimlas, 2009). Recent research studies have demonstrated that in underdeveloped countries, a lack of technological competence is a major hindrance to teachers' acceptance and integration of ICT skills. Lack of ICT skills was perceived to be the main reason for not using ICT instructional web technologies in education in Syria and Saudi Arabia. A lack of skills is a compelling factor that hinders educators from using ICT tools in education (Bingimlas, 2009). On the other hand, a lack of educator ICT competence could easily be addressed. The next section discusses educators' resistance (Hooker *et al.*, 2011).

2.11.1.3 Educator resistance to change

In an effort to fully understand educators' resistance to the use of technology, we take a closer look at the positive and negative attitudes and perceptions of the education. Attitudes contribute to educators' technical resistance. Ozer (2013) views attitude from a mental perspective separate from the environmental impacts and the professional variables that equip an educator to use ICT in teaching and learning. He argues that the intrapersonal psychological factors are possibly the most fixed determinant of individuals' willingness and readiness to assimilate technology individually or in their field of expertise.

This psychological aspect centres on the individual's beliefs and attitudes about technology, and therefore how the intellectual and sentimental assessment of technology regulates the use of technology for individual and qualified objectives. The technology acceptance model (TAM) proposed by Davis (1989) explains these intrapersonal aspects in terms of perceived usefulness and perceived ease of use or control (Ozer, 2013). Perceived usefulness is described as the degree to which an educator has confidence that using a specific SS/SW and ICT tool will improve his or her knowledge. The perceived ease of use may be described as the degree to which one has confidence when using a certain technological tool. Moreover, this perception of usefulness and ownership distinguishes the affective estimate of the tool and this is linked to positive or negative feelings towards the technology at hand (Ozer, 2013). In other words, a positive attitude leads to engagement/commitment behaviours, while the negative attitude leads to resistance or avoidance. Hence psychological readiness for ICT tools usage deals with the individual sensitivities, beliefs, attitudes and motives (Ozer, 2013).

Educators' resistance to accept change is another challenges. An inherent resistance to change has been perceived as one of the issues that most educators face. Educators' attitudes towards the use of new technological tools in education remain an obstacle for SS/SW and ICT integration (Bingimlas, 2009). Bingimlas (2009) reports that resistance to change is not a factor on its own, it is a sign that other things are wrong. This signifies that there are explanations as to why resistance to change develops. Resistance to change may be exacerbated by other issues, such a lack of technical support, educator proficiency or time for development (Bingimlas, 2009).

The next section discusses the institutional level challenges such as a lack of time, a lack of operational training in solving technical problems, and a lack of access to resources.

2.11.2 Institutional-level challenges

2.11.2.1 Lack of time

Lefever and Currant (2010) discovered that time and skills are key institutional level challenges that sometimes prohibit educators from integrating SS/SW and ICT tools in teaching and learning (also see UCISA, 2008). The National Student Forum Report (2009) indicates a lack of time and sustenance. Most institutional policies and procedures serve as hindrances to technology-improved delivery. Schoepp (2005) sustains that the time factor and the struggle to plan sufficient ICT applications for lectures were issues found in most education contexts. Bingimlas (2009) emphasizes that the issue of a lack of time was mentioned by many educators as something that hinders their work. It affects educators' capacity to function effectively in their respective jobs. It is clear that educators need adequate time. They need time to browse the Net; prepare classes and time for development support and training programme on using technological applications to facilitate learning (Bingimlas, 2009; Al-Alwani, 2005).

2.11.2.2 *Lack of operational training*

Educational institutions regard ineffective development support with the use of technology as a major stumbling block. Balanskat *et al.* (2006) and Özden (2007) aver that the most common challenges educators encounter is a lack of effective training. Educators receive inadequate training opportunities with respect to the use of SS/SW and ICT tools to enhance the lecture hall environment. Moreover, the challenge of operational training is indeed multifaceted, so it is vital to examine the components that constitute effective operational training support (Bingimlas, 2009). The components include time for training, educational training and skills training.

Kanvaria (2013) states that just like institutions are transforming rapidly, so are ICT tools and the various corresponding skills. We live in an era of growing access to technology and a progression of technology into educating, learning and the professional improvement of educators. Different kinds of knowledge can be gained during skills development training, instilling and ensuring professional advancement (Kanvaria, 2013). Skills development training requires a process of applying practices or techniques that involve new skills and alternatives. Bingimlas (2009) discovered that one of the main hindrances to educators' use of ICT applications in administering teaching to learners is the lack of training, insufficient number of in-service training programmes; and inadequate educator training support.

Providing education training for educators, as opposed to basically just teaching them how to use ICT tools, is a fundamental issue. Bingimlas (2009) claims that when educators have to be persuaded of the possible benefits of using ICT in their teaching, then educators' training should rather be based on academic issues. Bingimlas (2009) revealed that after educators had undergone professional development support training based on ICT tools application, most educators just knew how use the basic tools. This is because the training course only focused on educators acquiring basic ICT abilities. It did not prepare educators to develop the pedagogical aspects of ICT. Balanskat *et al.* (2006) suggest that ineffective operational training does not help educators to use ICT in their lecture halls. Balanskat *et al.* (2006) acknowledge that this state of affairs is because training support programmes do not concentrate on educational policies in association with ICT, but on the development of ICT skills. However, in addition to the necessity for instructional training, it is still essential to train educators in precise ICT skills. Schoepp (2005) maintained that once new technologies have to be incorporated in the lecture hall, educators have to be prepared for the use of these specific ICTs. Educators have to do more preparation to advance the applicable skills, information, attitude and confidence concerning the effective use of SS/SW and ICT tools to support teaching and learning in their subjects.

2.11.2.3 Lack of accessibility to resources and technical support.

Quite a number of research studies have indicated that a lack of access to resources is another problem that discourages educators from actively becoming involved in integrating new ICT tools and applications into the learning environment (Bingimlas, 2009; Korte & Hüsing, 2007). Many educators have limited access to ICT infrastructure and resources. They often have to share ICT infrastructures with fellow educators. Bingimlas (2009) argues that sometimes the inaccessibility of ICT infrastructure resources is not due to the unavailability of the hardware and software or other ICT resources within the institution. In some cases, it has to do with issues such as the maladministration of resources, flawed or poor quality hardware, unsuitable software, or a lack of individual access for educators (Bingimlas, 2009). Challenges associated with a lack of access can differ from country to country.

Korte and Hüsing (2007) identify infrastructure challenges such as problems with broadband, an inadequate number of computers, inadequate peripherals, inadequate copies of software, and deficient simultaneous internet access. These factors hamper ICT integration. Without access to resources, good technical support and ICT infrastructure in the lecture halls in place, educators cannot overcome the challenges that discourage them from using ICT.

Korte and Hüsing (2007) argue that ICT support or maintenance at institutions provide room for the efficient use of ICT in teaching as educator do not trail behind having to resolve frustrating software and hardware challenges. A lack of technical support can prevent educators from effectively integrating ICT into education. One research study reveals that countries like the United Kingdom, the Netherlands, Latvia, Malta and the Czech Republic all acknowledge the importance of technical support in the pedagogical environment (Bingimlas, 2009; Korte & Hüsing, 2007). The rapid development of ICT has brought notable changes in the twenty-first century and has affected the demands of modern societies (Buabeng-Andoh, 2012).

2.12 Educator and learner development and support

As seen above, ICT tools can improve the adoption of a collaborative and integrated learning environment. The second literature matrix theme examines the possibility of a development and support programme for educators and learners. The objective is to answer the research question on what strategies could be put in place for educators and learners to prepare them for the use of ICT tools.

According to Jung (2005) and Bowes (2003), teaching and learning practice is gradually becoming one of the most demanding professions today. Knowledge is escalating rapidly and modern social software technologies are compelling educators to learn how to administer these technologies in their day-to-day teaching practices. While Web 3.0 technologies increase educators' training needs, they also offer development and support. Trinder *et al.* (2008) mention that there are several scenarios where students (termed "digital natives") make use of technological tools to meet their essential needs, such as capturing photographs for projects through the use mobile devices and distributing them to fellow students. Trinder *et al.* (2008) further add that studies have revealed that students are most likely to engage in the use of the most prevalent communication tools such as the short messaging service (SMS), MSN Messenger, Skype™ and social networking sites such as MySpace, Bebo or Facebook. Meanwhile, many of the educators (termed "digital immigrants") may not be so familiar with the range of technologies available. Trinder *et al.* (2008) emphasize the necessity of developing the ICT skills of educators.

Despite the remarkable increase in the probable benefits of SS/SW tools in education, it is encountering high resistance (Kumar *et al.*, 2008). Angeli and Valanides's (2009) research report indicates that educators fail to integrate SS/SW and ICT tools into learning curriculum. These researchers feel that the failure to equip educators adequately to carry out teaching and learning may be attributed to a number of factors. They highlight pedagogical technology developments and skills concerning the use of applications, blogs, wikis, podcasting, virtual world 2D/3D, internet and graphics (Angeli & Valanides, 2009). It seems that although general computer techniques and skills create the foundation of technology literacy, skills-based courses are just not sufficient for developing educators to teach using technology. The lack of a subject-specific focus in many technology programmes remains an issue, but even in those cases where subject applications are discussed, issues of how technology interacts with the content and content-specific pedagogy are not adequately explored (Angeli & Valanides, 2009).

Kumar *et al.* (2008) affirm that educators do not make use of the potential features of SS/SW to contribute to the quality of learning environments. They are of the opinion that SS/SW does have the potential that it proposes (Kumar *et al.*, 2008). Many educators struggle to use SS /SW, even though there is evidence of great accomplishments with its use to facilitate learning. It is sensible then to recognize educators' inability to integrate SS/SW in the facilitation of learning as this makes one realize the paradigm shift with regard to the use of ICT tools upon the arrival of SS/SW (Kumar *et al.*, 2008).

Quadri and Olaojo (2013) sustain that the use of SS/SW educational tools to advance learning has turned out to be a mandatory skill for all professional educators in today's world. As such, all educational institutions should equip educators with the necessary SS/SW development and support to provide the next generation with the required techniques and resources for access and use and to develop the required skills. Educators use ICT technologies for curricular purposes and these technologies should function efficiently for their day-to-day activities. In other words, the purchase of educational software, ICT infrastructure, software and in-service training should be sustainable. Quadri and Olaojo (2013) support the claim that any in-service training requires follow-up support, peer coaching and a channel of communication to guarantee the positive integration and absorption of new technologies. This can only be attained if the educators who struggle in this regard participate. Active involvement will bring a sense of ownership of the innovation (Quadri & Olaojo, 2013).

The focus should not be on general basic skill development alone, but on the development of the SS/SW adoption and integration skills of educators so that SS/SW is adopted as part of the educational and administration processes (Quadri & Olaojo, 2013). Preparing learners for real lifelong learning in our technologically diverse world necessitates that educators embed SS/SW in the learning practices (Braun & Kraft, 1995). Angeli and Valanides (2009) argue that the lack of a theoretical and conceptual framework to guide SS/SW technological tools adoption in the facilitation of learning is a key weakness at educational settings. Therefore, Hooker *et al.* (2011) propose the adoption of a conceptual framework that guides educators' development support programme.

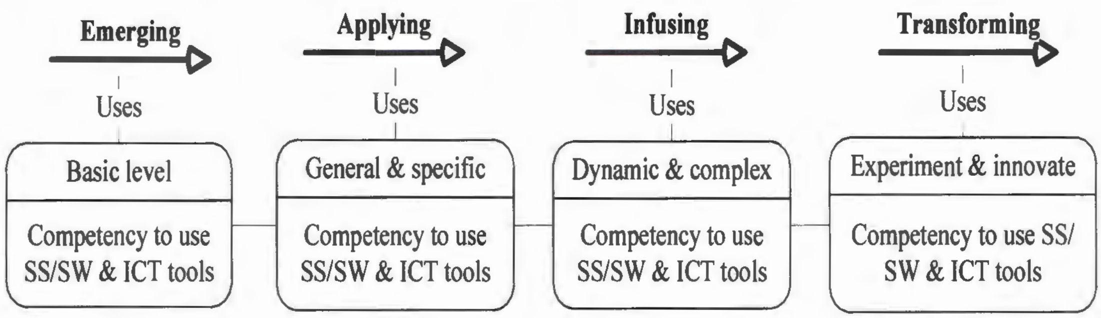


Figure 2-3: ***A conceptual model for an educators' development support programme for SS/SW and ICT tools (Adapted from Hooker et al., 2011).***

The presentation above shows the four stages of a developing and supporting programme for educators. The first stage deals with the emergent stages. Hooker *et al.* (2011) and Jung (2005) note that during the emergent stage, educator development and support is directed at the use of SS/SW and ICT tools as an add-on to the traditional curricula and standardized test systems. During this stage educators and students learning the SS/SW and ICT tools, and their functions and uses. The emphasis is on basic ICT literacy and skills (Noor Ul Amin, 2013). One example of this stage is the University Management Technology Incorporation Resource project mentioned by Jung (2005). It is a multi-lingual Canadian creation that offers SS/SW tools and resources to assist university management to incorporate SS/SW and ICT tools into curricula at their institution. Part of the project is the National Centre for Technology Planning. This centre helps with university ICT strategies, guides on how to offer technology, effective practices in introducing SS/SW and ICT, perceptions on staff growth, a beginners' guide to the internet, etc. The focus of this project is not on general basic skills growth, but on the improvement of educators' ICT pedagogy incorporation skills by sharing successful cases and theoretical ideas (Jung, 2005).

In the application stage, the focus is on the expansion of digital knowledge, coupled with how to use SS/SW and ICT tools for professional advancement in diverse programmes. It includes the use of overall and precise applications of SS/SW and ICT tools (Hooker *et al.*, 2011).

The infusing stage is the third crucial stage in the conceptual model for an educator's development support programme for SS/SW and ICT tools. During this stage educator development is dedicated to the use of SS/SW and ICT tools to provide direction for students who encounter complex challenges and to create a vigorous learning atmosphere. Educators will be building their ability to identify circumstances where SS/SW and ICT tools would be advantageous, and they will adhere to the most suitable technological tools for a specific task and deploy such tools to resolve actual challenges (Hooker *et al.*, 2011; Jung, 2005).

The final stage is the transforming stage where the learning state is reformed and restructured with the use of SS/SW and ICT tools. It is an innovative means of approaching facilitation and learning states with dedicated ICT tools. This is where the educators become the master learners and information makers who are continuously involved in educational invention to discover diverse knowledge about learning and facilitation practice (Hooker *et al.*, 2011; Jung, 2005).

It is vital that all members of the training team are advised to actually use SS/SW and ICT tools to learn about ICT skills and to progress in ICT-integrated training. These training plans appear to be supported by researchers who claim that educators are likely to benefit by learning ICT skills as a learner (Jung, 2005).

The progression through these four stages takes a while to accomplish. The reformation of educational practice requires more than just SS/SW and ICT skills development for educators (Quadri & Olaojo, 2013; Hooker *et al.*, 2011). In most cases the method employed for educator development and support with SS/SW and ICT incorporation is a once-off crash course on computer literacy. This method does not allow educators to incorporate ICT tools in their daily undertakings and ultimately to master SS/SW and ICT tools as effective educational tools for teaching and learning.

The South African education system should address the existing challenges with respect to educator development programmes by looking at several options and embracing a wider vision and philosophy (Quadri & Olaojo, 2013). Higher education institutions should revisit their present teaching programmes, practices and resources, and SS/SW should be incorporated and adopted at all levels, from the lecture halls to administration process, teaching and learning activities. Therefore, educators must receive suitable ongoing training support. Technology use must be in accordance with curriculum policies and the theory of learning. There should also be adequate ICT infrastructure in place in lecture halls (Quadri & Olaojo, 2013). Olakulehin (2007) affirm that we should implement a different framework for educator development. It should make a shift from training to lifelong professional preparedness and the improvement of educators through new modalities of professional growth.

This section of the study emphasized that educators play a vital role in advancing students' collaborative learning. Educators mediate the learning process in educational contexts. Various authors have indicated how educator development support programmes are essential to equip educators with the necessary skills to carry out their day-to-day activities effectively. Angeli and Valanides (2009) emphasize the impact that the lack of a theoretical and conceptual framework to guide educators with regard to SS/SW technological tools adoption in the facilitation of learning has on educational settings. Hooker *et al.* (2011) suggest the adoption of a conceptual framework as a remedy that could be incorporated in educators' development support programmes.

2.13 Privacy and policy issues governing ICT adoption

According to Moges (2013), universities' existing policy frameworks to govern the adoption of ICT tools into educational systems should be revisited to reposition ICT tools as necessary for the development of universities. Considerable emphasis should be placed on the availability, acceptability and accessibility of SS tools in the administration of university education (Moges, 2013). Privacy and safety issues have remained at the forefront. There may be issues with public postings, negatives or online technology such as SNS (Lefever & Currant, 2010). Research studies have recommended that HEIs should strive to present clear policies and procedures on the use of technology such as SNS and PLEs, again that learners should realize their public nature and their own vulnerability. This will help develop ethical and suitable use of technology (Ferrell *et al.*, 2007; Smailes *et al.*, 2008).

2.14 Future trends in education

The rise of the internet in the 1990s has provided an incentive for web-based revolutions in education. Web 1.0 technologies were the first generation of the Web (O'Reilly, 2005). During this phase the focus was primarily on building the Web, making it accessible, and commercializing it for the first time. The key areas of interest were protocols for HTTP; open standard mark-up languages such as HTML and XML; internet access through ISPs; the first Web browsers; Web development platforms and tools; Web-centric software languages such as Java and JavaScript; the creation of Web sites; the commercialization of the Web; and Web business models. The diagram below shows the evolution of Web up to the point where it is used in the teaching and learning context (O'Reilly, 2005).

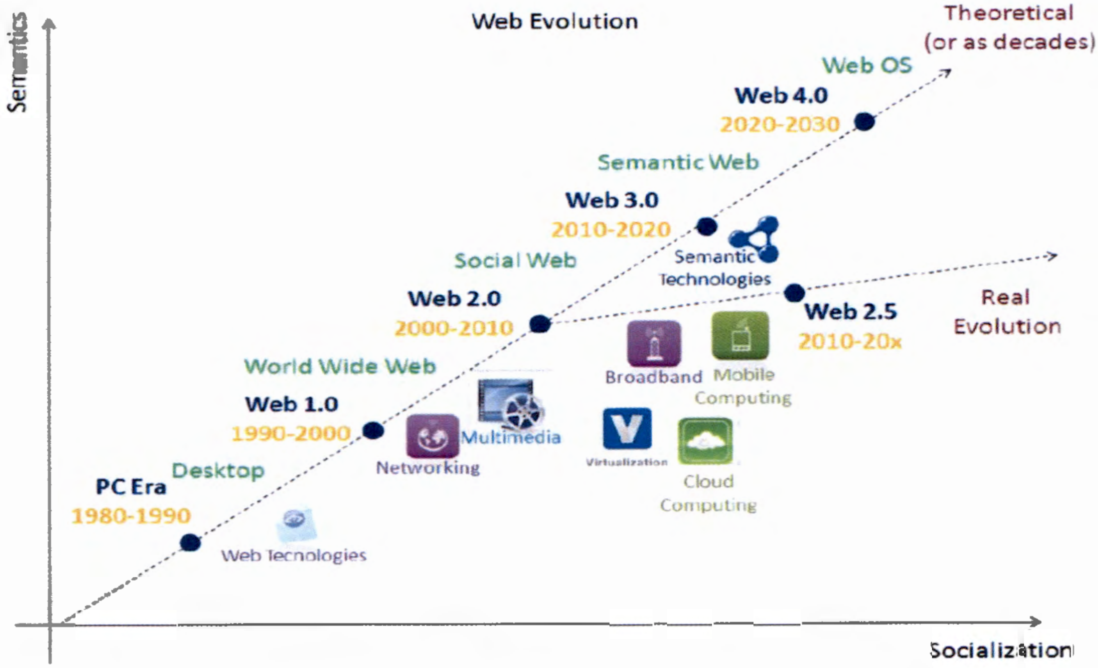


Figure 2-4: The evolution of the Web (Adopted from Pileggi et al., 2012)

According to Schroeder *et al.* (2010b), the prospect of enhancing teaching and learning practices has led educators to introduce dedicated social software applications into the course environment. These applications allow users to create highly dynamic content, often created in collaborative ways with peer-based quality assurance. Early forms of social software tools such as discussion boards date back to the origins of the Web. Others, such as blogs, social networking sites and wikis, only started to become popular in the early 2000s, but have gained widespread acceptance in social, educational and business contexts. Yet others, such as social bookmarking tools (e.g. Delicious) and micro-blogging applications (e.g. Twitter), are still in the early phases of acceptance by mainstream internet users (Schroeder *et al.*, 2010b).

2.15 Chapter Summary

This chapter presented a descriptive literature review to justify the specific approach to the theme and the selection of methods. It expounded the literature matrix concepts presented in this study. Important literature matrix themes and concepts where discussed in detail. This included discussions on ICT; educator and learner development and support; SS adoption at universities; defining SS/SW and Web-based educational systems (WBES); educators' confidence, readiness and challenges in the use of ICT tools and future trends in education.

The next chapter presents the proposed conceptual framework designed for the integration of SS/SW into educational systems. The chapter also describes the process of data gathering and the data collection methods.

CHAPTER 3

THEORETICAL FRAMEWORK

3.1 Introduction

This chapter assesses the existing technological tools and applications used in learning and business administration processes. The focus is on whether these tools are effective to support collective, interactive, constructive and transformative learning. The contribution of this discourse is to develop a comprehensive framework for the adoption and integration of SS/SW application tools in education to allow learners to choose how and where they want to learn (Moges, 2013). The chapter is structured as follows: a detailed framework is discussed and presented diagrammatically. This is followed by brief illustrations of all the nodes represented in diagram.

3.2 Framework

A theoretical framework is a conceptualization of a specific complex research phenomenon, including the salient constructs and their interconnection (Levy & Ellis, 2006). In the IS domain, a framework helps researchers and practitioners to understand and represent IS settings. Guiding ideologies for the concepts that are involved can be established by means of such a framework (Zualkernan, 2006). A framework may be perceived as road map that provides soundness to the practical investigation in a research activity (Howard & Lubbe, 2012). Omona *et al.* (2010) add that it is an organized technique of expressing how and why a research inquiry takes effect, and how to understand its activities. In this study, the framework is a sort of transitional theory that seeks to guide the researcher in all parts of this research and to align problem statement and research questions so that the research ultimately comes together into a whole.

Importantly, this framework develops the concepts involved and expands the body of knowledge. More specifically, the benefit of this proposed framework is that it will broaden the insight into the phenomena that are being studied. It brings understanding and exposes the theoretical foundations of complex research phenomena through visual exposition (Webster & Watson, 2002). Additionally, frameworks facilitate web information modelling, facilitate semantic annotation and information retrieval, enable system interoperability, personalization, virtualization, intelligent agent and enhance information quality (Pettigrew, 1990). The proposed diagrammatic framework proposes four precise aspects that govern institutional transition and is schematically exemplified by a tree structure. The first aspect in the diagrammatic representation of the framework below illustrates the conditions for transitioning and addresses the expected educational impact. The second aspect deals with the significance and facilitation of learning through an SS/SW tutoring agent matric. The third and fourth aspects deal with the problems surrounding SS/SW & ICT investments and their effects. The transition involves the adoption of semantic web-based educational systems (WBES) web content and it complements the four core nodes, namely educational impact, SS/SW tutoring agent impact, controversies, and ICT investment considerations.

The diagrammatic representation expands on the above and categorizes the educational impact of the basic structure into four leaves, namely innovation/collaboration, content-drivenness, information quality and transformation/sustainability. The SS/SW tutoring agent root is categorized into six leaves, namely the virtual 3D world of wikis/podcasts/vodcasts/folksonomies; intelligent search engines; semantic digital libraries; intelligent tutoring system; macro/semantic blogging and RSS filters/mash-up/social networks. These leaves are education delivery processes and they are briefly discussed in the sections to follow.

An overview of the proposed diagrammatic framework

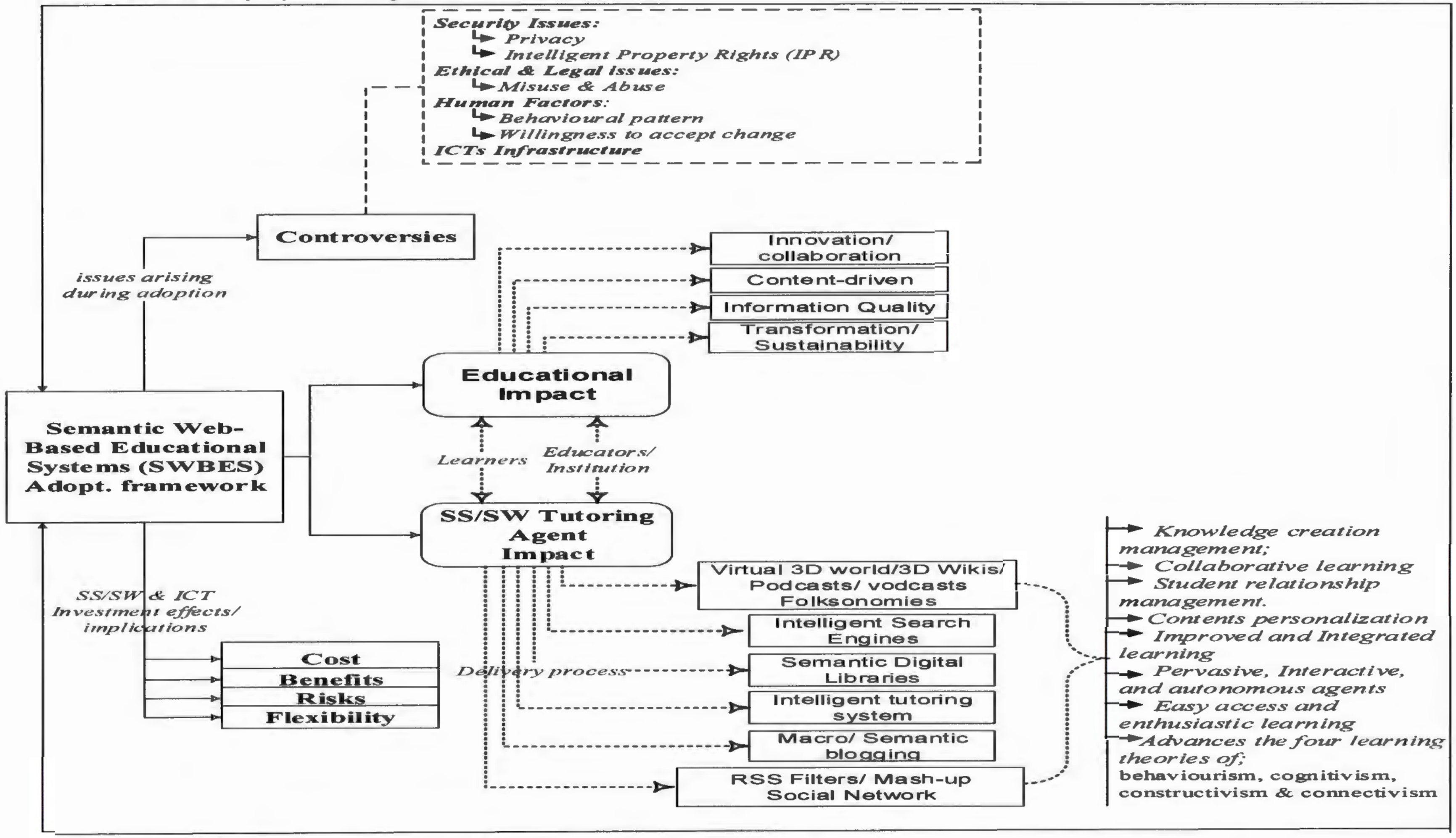


Figure 3-1: Diagrammatic framework for social software and semantic web adoption Adopted (Dotsika, 2012)

The third aspect governing the adoption of (SWBES) is the controversies root, which can be categorized into four leaves; security issues, ethical and legal issues, human factors and ICT infrastructure). The security issues relate to privacy issues and intellectual property rights (IPR). Ethical issues include the misuse/illegal use of SS/SW applications tools. Human factors divide into behavioural patterns and acceptance/willingness to use these tools. The fourth aspect, which is SS/SW & ICT investments and its implication, are categorized into costs, benefits, risks arising from software crises and flexibility. All the components of this framework are discussed as the study proceeds.

3.3 SWBES adopted framework

The first part of the discussion focuses on the positive aspects of the framework presented above. Such a framework may assist different users (learners, educators and the institution itself) to achieve their goals better. The framework includes a new cohort of SWBES that are useful for enhancing and improving business processes and that improve the quality of service delivery through the use of SS/SW web technology (Bittencourt *et al.*, 2009).

The two dotted double-edged arrows in the framework point towards the educational impact, and SS/SW tutoring agent root signifies the dynamic between the learners and educators/institution in the SWBES. The learner's role involves the eagerness of learners to collaborate with pedagogical technologies in an attempt to develop their knowledge and to achieve the student's learning goals (Dotsika, 2012; Ohler, 2010). This communication/interaction can only be made attainable through personalized and adaptable educational Web 3.0 content. The educators/institution's role entail numerous pedagogical events involved in SWBES, this includes collaboration abilities, information quality, content-drivenness and transformation of instructive teaching and learning, curriculum design and authoring. Adding to this, the educators play a role in assessing learners' collaborations (problem solving, assessment etc.) and helping learners construct approaches that best suit them. The processes described above are bidirectional and interlinked as learners and educators/institutions are all key components in the SWBES framework (Dotsika, 2012). The next section deals with the transitioning aspect, which includes the educational impact of the adoption of SWBES and ICT into education.

3.3.1 Educational impact

As stated above, the root representing education has four leaves, namely innovation/collaboration, content-drivenness, information quality and transformation/sustainability (Ohler, 2010; Dotsika, 2012). They are briefly discussed below.

- **Innovation/collaboration:** Innovation refers to the use of technologies associated with SS/SW and ICT application tools to support semantic content innovation in education. It involves semantic content representations, pedagogical curriculum course design with accuracy and reliability, allowing instinctive thinking, idea-based searches, and process configuration and information discovery.

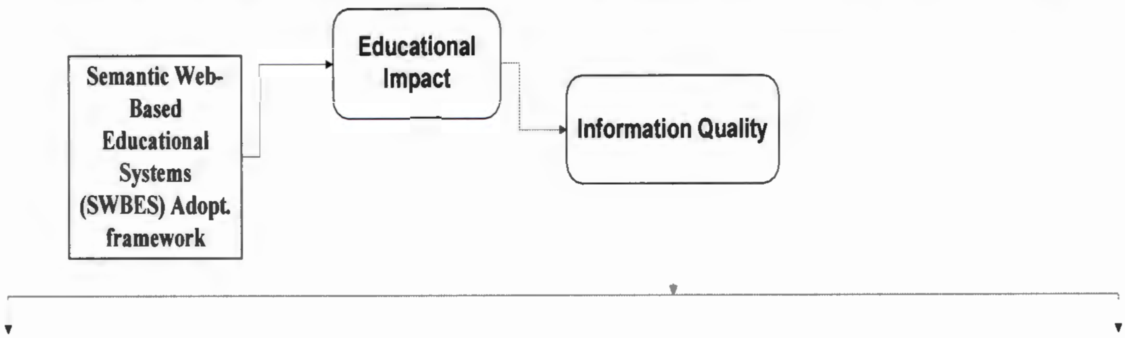
- **Content-drivenness:** This aspect relates to content generation, distribution, reposition, reuse, retrieval and distribution. The content generation processes result in improved enactment, with delivery lagging behind. Progressive automation allows networking to be content and user-directed.

- **The information quality category:** Information quality has a direct impact on educational success and profitability. Good quality information is associated with certain traits (applicability, assessment, added value, timeliness, comprehensiveness and capacity), proper representation (clarification, ease of comprehension, concise and reliable representation), user-friendliness/access, safety, and inherent document qualities (correctness, impartiality and consistency) as illustrated in the figure below.

- **Transformation/sustainability:** This aspect is associated with educational change away from a highly centralized model of learning to the inclusion of new ICT technological tools enabled by SW/SW, allowing institutional developments, new functions, standards and control. When compared with the web technologies of the past, the current web technologies have improved web application functionalities and have transformed data management and information discovery (Porter, 2012; Green, 2011; Dotiska, 2012). In other words, web information quality management has developed beyond Web 1.0. Generally speaking, it is sensible to reflect on the present and potential impact of internet growth, such as on mode of delivery and learning assessments. In terms of learning assessment, the intelligent tutoring/tagging agent help learners and educators to devote less time to searching unlimited amounts of data. Several authors advise that semantically intelligent searching can address some of the concerns about digital literacy and information management (Porter, 2012; Green, 2011; Devedzic, 2006; Parry, 2011; Traxler & Wishart, 2011; Attewell *et al.*, 2010; Ellis & Anderson, 2011; Ferguson, 2011; Dalgarno & Lee, 2010; Yuen *et al.*, 2011; McEneane, 2011; Carmigniani *et al.*, 2010).

Web 2.0 combined with Web 3.0 technologies have a far-reaching effect on educational settings. They inspire cooperative intelligence, support interoperability, improve sustainability, and bring a revolution that can give an institution a competitive advantage (Dotiska, 2012).

Comparison of information quality using three classifications (Web 1.0, 2.0 & 3.0)



Classification	Dimension	Web 1.0	Web 2.0	Web 3.0 [combined with Web 2.0 & Web 3.0]
Basic Information Quality	Accurateness	☞	less control	enriched
	Objectivity	☞	less control	better quality
	Credibility	☞	less control	improved
	Reputation	☞	control mechanisms available	control mechanisms available
Contextual Information Quality	Relevance	☞	enhanced	more advanced
	Added value	×	enhanced	✓✓✓
	Suitability	☞	upgraded	✓✓✓
	Completeness	×	enhanced	advanced
	Quantity of Information	☞	improved	Advanced
Openness/ Convenience	Accessibility	✓	✓✓	more advanced
	Access Security	✓	✓✓	advanced
Representation	Interpretation	✓	✓✓	✓✓✓
	Ease of Understanding	✓	✓✓✓	✓✓✓
	Concise Representation	✓	✓✓✓	✓✓✓
	Consistent Representation	✓	✓✓	✓✓✓

Figure 3-2: Web information quality management (adapted from Dotiska, 2012)

The next section presents the second aspect, which deals with the impact and facilitation of learning through SS/SW tutoring agents. The tutoring agent impact entails the methods of delivery, followed by the third and fourth aspects.

3.3.2 SS/SW tutoring agent impact

In the proposed framework, the SS/SW tutoring agent branches out into six leaves, namely the virtual 3D world, wikis/podcasts/vodcast/folksonomies; intelligent search engines; semantic digital libraries; intelligent tutoring systems; macro/semantic blogging and RSS filters/mash-up/social network. These categories are education delivery processes and are discussed in detail in Chapter 2 (see 2.8).

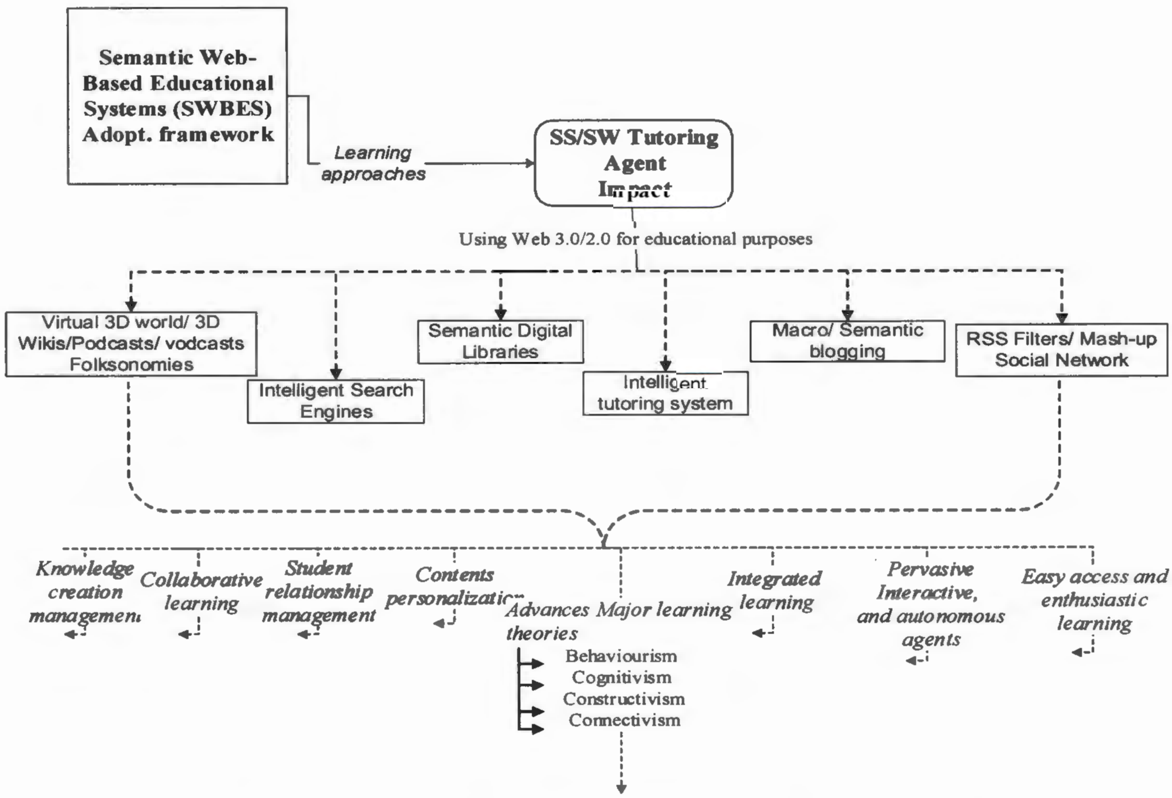


Figure 3-3: The tutoring agent's learning delivery processes (adapted from Dotiska, 2012)

Figure 3.3 presented above depicts how these tools and applications encourage knowledge creation management; collaborative learning; students' relationship management; content personalization; improved and integrated learning; pervasive, interactive and autonomous agents; easy access and enthusiastic learning; and improved learning theories (behaviourism, cognitivism, constructivism and connectivism). Section 2.7.1 provides an in-depth discussion of the probable benefits of adopting SS/SW in education. There are insightful examples of educational institutions that have adopted SS/SW in their administration and facilitation processes. This section expounds on these web applications as they relate to improving learning theories (specifically connectivism) as it is a more appropriate learning theory for the digital native in an educational setting.

3.3.2.1 Connectivist learning theory

Learning theories have developed and changed rapidly as a result changes in learning methods. Facilitation approaches have evolved due to the new technology applications that have emerged (Hussain, 2012). Studies suggest diverse views and various effective learning processes, but connectivism is regarded as the learning theory of the digital native (Rubens *et al.*, 2011; Dixon, 2012; Coetzee, 2014; Siemens, 2014). It serves as a replacement of behaviourism, cognitivism, and constructivism.

- Judging from Figure 3.3 and from a connectivism point of view, information and intellectual ideas are disseminated through contemporary networks that involve individuals and technology. Learning is therefore perceived as the process of interconnecting, developing, and navigating these networks (Siemens, 2014; Nobles, 2011; Siemens & Tittenberger 2009; Mix, 2010; Darrow, 2009; Rheingold, 2010).

- Collective tasks allow learners to connect, interrelate, ask questions, discuss answers, and assess learning topics. Teamwork with fellow peers makes learning more convincing. Learners may learn from each other provided that they have the platform so that they can participate in critical discussions and therefore inspire each other (Pileggi *et al.*, 2012). As a result of the applications empowered by SS/SW and ICTs, learners may conveniently discuss problems from diverse perspectives, suggest countless solutions, and evaluate information in a group context to reach decisions. In addition, learner commitment is improved when learners have the prospect of communicating ideas and learning materials with other learners. They can talk and write about what they are learning, conceptualize and virtualize it in their own context, and apply their newly attained knowledge to their day-to-day activities.

In conclusion, Web 3.0 provides creativity, innovation and improves learning satisfaction, but Web 2.0 technologies turn out to be realistic, efficient, standardized, more personalized and more effective in meeting individual and educational needs.

The next section addresses the negative aspects. The third aspect of the adoption of (SWBES) is the controversies root, and it branches out into four leaves, namely security issues, ethical and legal issues, human factors and ICT infrastructure. Security issues in this case are associated with privacy issues and intellectual property rights (IPR). Ethical issues that arise include misuse/illegal use of SS/SW applications tools and human factors associated with behavioural patterns and acceptance/willingness use the tools.

3.3.3 Controversial issues

3.3.3.1 Human factor/ICT infrastructure

In the Section 2.9, the concepts mentioned above are thoroughly discussed, except for the human factors and ICT infrastructure. This section explores how human behavioural patterns and people's acceptance of or willingness to use educational technologies influences this adoption process by using the theories that underlie adoption models. The researcher highlights few concepts and theories of adoption that are relevant to the higher education system. Omona *et al.*'s (2010), studies on ICT adoption models basically results in three core fundamental approaches, namely the technology acceptance model (TAM), the theory of reasoned action (TRA) and the theory of planned behaviour (TPB).

3.3.3.2 The technology acceptance model (TAM)

During the adoption of SS/SW technologies in the education context, there are a set of beliefs that influences the adoption process either negatively or positively. For the purpose of this study, the TAM is examined. Omona *et al.* (2010) suggest that when users are presented with a new technology, a number of factors influence their decision regarding how and when they will use it. This includes its perceived usefulness, ease of use, external variables and the intentions or attitudes of users. However, there are other associated factors that the TAM does not consider, such as personal control, economic factors, outside influences from suppliers, customers and competitors.

Technology acceptance model (TAM)

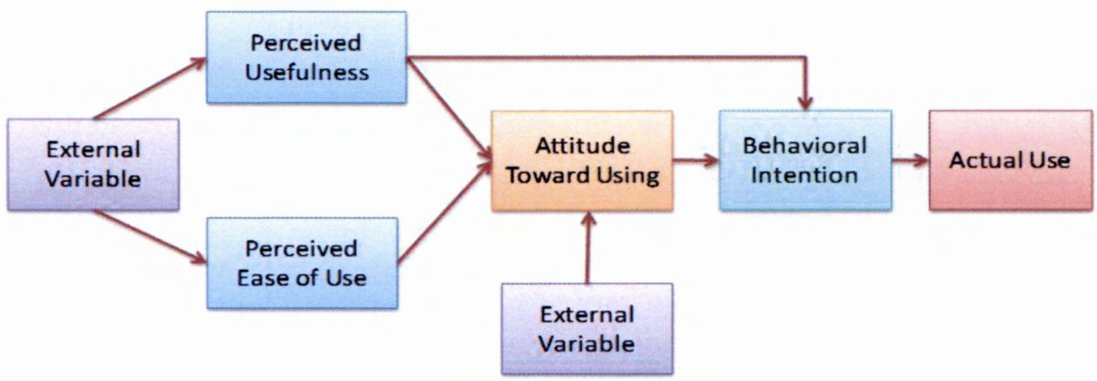


Figure 3-4: Theory of acceptance model (adapted from Davis et al., 1989)

Figure 3.4 shows what is needed for a learner/educator to use of SS/SW technological tools and applications for educational purposes successfully. The different elements of the theory may impact acceptance either positively or negatively. The decision to adopt SS/SW can be one of the challenging steps in the process. A brief description of the different elements follows below.

- **External variables (EV)**

  External variables influence perceived usefulness (PU) and perceived ease of use (PEOU or PEU), for instance demographic variables.

- **Perceived usefulness (PU)**

  Perceived usefulness refers to the degree to which an individual believes that using SS/SW and ICT tools applications for education will improve his/her work performance (Venkatesh & Davis, 2000).

- **Perceived ease of use (PEU)**

  Perceived ease of use is the degree to which a person trusts that using the SS/SW and ICT tools applications for educational settings will be convenient and easy (Venkatesh & Davis, 2000).

- **Attitudes towards use (A)**

  Attitude towards use describes the user's interest in or attraction to using SS/SW and ICT tools within the educational context (Malhotra & Galletta, 1999). Notably, perceived usefulness (PU), alongside perceived ease of use (PEU), are the key determinants of a person's attitude (A) towards Web 3.0/Web 2.0 technologies. The perceived usefulness and perceived ease of use is derived from external variables (EV) and attitudes towards use (A). More significantly, there is a relationship between behavioural intention and actual use. Attitude (A), joined with perceived usefulness (PU), causes behavioural intention (BI), while the behavioural intention (BI) in turn influences actual use. In attempt to do away with the limitations that the TAM brings, the TRA emerged. It is a more suitable theory that embraces four broad concepts, namely behavioural attitudes; subjective norms; intention to use; and actual use.

3.3.3.3 The theory of reasoned action (TRA)

The TRA is a widely studied model in social psychology (Malhotra & Galletta, 1999; Kwon & Chidambaram, 2000). It attempts to explain why people behave as they do in situations of 'reasoned action' by identifying causal relations between beliefs, attitudes, intentions and behaviour (Kwon & Chidambaram, 2000; Barnes & Huff, 2003; Pedersen, 2003). Attitude is defined as the individual's positive or negative feelings about enacting a target behaviour (Uzoke *et al.*, 2006).

3.3.3.4 The theory of planned behaviour (TPB)

The TPB is an extension of the TRA that deals with settings where the individual has no control over behaviour. This is discussed as it resorts under controversies as part of the human factor/behavioural patterns that could impact the adoption SS/SW and ICT tools and its application in pedagogy. As shown in Figure 3.5 below, attitude is explained as a function of the combined effect of behavioural beliefs and outcome evaluations (Mathieson, 1991). The behavioural beliefs relate to the favourable utilitarian, hedonic and social outcomes that can result from performing the behaviour (Venkatesh & Brown, 2001). Subjective norms reflect the perceived opinions of a person or group whose beliefs hold importance to the individual (Mathieson, 1991).

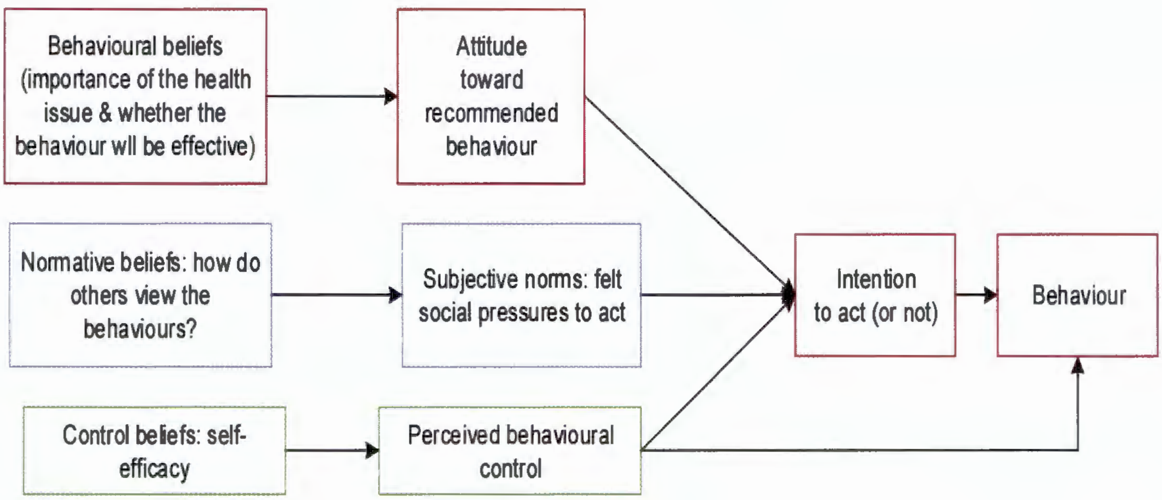


Figure 3-5: Theory of planned behaviour (Lau, 2011)

It is clear from the above that human factors should be considered during the adoption of SS/SW and ICT tools in pedagogical contexts. The actions of individual to either accept or reject a system may be associated with controversial issues surrounding SWBES adoption. The theories that describe behaviours around technology acceptance emphasize the process through which technology becomes an essential part of people's everyday lives.

The fourth aspect, which involves SS/SW and ICT investments and their implications, are considered below in terms of costs effectiveness, benefits, risks arising from software crises and flexibility.

3.3.4 ICT investments

Although most institutions and organizations barely pay attention to ICT investments, the effective implementation or adoption of any ICT project involves financing. Section 2.9 discusses this matter based on the available literature.

3.4 Chapter Summary

The objectives of this section were achieved by assessing the existing technological tools and applications used in learning and business administration processes. The chapter aimed to establishing whether these tools are effective to support and share, and whether they are interactive, positive and transformative within the context of learning. The discussion reveals that the traditional learning systems such as Web 1.0 and LMS/PLE were adequate to support students in collaborative, informative learning and in business processes.

The development of the framework presented in this study is justified in this chapter. None of the frameworks used in the past were developed with a MMR approach. This study's framework makes an original contribution to the academic body of knowledge and provides essential guidance and insight for SS/SW and ICT tools adoption in educational settings. It will help learners choose how and where they want to learn.

Chapter 4 discusses the research methodology. It starts off with an introduction to the research strategy and provides the philosophical foundations, including the ontological, epistemological and methodological assumptions that underpin the research and determined the research paradigms.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents the research methodology used to answer the research questions posed to reach the research objective. The goal of this chapter is to demonstrate the research methodology employed for sampling, data collection, data analysis, ethical issues, and limitations. The chapter addresses four aspects: the theoretical basis for the study; the research approach and how it aligns with the research problem; the research objectives; and the research questions. In addition, the chapter scrutinizes the appropriate research methods to be adopted and considers the ethical variables involved in this research activity.

This research study probes a framework for the combined integration of SS/SW and ICTs tools and their adoption in pedagogical settings. The primary aim of this research is to establish how the use of SS/SW and ICT tools can improve learning enthusiasm and ease access to education.

The research approach that underlies this study is MMR, which entails the combined use of qualitative and quantitative methods. Its underlying philosophical assumption centre on discovering and understanding the experiences, perspectives, and thoughts of participants and respondents. In addition, the discussion describes the principles used to select research methodologies, approaches, data-collection instruments and to identify the analytical objectives. In order to ensure the trustworthiness of the research, the study addresses the ethical issues considered in this research and the method used to ensure validity.

4.2 Research design

A research design is a strategy that deals with the overall plan of the research and it is determined by data required (primary or secondary, qualitative or quantitative or a combination) to investigate the problem. The design determines what methods would be used to collect and analyse the data, how all of this will answer the research question and what techniques would be used in reporting the findings of data. It is about designing the overall structure of the research (Bless *et al.*, 2006). Based on this explanation, the strategy of enquiry, also referred to as the research design, is determined by the researcher's theoretical assumptions, abilities, skills and practice, and even patterns of data gathering. However, a researcher may choose any design that is deemed suitable for generating the kind of data required to answer the research question postulated (Jokonya, 2016; Creswell, 2015).

Jokonya (2016) reveals that the key issues to consider in a MMR design are the timing and ordering of the methods in the study. The order can be simultaneous (same time) or sequential (different periods). The most prevalent types of MMR strategies are sequential explanatory, sequential exploratory, concurrent triangulation, sequential transformative, concurrent transformative and concurrent nested design (Jokonya, 2016; Creswell, 2015, 2009).

All of the research designs highlighted above are used to emphasize the landscape of a study. The concurrent nested or embedded design is suitable for this study. This strategy assists the researcher with an advanced pathway of addressing data collection, analysis and the validity of the research (Creswell, 2015, 2009; Oates, 2008). Furthermore, this strategy attempts to appreciate the qualitative results by quantitative means. Creswell (2009) avers that this MMR design entails one stage of data collection that guides the study and that receives precedence (in this case qualitative). The second approach (quantitative) is entrenched or embedded in the study and acts as a support. The researcher chose this strategy of enquiry because it employs the quantitative data to expound on the qualitative results (Creswell, 2015, 2009). This strategy was deemed fit for this research study as it enables the researcher to achieve the research objective by identifying the problem, explaining its nature and determining its scope. This design is frequently followed to uncover new knowledge in a field where very little is known, to develop propositions and questions for further research, and to gain a better understanding of an issue (Creswell, 2015). In addition to this, this design also aids triangulation by adopting a pluralistic approach where one research method compensates for the weaknesses of the other and they operate side-by-side or sequentially (Creswell, 2009).

Research is always based on specific fundamental and philosophical assumptions about what constitutes proper research and which research methods are applicable for the development of knowledge in a given study (Oates, 2008). The next subsection details the study's ontological and epistemological assumptions. Importantly, this section demonstrates rigour by means of detailed explanations of the salient methodological, theoretical, and analytical decisions made. Such explanations also establish the trustworthiness of the research (Skulmoski *et al.*, 2007).

4.3 Philosophical grounding

Understanding different philosophical arguments benefits researchers as consideration of various paradigms encourage researchers to study phenomena in different and coherent ways. Denzin and Lincoln (2008) highlight how different kinds of knowledge may be derived from observing the same phenomena from different philosophical perspectives. The ontological, epistemological or methodological are important philosophical concepts for research activity. Mack (2010) maintains that researchers may decide to select which phase to begin with, whether ontological, epistemological, or methodological.

Ontology is the study of the nature of reality (what is real and what is not, what is fundamental and what is derivative); epistemology is the study of the nature of knowledge; methodology is the study of approaches to systematic enquiry for conducting research (how is the research carried out), while axiology is the study of value (what value does an individual hold and why) (Oates, 2008). The definitions of these concepts may vary from one author to another as it applies to them since there is no possible best way to describe the terms (Mavetera, 2011b).

Epistemology involves questions related to what knowledge is and how people acquire it; and grapples with the philosophical problem of how an absolute viewpoint can be obtained if people can never transcend their language and cultural systems. This philosophical problem indicates that knowledge is not reliable, but conditional and dependent on societal or group acceptance, time, and place (Locke, 2004; Hirschheim, 1985). The response to the question of how people acquire knowledge introduces the conception of science, which can be viewed as conventions for discovering knowledge. This conception is also dependent on societal or group acceptance, time, and place.

This study aims to provide a framework for SS tools adoption in higher education systems. The process involved learners, educators and management. The study attempted to understand the nature of the world and to examine learners and educators experience of their cultural systems, views and degree of acceptance. The way they understand their real world and how they view it is questioned. In such a study, the researcher should appreciate the philosophical grounding(s) underlying the research. They should become transparent so that the researcher is conscious of them (Denscombe, 2003). Recker and Niehaves (2008) claim that there is often a lack of philosophical grounding to sustain the research practice. In an effort to address this concern, an epistemological assumption will apply to this study to answer the question of how individuals gain knowledge. The answer lies in the idea of science, which can be regarded as resolutions for realizing knowledge. In the next subsection, a detailed research paradigm is discussed.

4.4 Research Paradigm

Some researchers distinguish three research paradigms, others four. These include positivism, interpretivism and critical theory or an emancipatory paradigm, with some researchers adding community of practice and reflexivity.

A paradigm is an ideal or model within which theories are formulated and experiments performed in support of a philosophical and theoretical framework (Oates, 2008; Guba, 2004). Denzin and Lincoln (2008) describe a research paradigm as an interpretive framework, and Guba (1990) explains it as a basic set of beliefs that guides action. According to Johnson and Onwuegbuzie (2004), a paradigm refers to a research culture with a set of beliefs, values and assumptions regarding the aspect of reality. When undertaking scientific research, it is important to consider the different research paradigms. The most commonly applied research paradigms are positivism, interpretivism and critical theory. All three paradigms maybe be employed in any kind of research activity.

A positivist research paradigm emphasizes an objective approach to studying social phenomena and gives preference to research methods focusing on quantitative analysis, surveys and experiments (Mertens & McLaughlin, 2004). An interpretivist or anti-positivist research paradigm stresses a subjectivist approach to studying social phenomena and attaches importance to a range of research techniques that focus on qualitative analysis (Mertens & McLaughlin, 2004). The third research paradigm, critical theory, suggests ideology critique and action research as research methods to explore the existing phenomena. Interpretive research gives greater scope to address issues of influence and impact and to analyse questions such as the "why" and "how" of particular technological streams (Deetz, 1996).

4.4.1 Choice of research paradigm for this study

A social science epistemology advocates methodological pluralism. This is also applicable for IS research (Hirschheim, 1985). Following the discussion presented above pragmatism is the most appropriate paradigm, with MMR being the method (Jokonya, 2016; Teddlie & Tashakkori, 2009; Peng *et al.*, 2011; Greene, 2006).

The pragmatic method allows both positivist and interpretivist methods in the same research study as part of combined thinking. Therefore, the pragmatist viewpoint sees the extremes of positivism and interpretivism as logically self-directed, and therefore these philosophies can be mixed to suit a precise research question (Greene, 2006). This study is theoretically based on the positivist approach alongside a connectivist learning theory (Denzin, 2012).

The justification for a positivist approach lies in the fact that in a pedagogical environment, learning is an ongoing process associated with one becoming a participant of a community while building knowledge as a participant at several stages of capability. Learning entails transformative development of both the learner and the social world (Wood, 2015, 2011). It can further be deduced that learning is a reflective and active development where the student makes physical and sensory contributions and constructs meaning from the result. Most significantly, learning is a social activity and therefore closely related to social environment (Wood, 2015). The traditional method of learning focused on segregating the learner from all social interaction and perceived education as a one-sided connection between the learner and the objective material to be learned. Progressive education in turn acknowledges the social aspect of knowledge and uses collaboration with peers and the presentation of knowledge as an integral part of learning.

In a positivist approach, reflection, observation and reasoning are the superlative means of comprehending human behaviour; true knowledge is based on involvement and can be achieved by observation and experimentation (Hein, 1991; Mertens & McLaughlin, 2004). Many researchers have different beliefs, approaches and ways of viewing and interacting with their surroundings. Moreover, the ways in which research studies are conducted vary (Mavetera & Kroeze, 2009), and the quality and relevance of any research is reflected in the research method adopted.

4.5 Research approach: mixed method research (MMR)

The research problem largely determines the type of research approach that would be applicable (Leedy & Ormrod, 2010). Social studies often mix qualitative and quantitative methods. The selection of a research methodology is also influenced by the research paradigm and approach selected. The method can either be qualitative, quantitative or a mix of the two. None of these methods is intrinsically better than the other, but for this study, MMR is the most suitable.

This method is most suitable because of its usefulness when dealing with a precise research question and realizing a precise research objective. The research objective and research questions in this study cannot be resolved by using only one research method (Leech & Onwuegbuzie, 2009; Creswell, 2009). An MMR approach can be applied at any point during a research endeavour; it can fit into any structure; can function at any level of investigation; in any proportion; with any instrument or methods; and with either qualitative or quantitative data analysis (Creswell, 2015, 2009; Rocco *et al.*, 2003).

More specifically, the study used a nested or embedded MMR design because this enabled the researcher to get close to the education systems and to gain insight into the circumstances surrounding SS/SW and ICT tools implementation and investment. Nested The MMR design also forced the study to consider the meaning of certain more or less naturally occurring phenomena in the world of social semantics (Creswell, 2015, 2009). The study is grounded in both pragmatist and the connectivist assumptions as shown in the figure below. The figure illustrates the road map for the research. The next section provides a detailed rationale behind using MMR, bearing in mind that MMR implies the combined use of qualitative and quantitative method.

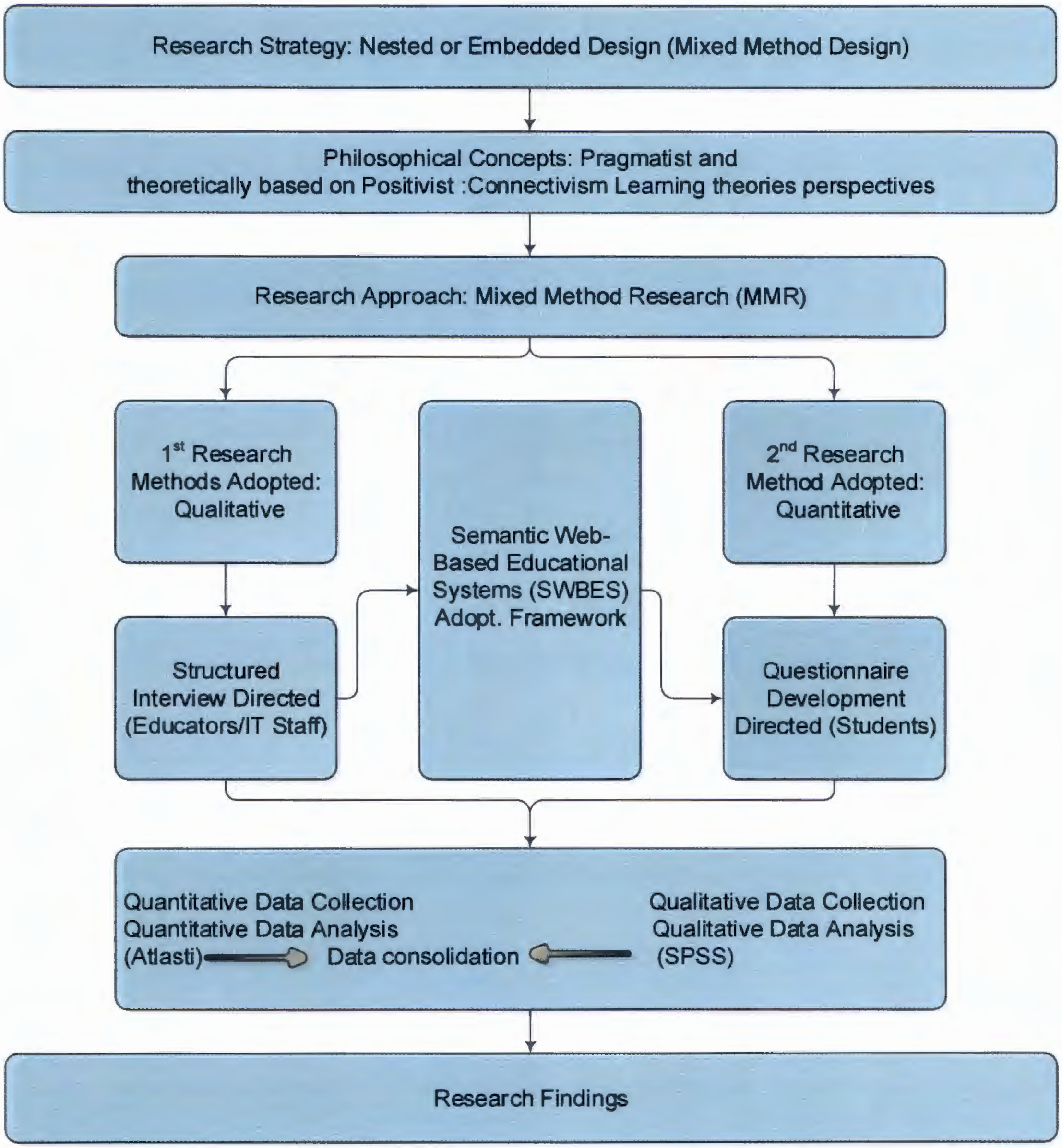


Figure 4-1: ***Top-level research strategy***

4.5.1 Rationale

MMR has its origins in the paradigm wars concerning qualitative and quantitative research methods, but it has come to be used extensively (Terrell, 2012; Denzin, 2012). Depending on the choices made across four dimensions, MMR can provide the researcher with several design options that include a range of sequential and contemporary approaches (Terrell, 2012; Denzin, 2012). Although there has been ongoing and substantial debate over what constitutes MMR, several authors (O'Halloran *et al.*, 2016; Curry & Nunez-Smith, 2015; Guetterman *et al.*, 2015; Fetters *et al.*, 2013; Denzin, 2012; Teddlie & Tashakkori, 2011; Creswell & Plano Clark, 2011;

Morse & Niehaus, 2009) aver that MMR focuses on gathering, analysing, and mixing both quantitative and qualitative empirical materials in a single study or a series of studies. O'Halloran *et al.* (2016) suggest three configurations: first, the convergent design, where qualitative and quantitative data are merged and interpreted; second, a descriptive progressive design, where the analysis and interpretation of quantitative data occur by means of a qualitative analysis to explain the quantitative results; and finally, an explorative progressive design, where the problem is first explored through qualitative data collection and analysis, followed by quantitative phase to develop and apply an instrument design or intervention.

Therefore, MMR is described in this section of the study as a research initiative where the researcher chooses to combine quantitative and qualitative research practices, methods, styles, concepts or language into a single study as mentioned above. MMR is also regarded as an effort to genuinely adopt the use of multiple research approaches in solving research problems as opposed to being restricted or constrained by more limited choices (i.e., avoids inflexibility). MMR tends to be quite expensive, but it is a creative research approach. In addition, the mixture of qualitative and quantitative methods of information gathering and analysis offers the necessary productivity for IS research (Kaplan & Duchon, 1988), improves insightful ideas that sustain the research findings, develops the exactness of interpretations, and advances credibility and trustworthiness (Jogulu & Pansiri, 2011).

Having stated the above fundamentals of using MMR, it is important to take a closer look at the limitations or challenges involved in using a MMR approach. These flaws include the unreliable use of MM terminology within and across disciplines; the likelihood of inconsistent interpretations of data (Petter & Gallivan, 2004); and the amount of time and resources involved in using more than one research method. The study addresses these flaws by describing the language used comprehensively; and by preparing for the additional time and resources needed in exchange for the advantage of a substantial contribution to the body of knowledge. The next section presents the first research method adopted for this study, namely the qualitative method, together with the procedures followed to develop the interview questions.

4.6 Interview Protocols (Developing the research questions)

The interview protocol served as the instrument used in the study, and as the basic rules and procedures for carrying out the work. Before probing the general nature of research questions, it is essential to ascertain the role and purpose of research questions (Jacob & Furgerson, 2012). Interviews specifically strive to answer basic questions such as who, what, where, when, how and why (Jacob & Furgerson, 2012; Charmaz, 2006). The use of a mixed method for this study meant that the research questions only involved asking what, how and why. Creating an interview protocol is an exciting task in the sense that what the researcher asks, determines what the researcher finds. What the researcher finds determines how the researcher articulates the results. How the researcher articulates determines how the researcher imagines. How the researcher imagines determines what the researcher achieves (Jacob & Furgerson, 2012).

The use of interviews offered enriched data generation since the interviews anchored the research in the interviewee's own personal knowledge and experience. Interview questions can be built on insights from the literature review, general knowledge, the researcher's own in-depth knowledge, and the researcher's own impressions (Bakir & Bakir, 2006). The interview questions were refined after a pilot study and survey.

The interview schedule included two sections. Section A elicited biographical information from the participant. Sections B to F concentrated on the participants' knowledge of SW/SW in general and ICT tools in education. The following matters are addressed: 1) SS/SW adoption at universities; 2) Educators' confidence, readiness and willingness level with respect to ICTs; 3) Controversies and challenges of SS/SW and ICTs tools; and 4) educator and learner development and support (see Annexure I). Table 4.1 below describes the themes that were addressed.

Table 4-1: Question development

Interview Protocol (Developing the research question)
Objectives of the research This research study acknowledges that educators are dynamic links in the education system, especially at higher education institutions. Educators have to meet the needs of learners in the 21st century by leveraging technology. The main objective of this study was to examine the adoption of SS/SW and ICTs tools at universities in view of creating a framework to guide technology adoption at educational institutions. As such the study investigated the extent of educators and students' ICT confidence, readiness, willingness and digital competence by means of a series of interview questions. The questions allowed participants the opportunity to provide information on a wide range of issues related to information, decision-making, implementation activities and organizational performance. Participants were allowed as much freedom as possible during the interviews to ensure that the interviewer could not prejudge the evidence they offered. The researcher compiled a list of discussion topics for use as an interview schedule. The topics were kept on stand-by to help the interviewer should the discussion require some prompting or guidance.
(To be continued on next page)

Theme 1	Initial research question	Interview question
SS/SW and ICT web technology adoption in higher education	✓ How will SS/SW and ICT web technologies help to improve learning enthusiasm, ease access, performance and quality education delivery?	1. SS/SW, also known as Web 2.0/3.0, and ICT tools have been perceived as a driving force to improve learning enthusiasm and ease access to education. 1.1 Are you familiar with any of the following SS/SW and ICT tools: Facebook, Twitter, YouTube, Skype, blogs, wikis, digital libraries, Podcast, myUnisa, eFundi, clickUP, MyTUKS, Blackboard, WebCT, overhead projector? 1.2 Does your institution offer open distant learning (ODL)? 1.3 Do you think adopting these SS/SW and ICT tools in higher education systems (HES), do/can help improve learning enthusiasm, performance, easy access and quality educational delivery? If so, how?

Theme 1	Initial research question	Interview question
Educators' perceptions of SS and ICT tools in HES	✓ What are educators and students' views on the educational impact of SS/SW and ICT web technologies in complementing facilitation of learning and business processes?	2 These questions were aimed at accessing educators' views on SS/SW and to explore the flaws and effectiveness of Web 2.0 and Web 3.0 with respect to the facilitation of learning and business administration in the education sector. 2.1 What do you know about SS/SW and ICTs tools and applications and do you think it could potentiality support educational goals? 2.2 Do you find SS/SW and ICTs tools useful for teaching and learning? If so, please explain? 2.3 Can the integration and adoption of SS/SW and ICT tools enable you to accomplish tasks more quickly? If so, explain how? 2.4 Can the use of SS/SW and ICT tools increase your productivity as an educator? If so, how? 2.5 Do you think using these tools pose serious threats related to ethics, privacy, intellectual property rights, misuse and exploitation? Please provide your view. 2.6 What other possible problems may arise as a result of using SS/SW and ICT? Explain your view?

Theme 1	Initial research question	Interview question
Educational impact and benefits of Web 2.0/3.0 and ICTs in HES	✓ What are the extent of educators and students' ICT confidence, readiness, and willingness to ensure a systematic approach to supporting and sustaining technological innovation in HES?	3 This area explores the extent of educators' ICT confidence, readiness, willingness and their digital competence when using these tools to ensure a systematic approach to supporting and sustaining technological innovation in teaching and learning. 3.1 There are various types of SS/SW and ICT applications that educators can use on a daily basis for teaching and learning (as highlighted in Question 1.2). Which of these SS/SW tools do you often use? 3.2 Please give reason(s) why you use these tools and applications when facilitating learning. If you don't use these tools, why? 3.3 Why are you not using the SS/SW and ICT tools that you didn't mention (Facebook, Twitter, YouTube, Skype, blogs, wikis, digital libraries, podcasts, myUnisa, eFundi, clickUP, MyTUKS, Blackboard, WebCT, overhead projector)? 3.4 Does your institution provide the necessary resources to enable you use SS/SW and ICT tools and application? 3.5 Does your institution provide you with the necessary training, workshops or seminars to advance your knowledge of using SS/SW and ICTs tools and applications?

Theme 1	Initial research question	Interview question
Controversies and challenges related to adopting SS/SW in HES	✓ What are the hindrances associated with the adoption of SS/SW and ICT web technologies and its applications in the teaching and learning environment?	4 A number of challenges and controversies associated with the adoption and use of SS/SW and ICT tools in teaching and learning have been listed. Please explain to what extent you agree with the following statements: 4.1 SS/SW and ICT tools are difficult to integrate and use for facilitation of learning. If yes, explain. 4.2 There is insufficient time, simultaneous access and a massive workload. If yes, explain. 4.3 There is a lack of confidence and willingness to accept technology change. If yes, explain. 4.4 There are phobias and negative attitudes and perceptions with respect to using web technologies. If yes, explain. 4.5 There is a lack of resources (ICT infrastructure/facilities; technical assistance; training) and policy. If yes, explain?
Educator development and support	✓ What strategies could be put in place to develop teachers and learners in preparation for using SS/SW and ICT web technologies in HES?	**5.** What strategies would you recommend for educator development support in preparation for the use of SS/SW and ICTs tools? 5.1 Educator support

4.6.1 The interview protocol

The outline in Table 4.1 includes the objectives of the interview, an overview, as well as the interview schedule that was employed during data collection by means of interviews.

4.6.2 Procedural reminder

As mentioned above, the interview protocol serves as the basic rules for and procedures of the work (Charmaz, 2006; Hove & Anda, 2005; Myers & Newman, 2007). The interviewer should consider the real world and should adjust to real-world situations during the data collection. A procedural reminder helps the researcher to emphasize issues such as:

- defining who should be interviewed;
- gaining access to the right people;
- having adequate resources available, such as time, paper, audio recorders, etc.;
- developing a procedure for discussing the research with other researchers; and
- making a schedule of the required data collection activities that provides for contingencies.

Table 4.2 displays the protocol for the interviews. The middle part of the protocol presents a set of questions that reflects the real investigation. There are two features that differentiate such a set of questions from those used in a survey. First, the protocol questions are set for the interviewer and not the participant. The questions serve as the interviewer's reminders or prompts regarding the information that have to be collected. Second, each question is accompanied by a list of probable sources, including documents, observations and interviewees' comments.

Table 4-2: Protocol for procedural reminder

A Protocol for Procedure		
1	At least two participants should be IT personnel, senior academic staff members or educators. They should be individuals who report to the board of directors or a similar structure	
2	Make initial contact with the relevant institution at the highest level possible	
3	Tape recorder for all interviews	
4	Support verbal information where possible	
5	Attempt to secure multiple interviews per site to reduce traveling time	
6	Attempt to interview participants in their offices rather than interview rooms	
7	Engage as many members of the academic staff or IT personnel as possible who are conversant about the institution	

A good research question helps participants to appreciate the exact problem while addressing the wider question. Suppose the researcher is interested in addressing the issue of SS adoption and its uses in and educational context. The researcher may pose question like, "Are you familiar with the term social software and its applications" as opposed to the other way around. This provides the interviewer the chance to determine the participant's level of understanding of the concept under investigation (Charmaz, 2006). A good research question has the following characteristics:

- It is stated in the affirmative.
- It is a leading question that builds on assumption.
- It gives a broad definition of the topic.
- It is presented as an invitation: expansive; positive words; locating words; experience words.
- It enhances the possibilities of storytelling and narratives.
- It is phrased in rapport talk, not report talk.
- It is sometimes ambiguous, providing room to swim around.
- It values what is. The question sparks the appreciative imagination by helping the person locate experiences that are worth valuing.

- It conveys unconditional positive regard.
- It helps participants express their ultimate concerns.

4.7 Data gathering methods

Table 4.1 indicated that the study followed an embedded or nested MMR design. During data gathering, data were obtained from both primary and secondary sources, as discussed by Leedy and Ormrod (2010) and Denzin and Lincoln (2008). The primary data were gathered from interviews, while secondary data were obtained from published and unpublished sources such as journals, books and various helpful internet publications on SS/SW and ICT tools. The information that was obtained from secondary data enabled the researcher to develop the topic of the research study and to determine the information that would be helpful to this specific research study.

4.8 Methods of collecting qualitative and quantitative data

4.8.1 The qualitative method

Qualitative research methods attempt to understand a specific research problem of a specific population by gathering culturally relevant information about the value, opinion, behaviours and social context of a precise population (Creswell, 2015, 2009; Leedy & Ormrod, 2010). Such data gathering techniques involve a scientifically predefined set of actions and rules to collect evidence. Qualitative research incorporates a number of research techniques, such as ethnography, phenomenology, case studies and interview studies (Creswell, 2009; Spradley *et al.*, 1972). One strength of qualitative research is the use of open-ended and probing questions to allow participants to answer in their own words, as opposed to limiting them to choose from fixed responses (Oates, 2008).

4.8.1.1 The interview as a tool for collecting qualitative data

Interviews offer the researcher the chance to collect a broad range of open-ended, qualitative data. Interviews provide information about people's motivations, attitude, feelings and what they remember and recognize (Nicholls, 2009). Rosenblatt (2014) refers to interviews as an exchange of views between two or more people on a topic of mutual interest. The method is based on the centrality of human interaction in knowledge production and it emphasizes the social dimension of research data. Interviews can be divided into structured or unstructured interviews where people express their opinions generally on in more detail (Bless *et al.*, 2006). The interview used in this study provided an explicit structure in the form of an interview guide to guide the interviewee's articulation and interpretation of her/his experiences (Schultze & Avital, 2011).

Interview questions can be based on concepts from the literature, common knowledge, the researcher's own theoretical sensitivity, and the researcher's own experiences (Bakir & Bakir, 2006). As a qualitative interview proceeds, the interviewer should provide guidance by means of additional attentive questions, explanatory questions, and elaborative questions (Charmaz, 2006). Reviews, reminders and probes can be effective in this regard. Probes are questions that get an interviewee to elaborate on a response, and may even involve a series of silences. Reminders are questions that ensure that interviewees answer accurately (Hove & Anda, 2005).

Blumberg (2007) highlights three main types of interviews. The first type is the structured interview, where a standard interview is used with an emphasis on fixed format response categories. All questions are prepared beforehand and are put to each interviewee in the same order. The second type is unstructured interviews, where the participant is given the freedom to discuss reactions, behaviour or their opinions on particular matters. The third type is the semi-structured interview, where participants provide valuable information from the context of participants according to a pre-determined set of questions.

It is important to pay attention to nuances in interviewee responses, as these can indicate assumptions, articulation difficulties, or specific meaning (Charmaz, 2006; Blumberg, 2007; Bless *et al.*, 2006). For this reason, semi-structured interviews were preferable for this particular research study. During the interviews, the interviewer listened with sensitivity while the interviewee did the talking (Charmaz, 2006). Making use of a recorder during an interview allowed the interviewer to give an interviewee his full attention, to maintain eye contact, and this provided the researcher with detailed data (Charmaz, 2006; Rodon & Pastor, 2007).

Schultze and Avital (2011) aver that good interviewer conduct includes providing the interview questions in advance for interviewee preparation; creating an atmosphere of trust and rapport; ensuring confidentiality; explaining the interview objectives and the research objectives; explaining how the data will be used; phrasing questions in a non-threatening manner; mirroring or utilizing the interviewee's words or phrases in subsequent questions; (Hove & Anda, 2005; Myers & Newman, 2007) allowing the interviewee to talk freely; actively listening; asking for permission to record the interview; dressing in accordance with the organization's acceptable dress code; encouraging silent interviewees; and managing interviewees who talk too much.

4.8.2 The quantitative method

The difference between the qualitative method and the quantitative method is that quantitative research focusses on numerical measurements of scale, range and frequency. It is appropriate for phenomena that can be articulated in terms of statistics, mathematics or computed quantities (Hartley, 2004) Qualitative data, on the other hand are data that depends on observation and interpretation as opposed to numbers, and may be represented using a variety of techniques.

Quantitative research is founded on the interpretation of quantification of results (Neville, 2007; Terrell, 2012; McEvoy & Richards, 2006; Johnson & Onwuegbuzie, 2004).

4.8.2.1 Questionnaires as tools for collecting quantitative data

A questionnaire entails a series of questions that a respondent has to answer. It should be kept short and simple (Dawson, 2002). The use of jargon and technical words or words that may have more than one meaning should be avoided. The questions should not reveal bias, as this may lead to the respondent giving false answers to avoid looking bad. Preferably, the researcher should ask indirect questions as opposed to direct questions in the case of sensitive issues. This can create a platform where the respondent is willing to provide answers to the questions. Providing confidentiality and anonymity is crucial. In this study, the structured questionnaire consisted of questions answered with a 5-point Likert scale, ranging from 1 – strongly disagree, to 5 – strongly agree. A structured questionnaire was suited for this study given the nature of the problem.

4.9 Data Analysis Methods: Qualitative and Quantitative

Data analysis is the process of transforming raw data into findings, themes, or propositions. It combines inductive category coding with a simultaneous comparison of all social incidents observed (Leedy & Ormrod, 2010; Creswell, 2009; Dawson, 2002; Delley, 1999; Levine, 1996). Data collection and analysis occur simultaneously in qualitative research. The process is recursive and dynamic, as the researcher continuously develops, refines, and validates emerging codes (Delley, 1999). The analysis of the qualitative data typically follows the path of aggregating it into categories of information and presenting the diversity of ideas gathered during data collection.

This study adopted a MMR approach and a semi-structured interview as the first data collection instrument (qualitative approach). Participants' views were analysed according to identified themes. The interview sessions lasted between 30 to 45 minutes at the most so as not to keep participants very long and to prevent boredom (Corbin & Strauss, 2008; Charmaz, 2006). For the quantitative part of the research, the study adopted the use of questionnaires as the second instrument for data collection (quantitative approach). The researcher developed questions from the conceptual-theoretical aspects of the literature. Therefore, each section of the questionnaire (apart from the biographical information) were formed from the research question in chapter One. For example, section B (internet awareness and access) and C (Integrating ICT tools and application in HES) attempted to provide answer to the first research question as stated in page 4 and were structured as follows (see annexures I).

The questionnaires were then administered by means of both personal administration and online QuestionPro services. QuestionPro allowed respondents to indicate their agreement to participate in the survey by clicking on a link that directed them to the questionnaire. It took between 10 to 15 minutes to complete the questionnaire. The responses gathered from respondents and the online QuestionPro services were captured in a database and the researcher transferred the information to SPSS (version 20.0) for analysis. The use of computer software such as SPSS to analyse data makes the process quick and easy (Dawson, 2002). During quantitative data analysis, such software reduces the time it takes to perform activities, it is suitable for difficult searches, it is able to detect certain facts that the researcher may miss and it is useful for researchers who have to complete their work quickly. The qualitative data from the interviews were analysed using ATLAS.ti 7 as a data analysis tool. It is briefly explained below.

4.9.1 ATLAS.ti

ATLAS.ti is a qualitative data analysis instrument used mainly for analysing interviews, literature or any other data that capture the thoughts, ideas and perceptions of the participants (Olivier, 2004). The data analysis involved several steps. First, the interviews are transcribed and stored as a hermeneutic unit (HU) created in ATLAS.ti. At this stage the interviews are known as primary documents (PD). Each of the PDs was captured into this software so that codes could be assigned to those parts of the interview that can be applied to the subsequent PDs. These assigned codes then formed a guide to comparing the PDs, creating a general overview and making the identification of specific themes easy.

The initial data analysis involved open coding to define the data by categorizing, summarizing, and accounting for every data segment (Corbin & Strauss, 2008; Charmaz, 2006; Orlikowski, 1993). Initial coding breaks the data into segments and assigns a concise qualitative code to each data segment. The code may consist of one or many terms. These initial codes provide analytic handles for developing abstract concepts or theoretical categories and facilitate the extraction of meaning from the data (Charmaz, 2006; Rodon & Pastor, 2007).

During the initial coding it is important that the researcher remains very consistent with the data or remains grounded in the data; avoids pre-existing or preconceived theory and codes; acknowledges that the researcher's own view is only one of many views; remains open to all possible theoretical directions indicated by the data; keeps codes short, precise, and simple; uses codes that reflect actions; and uses gerunds to detect processes and adhere to the data (Charmaz, 2006). Coding is an iterative process where the researcher can go back to any point and recode some of the data as concepts emerge (Charmaz, 2006). A final step in data analysis is integration, which involves linking categories around core categories and refining the resultant theoretical construction into a logical, systematic explanatory scheme (Corbin & Strauss, 2008).

4.10 Population and sample selection

Sampling is the process of selecting a proportional sample of a population for a study with the aim of gathering data that are likely to be representative of the whole group. It is therefore used to make inferences about the views of larger groups (Carey & Asbury, 2012). The target population for this study was academic staff members who are involved in SS/SW and ICT web technologies and application at South African universities. The sample was identified from among academic staff members at eleven conventional universities. A purposive snowball sampling technique was adopted to select academic staff members from three selected universities, namely the North-West University, the University of South Africa and the University of Pretoria to participate in the interviews. For the quantitative data gathering, the study adopted a probability sampling technique where random sampling was employed to randomly select students from the selected universities.

In order to meet the requirement of being unbiased, the researcher chose the suitability sampling method to select three universities that would constitute a proper sample. Out of those three universities, three (3) interviews were carried out at each university. This provided the researcher with the relevant information for a framework for SS adoption in an educational setting in the universities. Probability sampling techniques are predominantly used in quantitative research and entails randomly choosing a reasonably large number of units from a population or from specific subgroups (strata) of a population. The probability of inclusion for every member of the population should be determinable and equal (Robinson, 2014; Hennink *et al.*, 2010).

Suitability sampling was chosen for ease, accessibility, and to avoid constraints with time and money (Walliman, 2005). Purposive random sampling was employed to select different participants from the three universities.

The sample size formula below illustrates how the sample size was derived to justify the quantitative method in Krejcie and Morgan's (1970) table.

$$n = \frac{p\,(1-p)N.\ X^2a(1)}{d^2\ (N-1) + p(1-p)\ N.X^2a(1)}$$

where p = population proportion = 0.5 (for maximization)

N = total population

d = error margin (Degree of accuracy) = 5% = 0.05

and X^2_a (1) = X^2 0.05 (1) = 3.841 and p = 5% = 0.05

Or

$$n = \frac{X^2 * N * P * (1-P)}{(ME^2 * (N-1)) + (X^2 * P * (1-P))}$$

Where:

n = sample size

X^2 = Chi – square for the specified confidence level at 1 degree of freedom

N = Population Size

P = population proportion (.50 in this table)

ME = desired Margin of Error (expressed as a proportion)

The total population consists of 74 355 students at the North-West University, 53 068 students at the University of Pretoria and approximately 400 000 students at UNISA. A total of 969 students were selected across the three universities. The qualitative sample included three (3) educators from each of the selected institutions.

These universities, selected from the eleven traditional universities, all offer a full range of courses that lead to internationally recognized qualifications. The choice of 'traditional or conventional' universities rather than others was based on the following reasons:

- Most universities in South Africa are classified as traditional universities. The selection of this category meant a greater chance to draw accurate results and to generalize.

- Financial and time constraints limited the study. It was not possible to include the full range of tertiary institutions to study those that combine academic and vocationally oriented education as well.

- The statistics released by the International Education Association of South Africa (IEASA, 2007) indicate that traditional (conventional) universities offer bachelor degrees, have a strong research capacity and high numbers of post-graduate students compared to the others. This suggests more student activity, which means that the traditional universities are more involved, spend more time with their students and are more probable to use technology as part of the process.

- The researcher considered the list of the top ten universities of South Africa that offer world-class learning experiences. A study of this nature at these institutions would offer so much more. Students can benefit from the study by evaluating the importance, use and challenges related to SS/SW and ICT tools.

4.11 Pre-test

4.11.1 Pilot study for interviews and questionnaires

Pre-testing plays a central role in the development of scientific research. It can be used to determine the feasibility of conducting a large scale study and can test the variable reproducibility, measurement errors, inconsistency and other metrics that can be used to estimate sample size and research methods (Bryman & Bell, 2011; Bryman, 2004). A pilot study was conducted as the interview questions had never been disseminated before. The pilot study evaluated feasibility, time, cost, adverse events, and effect size in an attempt to predict an appropriate sample size and to improve the study design prior to performance of a full-scale study.
The pre-test interview and survey involved three interviewees and about twenty students selected with a convenience sampling method. Two interviewees and ten students were selected from the Mafikeng campus of the NWU and one interviewee and three students from the UNISA, as well as three students from the UP. The pilot study revealed a few issues related to the manner in which the interview and questionnaire were structured. A few typographical errors were also identified at an early stage and suggestions for improvement were provided, which improved the validity of the interview and the questionnaire (Turner III, 2010).

The pilot review highlighted a number of reasonable issues: 1) repetitions were removed; 2) questions that caused contradictions between the quantitative and qualitative methods were addressed and put in the appropriate order. The language was revised to eliminate redundant words and phrases. This paved the way for conducting interviews and administering the questionnaire. The pilot study was completed in September 2016.

The interview guide and questionnaire (Annexure I and J) served as the interview and survey guides.

4.12 Establishing credibility by using both research methods

4.12.1 Reliability

Reliability refers to the consistency of a measure, that is, the ability of a measuring instrument to measure the same thing each time it is used (Rodon & Pastor, 2007; Singh, 2007; Shenton, 2004). There are three ways to assess reliability:

- Test-retest reliability, which is a measure of reliability by means of administering the same test twice over a period of time to a certain group of individuals. This study tested reliability by means of a pilot test. The questionnaire was administered to ten respondents and after two weeks the same questionnaire was administered again to the same respondents to check for consistency in the responses. Pearson's correlation coefficient was calculated to measure if the results reach the acceptable level of 0.5.

- Internal consistency reliability, which seeks to assess whether the indicators that make up the scale or index are consistent. Internal consistency was tested by different items that probe the same theme.

- Inter-rater reliability, which assesses the degree to which different rates give consistent estimates of the same phenomenon. Three respondents will be given the questionnaire in order for them to give their opinions with regard to the structure and coverage of the key research areas.

4.12.2 Validity

Validity refers to the technical soundness of the study. The following validity measures were applied to this study:

- Construct validity, which tries to assess whether the measuring instrument really measures the thing it was designed to measure (Rodon & Pastor, 2007; Shenton, 2004). Question items on the questionnaire that require exact responses and that require general responses were compared to ensure construct validity.

- Content validity means that the items on the test represent the entire range of possible items the test should cover.

- External validity is concerned with generalizations, in other words the extent to which the results of a study can be generalized to populations, settings and measurement variables.

4.13 Ethical considerations

Research ethics dictates that no one may be harmed in any way, either physically, psychologically, or emotionally, and that each person should be treated fairly and with dignity (Oates, 2008; Mouton, 2001). This is expressed in terms of participants and respondents' rights, including the right to privacy, the right not to participate, the right to withdraw, the right to give informed consent, the right to anonymity, and the right to confidentiality (Oates, 2008; Mouton, 2001). Furthermore, research ethics is defined in terms of the researcher's responsibilities. The researcher should not intrude; should behave with integrity; and should follow appropriate professional codes of conduct (Oates, 2008). Research ethics necessitates objectivity and integrity; no fabrication or forgery of data; recording of own data; ethical publishing practices involving appropriate ascription of authorship to a publication; rejection of any form of plagiarism; no simultaneous submission of manuscripts; and accountability to society, the scientific community, and the environment (Mouton, 2001; Allmark *et al.*, 2009; Creswell, 2009).

This study adhered to the aforementioned research ethics, which is detailed in the form for the ethics approval that was submitted to the research ethics committee at the NWU Institutional Research Ethics Regulatory Committee (IRERC). This committee approved the study on 18 August 2016 (NWU Ethics approval no: NWU-00402-16-A9). The researcher promised to ensure:

- the confidentiality of the information and the anonymity of the participants and respondents. Informed consent was obtained and participants and respondents were free will to withdraw their consent and to discontinue participation in the research interview or completion of the questionnaire at any time without prejudice.

- the avoidance of discomfort, anxiety, and harassment, invasion of privacy or dehumanizing procedures during data gathering.

- respect for persons involved and a fair explanation of the purpose of the research. The interests of participants and respondents were safeguarded. Voluntary participation was encouraged and participants and respondents were not coerced in any way to take part in this research.

- sharing of benefits (description of potential benefits to the subjects). The participants and respondents had a clear idea of precisely where and when the interviews were to take place; the length of the interview and that the researcher would take notes. They were informed of the purpose of the interview and research study and had a clear idea of why they were interviewed (Creswell, 2009).

- that he would adhere to the ethics code of conduct of the Human Sciences Research Council and the university research ethics code. Finally, ethics was placed high on the research design agenda.

4.14 Chapter Summary

This chapter explained the study's research methodology, namely a MMR approach. The qualitative method is regarded as the primary method selected and the quantitative as the secondary method. The study was founded on a pragmatic and connectivist philosophy, as these offer access to both positivism and interpretivism through the use of a MMR approach.

The next chapter presents the results of the first phase of data gathering by means of interviews (qualitative research). Chapter 6 presents the results of the second phase of data gathering (quantitative research). Chapter 7 also deals with the responses offered in the questionnaire.

CHAPTER 5

QUALITATIVE ANALYSIS AND INTERPRETATION

5.1 Introduction

Chapters 5 and 6 present the results of the qualitative data analysis as mentioned in Figure 4.1. The qualitative method is the primary method for this MMR and is therefore discussed first.

Chapter 5 deals with the qualitative data procedures. It first describes the processes and steps that were followed and the data sampling and collection. This is followed by the presentation of the demographic data of the participants, the thematic open coding and a network diagram. Chapter 6 focuses on the participants' responses and offers a discussion of the research findings (see Figure 6.1).

5.2 Qualitative data procedure

The qualitative data analysis process aims to make logical sense of the research participants' observations and judgements with respect to the phenomena under study and to identify consistent patterns, themes, categories (Vosloo, 2014; Cohen *et al.*, 2007). The process of qualitative data analysis is an ongoing and iterative procedure. Data gathering, analysis, presentation and discussion are intertwined as illustrated below.

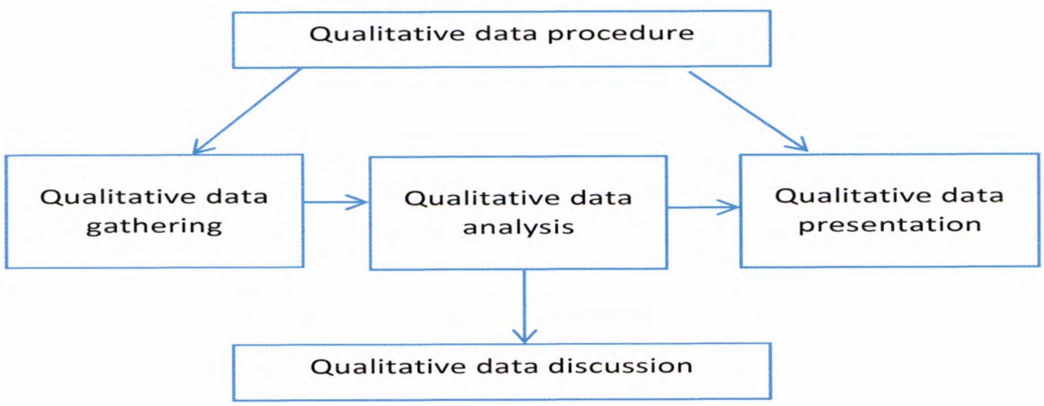


Figure 5-1: Qualitative data procedure (adapted from Creswell & Clark 2011)

Rigour is essential in research and various strategies are available within qualitative research to protect against bias and enhance the reliability of the study. This section demonstrates the study's rigour. Rigour is evaluated and measured based on the following qualitative criteria (Shenton, 2004): trustworthiness (Morse *et al.*, 2002), authenticity (Bryman & Bell, 2011), and adequacy. It is vital that participant validation is carefully considered in areas of credibility, transferability, dependability, and confirmability (Bryman & Bell, 2011) as detailed in Chapter 4.

The Figure below depicts the process followed to ensure rigour. This ensures the relevance of qualitative research in terms of validity, reliability, trustworthiness, safeguarding consistency, and applicability.

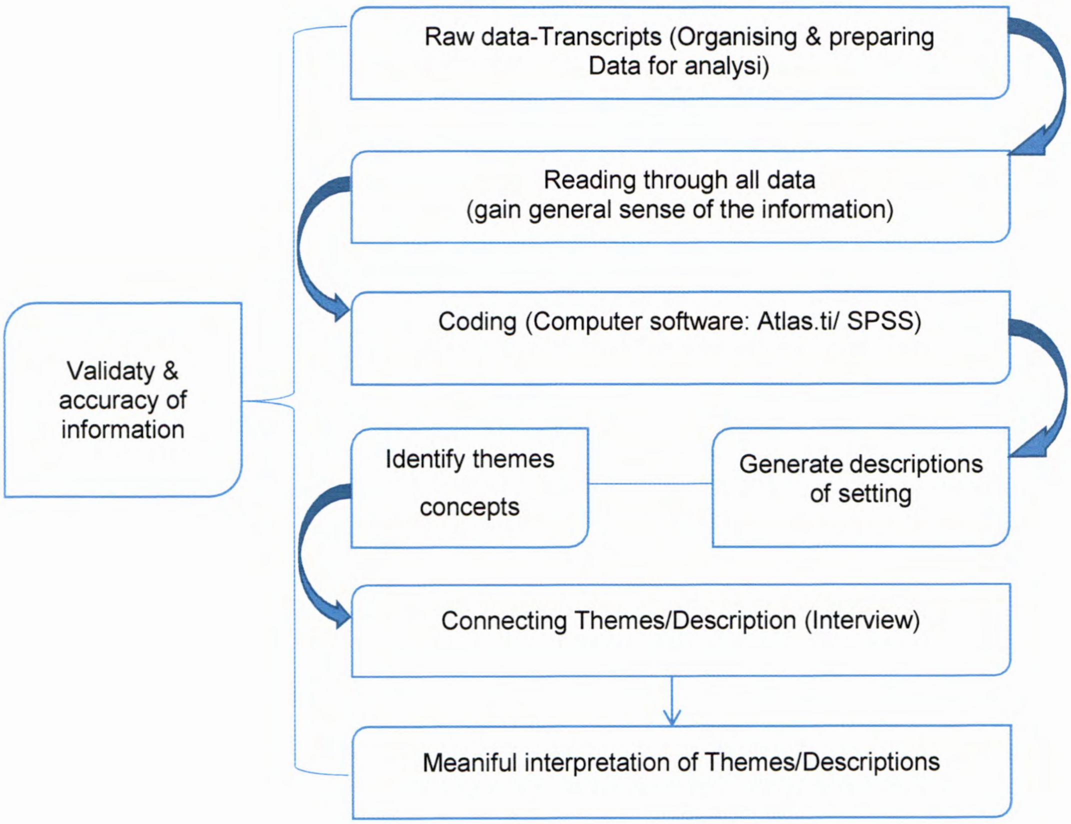


Figure 5-2: Qualitative data analysis development (adapted from Creswell, 2015)

The above process was applied to the transcribed interviews and the field notes. Starting with the raw data (transcripts), the first and second tasks involved reading the data. During the first stage, reading the data helps the researcher gain an overall impression of the data, the ideas that emerge, and the context. The second process involves identifying themes from the data. The third step is the data coding (using a statistical instrument or an application to code information). The transcriptions were organized into themes and classifications with the help of ATLAS.ti. As the analysis evolved, sub-themes and subcategories emerged to reveal connections, associations and trends. The coding process comprises three steps described by Vosloo (2014), namely open coding, axial coding and selective coding.

Open coding deals with the identification and labelling of sections of meaning that make sense from the field notes and transcripts relative to the research topic. The focus of open coding is on wording, expressions, rephrasing/phrasing, context, uniformity, regularity, comprehensiveness and specificity of commentaries. Meaningful segments of the transcripts and field notes were marked and categorized into themes descriptive titles (Urquhart *et al.*, 2010).

Axial coding entails examining associations among codes (Mavetera, 2011a, 2011b). In this study, axial coding was carried out by revisiting, rereading and inspecting the original codes identified during the open coding. Classifications and patterns are identified as part of this step and they are structured in terms of interconnection, perspective and consistency.

Selective coding, which is the last step of coding procedure, entails careful selection and revision of all the identified codes. During this process, the researcher evaluates all the codes to identify dissimilarities and relationships to the research topic (question) fundamental themes or key associations that may arise. The codes were also assessed for significance to the research objectives (Section 1.4 in Chapter 1). Interrelated codes were itemized in categories that correlate with the research objectives (Section 1.4 of Chapter 1). The fourth step is the identification and generation of themes and concepts, followed by linking some of the themes that had been identified and finally, the interpretation of themes and descriptions.

5.2.1 ATLAS.ti

ATLAS.ti Version 7 was employed as a qualitative data analysis instrument for analysing the interviews. The initial data analysis involved open coding and a process of defining the data, identifying categories, making summaries, and accounting for every data segment (Corbin & Strauss, 2008; Charmaz, 2006).

5.3 Data sampling and collection

The interview questions started with questions on participants' demographic information, followed by the main research questions (see Annexure I: Interview Guide). The interview consisted of six (6) separate sections (Part A–F), each part containing several questions directed at a framework of SS adoption in HES. The research sample involved 15 interviewees from the three selected universities. This included the North-West University, University of South Africa (UNISA) and the University of Pretoria (UP).

The participants were selected for the interviews due to their vast knowledge of SS/SW and ICT application in HES. The interviews offered the most suitable and convenient platform for academic staff members to share their opinions.

The 15 participants gave consent for the interview. Each interview was audio recorded to facilitate the collection of information. The data generated from the interviews were transcribed (Corbin & Strauss, 2008) and imported to ATLAS.ti as hermeneutic units (HU). The information derived from interviewees had to be structured, arranged and interpreted. The qualitative data gathering process delivered the primary data, which were supported by the addition of secondary data that were obtained from the literature study discussed in Chapter 2 and the questionnaires.

The figure below is an example of the creation of codes using ATLAS.ti. This "code family" includes a list of codes and the number associated with each code and quotes that relate to the code family.

Name	Grounded	Density
Active learning~	6	1
Awareness and use of ICT web tools~	16	0
Behavioural pattern/attitute/perception/bel...	21	1
Blended and integrated learning~	32	0
Collaboration	4	1
Collaborative learning~	10	1
Concept of Web 2.0 and Web 3.0	14	0
Content driven	12	1
Content personalization~	14	0
Creative / Integrative learning~	7	1
Critical thinking~	4	1
Difficult to integrate SS/SW and ICT	14	1
Distance learning~	17	0
Educators' support	27	3
Educators development and support~	12	0
eFundi	6	1
Ethical and legal issues~	12	2
Expliotation	7	1
Human Factors~	27	3
ICT improving ease access to education~	14	0
ICT improving learners' performance	13	0
ICT improving learning enthusiasm~	16	0
ICT improving quality education and mode ...	22	5
ICT in increasing educational opportunities~	9	0
ICT investment: costs/risk/benefit	18	1
ICT teaching facilities	23	1
ICTs infrastructures~	30	6
Improved business processes~	11	0
Increased productivity as an educator~	27	0
Information quality	5	1
Innovation	3	1

Insufficient educator time	0	1
Intelligent Property Rights (IPRs)	15	1
Interoperability, Personalization, Virtualizati...	8	4
Knowledge creation management~	11	0
Lack of confidence level	0	1
Lack of willingness to accept change	0	1
Lack students exposure	3	1
learning management system	35	1
Misuse	6	1
Not enough simultaneous access	0	1
Other possible issues	23	2
Privacy	7	1
Reflective learning~	5	1
Security Issues~	19	2
Semantic blogging/wiki/podcast/vodcast	10	1
Seminar	9	1
Social network	10	1
Student's management~	24	0
Too much of workloads	0	1
Training	15	1
Transitioning/Change~	3	0
Tutoring agent systems~	28	4
University's policy framework	22	1
Workshop	11	1
55 Codes		

Figure 5-3: Themes derived during the open coding process

5.4 The demographics of the participants

Table 5-1 presents the demographic data of the participants. The participants were each assigned a code [AC1-INT1, BC4-INT4] and [CC5-INT7]. In this instance, A, B and C signify the university; the second C signifies Case; the number is the case number, INT refers to the interviewee with a unique number. Gender was denoted with (M/F) and their professions and institutions were also logged. The participants were selected from different academic disciplines, namely Information Systems, Computer Sciences, School of Computing, and Informatics. This sample ensured that the carefully selected participants were representative of the mixed population and expertise. This ensured that the findings achieved from the sample would offer relevant information in line with the objectives of the study. The below demographic table of interviewees is not biased or segregated according to gender, profession, academic experience and area of expertise.

Table 5-1: Demographic information of the participants

Interviewee No.	Gender	Academic experience	Profession	Institution
AC1-INT1	M	11 years	Senior lecturer: Computer Security and Networking	University A
BC4-INT2	F	14 years	Professor: School of Computing	University B
BC4-INT3	M	20 years	Lecturer: School of Computing	University B
BC4-INT4	M	25 years	Associate professor: School of Computing	University B
CC5-INT5	M	7 years	Associate professor: Department of Informatics	University C
CC5-INT6	F	8 years	Lecturer: Department of Informatics	University C
CC5-INT7	M	23 years	Professor: Department of Informatics	University C
AC1-INT8	M	15 years	HOD and lecturer: Information Systems and IT Security	University A
AC1-INT9	F	5 years	Junior lecturer: Information Systems	University A
AC2-INT10	M	16 years	Professor: Economic and Management Sciences	University A
AC2-INT11	F	8 years	Lecturer: Faculty of Agriculture, Science and Technology	University A
AC2-INT12	M	20 years	Associate professor: Faculty of Agriculture, Science and Technology	University A
AC3-INT13	F	12 years	Senior lecturer: School of Information Technology	University A
AC3-INT14	M	22 years	Professor: School of Information Technology	University A
AC3-INT15	F	7 years	Senior lecturer: Faculty of Economic Sciences and Information Technology	University A

The selected educators were more likely to have a comprehensive understanding and their own ideas of the concepts involved in SS/SW and ICT technologies in their educational activities. They may have acquired this knowledge through academic experience, research, reading and the facilitation of learning. The interviews occurred between February and March 2017, although the arrangement process and communication between the researcher and the participants took place during January and February.

The delay was due to a prolonged ethics clearance process, asking for informed consent, and unavailability of the academic staff, some of whom had to attend conferences locally and internationally. This caused procedural delay and a lower response rate than initially anticipated. Snowball sampling was used in that participants would refer the researcher to another person who would be able to provide fruitful information. After agreeing to participate in the interview based on the initial telephone call or e-mail communication, each participant was sent an e-mail before the interview date that officially introduced the researcher and described the research objectives and what the study entailed. In addition, all participants received the required informed consent form prior to the interviews.

The interviews lasted for about 30 to 45 minutes. All the interviews were immediately transcribed and analysed by following the process described in Chapter 4. The data obtained from the participants and the information from the literature review supported the generation of categories during the original coding and analysis. The properties of the different categories and the main themes are demonstrated in Table 5.2 and discussed in Section 5.2.

5.4.1 Thematic evidence from the interviews

Thematic analysis is commonly used in qualitative data analysis. It involves linking two or more themes that are essential within the narrative of the context. The themes and sub-themes that became apparent from the interviews are as follows: SS/SW and ICT tools adoption in HES; Educators' perceptions of SS/SW and ICT tools in HES; Educational impact and benefits of Web 2.0/3.0 and ICTs in HES; Controversies and challenges related to adopting SS/SW in HES; and Educator development and support.

Table 5.2 presents the thematic evidence that resulted from the open coding of transcribed interviews. The table also contains descriptions of the themes as the themes formed the basis of the proposed framework for the adoption of SS/SW in HES. The descriptions have been rephrased to fit the interview questions and the themes were selected through content analysis. The themes are discussed with the literature review (Chapter 2) in mind and in correspondence with the research objectives to ensure that the study is coherent.

This initial phase of the literature review and interviews with participants with academic involvement assisted in establishing the foundation for a framework for the adoption of SS/SW technologies into HES to support the facilitation of learning. After codes had been created, a classification chart and tables assessed the frequency and concentration of these codes. However, the demographic codes were left out of this process.

Table 5-2: Thematic evidence derived from open coding themes

Themes	Descriptions

SS/SW and ICT tools adoption in HES	**Integration of ICT**
	• ICT improves quality education and the mode of delivery
	  o Creative / Integrative learning
	  o Reflective learning
	  o Collaborative learning
	  o Active learning
	  o Critical thinking
	• ICT improves learners' performance
	• ICT improves learners' enthusiasm
	• ICT increases educational opportunities
	• ICT eases access to education

Educators' perceptions of SS/SW and ICT tools in HES	• Knowledge creation management • Improved business processes • Content personalization • Transitioning/Change • Increased productivity as an educator • Student management • Blinded and integrated learning
Educational impact and benefits of Web 2.0/3.0 and ICTs in HES	**Interoperability, personalization, virtualization and intelligence** • Information quality • Content driven • Innovation • Collaboration **Tutoring agent systems complementing facilitation of learning** • Learning management systems • (eFundi, myUnisa, clickUP, MyTUKS, Blackboard/WebCT)

Themes	Descriptions
	• Social networks • (Facebook, Twitter, YouTube, Skype) • Semantic blogging • (Blogs/wikis/podcasts)
Controversies and challenges related to adopting SS/SW in HES	**Security issues** • Privacy • Intellectual property rights (IPRs)
	Ethical and legal issues • Exploitation • Misuse
	Human factors • Behavioural pattern (Technophobia, attitude, belief) • Lack of willingness and readiness to accept change • Lack of confidence
	ICT infrastructure • ICT teaching facilities • ICT investments (Costs, risk and benefit) • Heavy workloads • Insufficient educator time • Difficult to integrate SS/SW for facilitation of learning • Not enough simultaneous access **Other possible issues** • Students lack exposure • University policy framework
Educator development and support	**Educators support** • Training • Seminars • Workshops

Based on the thematic evidence derived from the open coding process, the qualitative analysis produced five themes and 55 codes. The visual map (ATLAS.ti network diagram) with the themes, sub-themes and codes is presented in Figure 5.4.

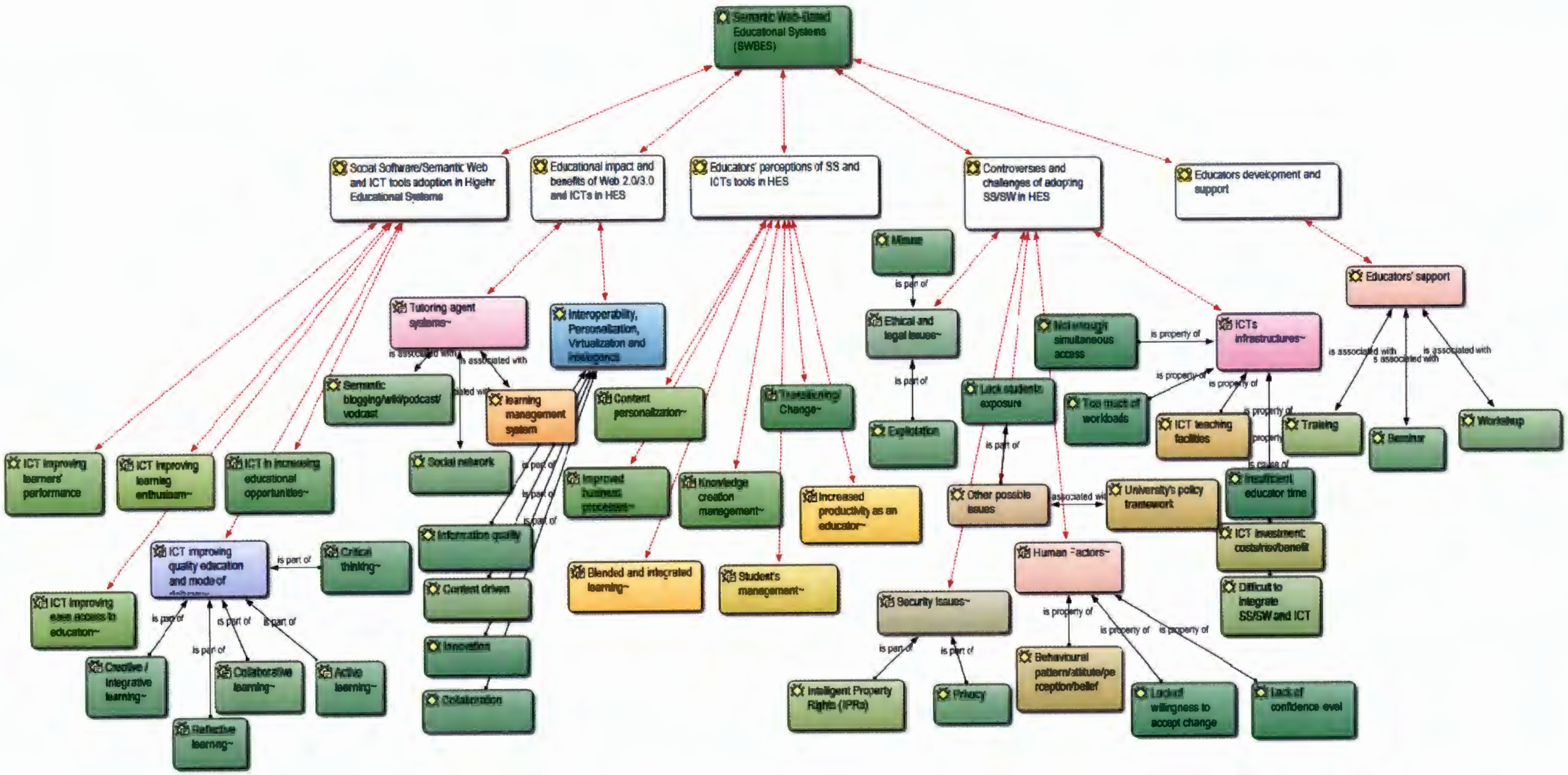


Figure 5-4: The network diagram: SS adoption in HES

Figure 5.5 details the quotations from the interviews and the scoring of themes. Content assessment justifies the validity and strength of the context elements found in the interview transcripts. The representation in the figure assisted the researcher to condense large quantities of information by means of different research methods.

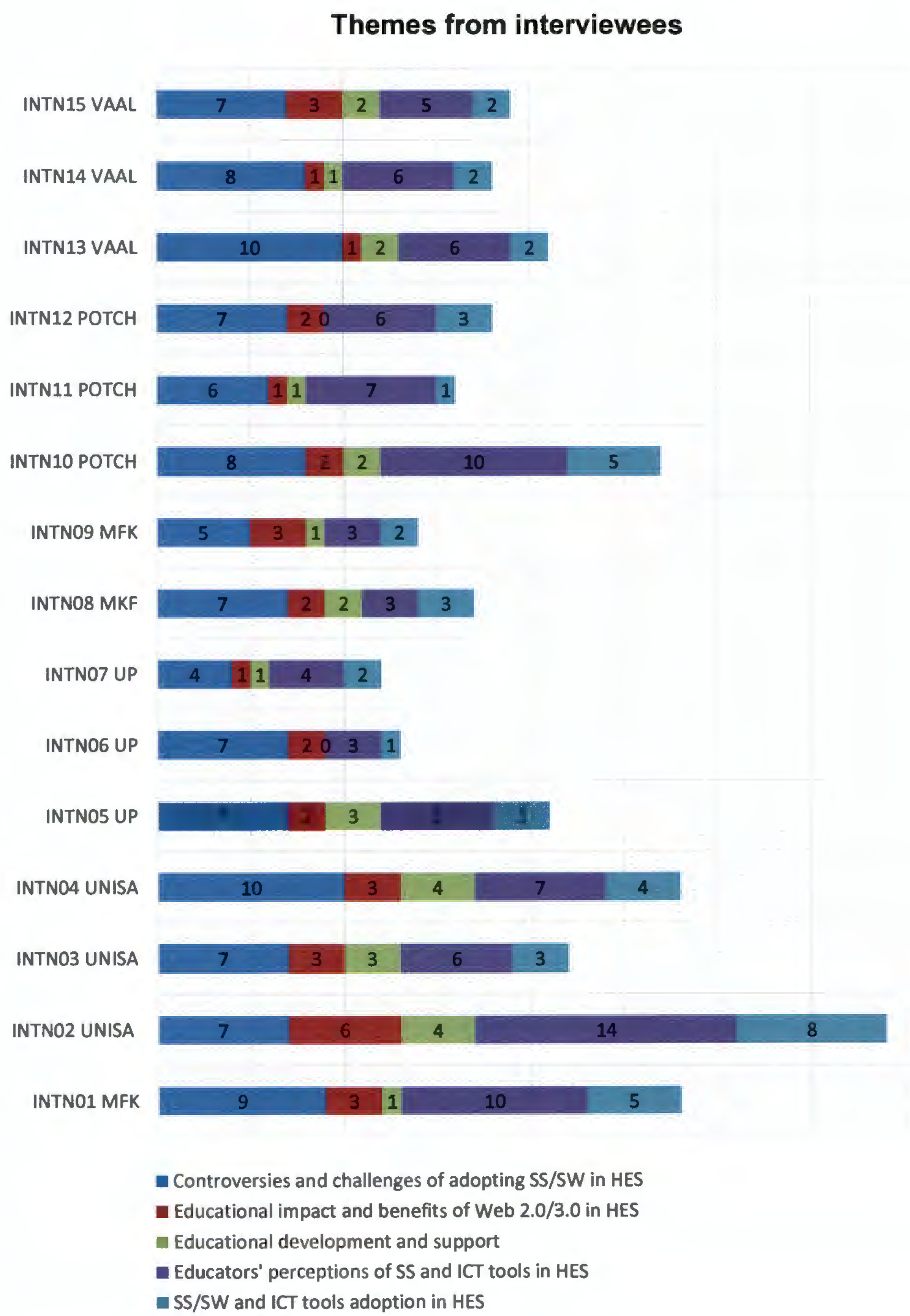


Figure 5-1: Scoring of themes

Table 5.5 shows the scores of the different thematic codes used to clarify the five central themes. There were 11 codes, with 46 quotes describing Theme 1 – SS/SW and ICT tools adoption in HES. Eight codes with 96 quotes described Theme 2 – Educators' perceptions of SS and ICT tools in HES; and 10 codes with 35 quotations described Theme 3 – Educational impact and benefits of Web 2.0/3.0 in HES. For Theme 4, 21 codes and 109 quotes explained the theme of Controversies and challenges of adopting SS/SW in HES, while Theme 5 – Educational development and support, was described by 5 codes with 27 quotes. A total of 55 codes and 313 quotations were employed in identifying and generating items for SS adoption in HES from interviews.

Table 5-3: Quote counts of codes

Quote counts of codes	**Total**
SS/SW and ICT tools adoption in HES	46
Educators' perceptions of SS and ICT tools in HES	96
Educational impact and benefits of Web 2.0/3.0 in HES	35
Controversies and challenges related to adopting SS/SW in HES	109
Educational development and support	27
Total	**313**

This table shows that the themes Controversies and challenges related to adopting SS/SW in HES (109) and Educators' perceptions of SS and ICTs tools in HES (96) were the most prevalent themes. This was followed by Theme 1, Theme 2 and Theme 3 in that order. Theme 5 – Educational development and support, contributed only slightly.

5.5 Chapter Summary

This chapter detailed the procedure of analysing qualitative data. The discussion elaborated on the use of ATLAS.ti. to create code families, lists of codes, numbers associated with each code. Quotations were selected to fit each code family. The chapter also presented the results of the demographic data. Finally, thematic evidence was briefly discussed and the network diagram for SS adoption in HES was derived. Chapter 6 elaborates further on the qualitative data analysis and interpretation and discusses themes in detail. In addition, the chapter continues with the discussions of the interviewees' responses.

CHAPTER 6

INTERVIEWEE RESPONSES

6.1 Discussion of research findings

The earlier Chapter 5 dealt with the first part of the qualitative analysis and interpretation. Chapter 6 presents the second part. The discussion of the qualitative analysis and data interpretation continues as this chapter offers a detailed discussion of the interviewee responses from all three universities. The interview responses from the selected universities were transcribed and read into ATLAS.ti.

Sgier (2012), Seers (2012) and Miles *et al.* (2013) note that in a qualitative data analysis and interpretation, a researcher should employ a systematic and rigorous tactic to ensure that the research questions are addressed. In this instance, the researcher explored the educators' ideological understanding and knowledge of SS/SW and ICT technologies in HES simply by describing and categorizing these universities into groups.

For the sake of clarity on how the educators from each different institution responded to the research questions, the researcher grouped all the participants from one university together and refer to these universities as university A, B and C. The different groups are referred to as Case 1, 2, 3, 4 and 5. Case 1 is from Mafikeng Campus, Case 2 from Potchefstroom Campus and Case 3 from the Vaal Campus. Together they form University A. Case 4 represents University B and Case 5 represents University C. The rationale behind grouping the participants from each campus together into cases is that it enables the researcher to place emphasis on depth rather than breadth. The findings for each individual case are first discussed. Thereafter, the overall research discussion and findings of the study are presented. The below figure offers an overview of the processes involved in this chapter.

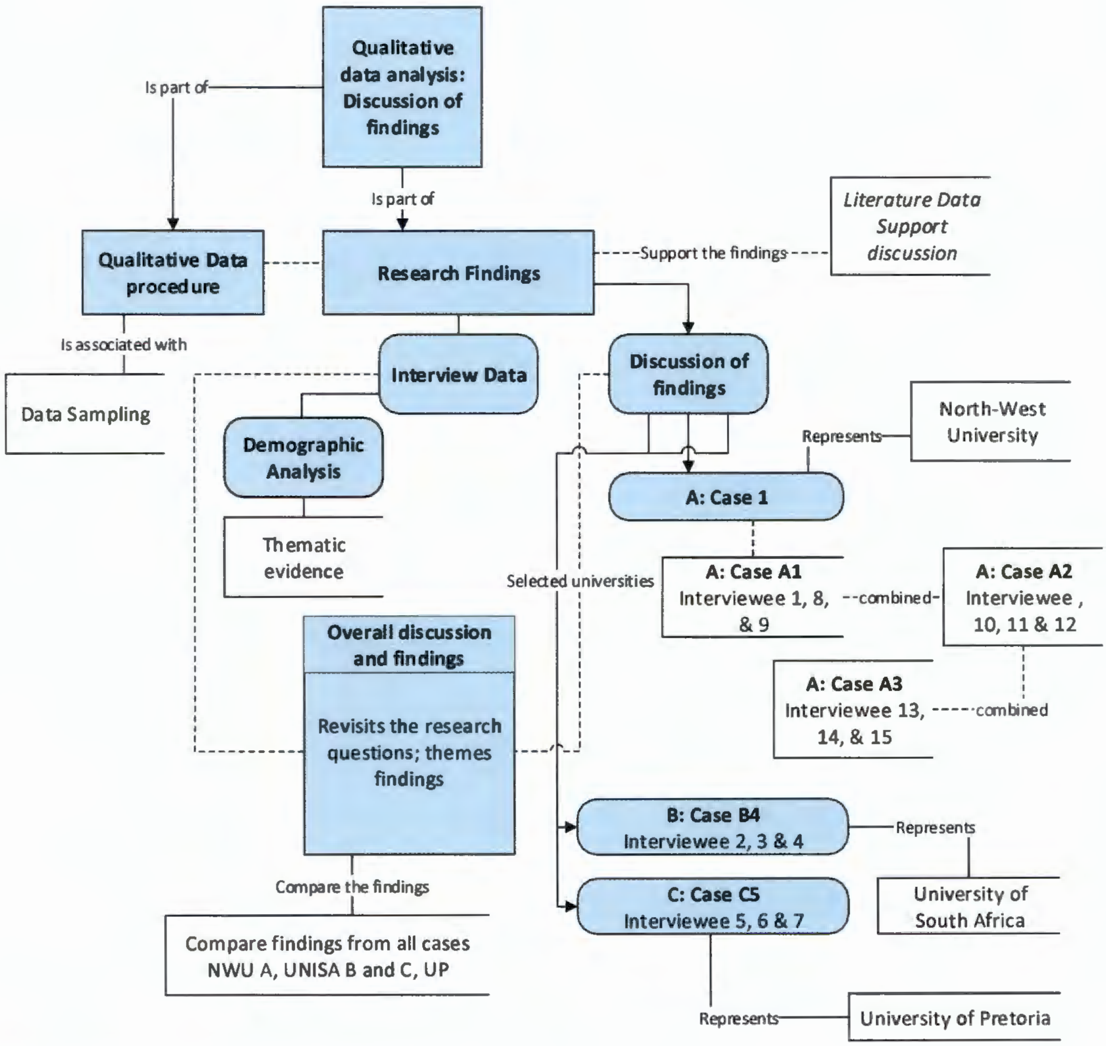


Figure 6-1: Overview of Chapter 6.

6.1.1 Interview Responses

The interview questions were divided into Part B–F. This structure meant that the questions reflect the research questions.

The interview questions in Part B related to SS/SW and ICT web technologies adoption in HES.

- The questions examine the adoption of SS/SW in HES; awareness; familiarity with ICT technologies; as well as the open distance learning approach.

The interview questions in Part C addressed SS/SW adoption and its usefulness in universities.

- The questions centre on how educators view SS/SW and the related concepts. These questions explore the flaws and effectiveness of Web 2.0 and Web 3.0 in education for the facilitation of learning and business administration.

The interview questions in Part D focused on educators' confidence level with ICTs.

- These questions probe educators' ICT involvement, confidence, readiness, and willingness to use ICT web technologies to facilitate learning process. It also asks whether the institution offers the necessary resources and training.

The interview questions in Part E relate to controversies and challenges

- The questions examined the controversies and challenging issues preventing the adoption process of SS/SW and ICT web technological tools in HES.

The interview questions in Part F were related to educators and learners' development and support.

- These questions probed the support system to develop and prepare educators in the use of SS/SW and ICT web technologies in HES.

6.2 University A – North-West University

University A consisted of Cases A1, A2, and A3 of the study as represented in Figure 6.1. For clarity purposes, Case A1 stands for Mahikeng, Case A2 Potchefstroom, while Case A3 represents the Vaal Campus. In this study, these cases (A1, A2 & A3) together form the NWU as a unit, called Case A. Each case discussed in this chapter involves three interview participants. Case A1 comprises of three interviewees, namely interviewee 1, 8 and 9. A proposition was generated for Case A1 and denoted as [AC1-INT1, AC1-INT8] and [AC1-INT9]. In Case A2, the proposition is denoted as [AC2-INT10, AC2-INT11 and AC2-INT12], while for Case A3, the proposition is denoted as [AC3-INT13, AC3-INT14 and AC3-INT15].

6.2.1 Case A1-M

6.2.1.1 The responses of interviewees 1, 8 and 9 to the questions in Part B: SS/SW and ICT web technologies adoption in HES

This section presents the interview responses of the participants that together form Case 1 of University A. The three participants all received the same questions. The findings show that educators are familiar with ICT web technologies enabled by SS/SW, ODL and the adoption of ICT technologies in HES to improve learning enthusiasm, performance, easy access and quality education delivery.

The finding revealed that educators were familiar with the concept of SS/SW and ICT web technologies as things that can support teaching and learning activities. AC1-INT1 and AC1-INT8 explained that their campus has not fully incorporated ODL as part of their teaching and learning. AC1-INT9 supported this by revealing that some components of ODL have been initiated. On the matter of whether the adoption of ICT and web technological tools in HES serve as complementary tools, the interview participants seemed to trust that the use of ICT web technological tools in HES would have a positive impact on education delivery. They felt that it would support learning goals. AC1-INT8 was of the opinion that the adoption of these technologies would make education more affordable in that learners would have access to educational resources at any given point in time, regardless of the geographical location. The findings show that the participants embrace the idea of adopting SS/SW and ICT web technological tools as complementary tools to support teaching and learning facilitation. AC1-INT1-AC1-INT9 said that, *"it can complement quality education"*. The responses from the participants all indicated that there is a need for the adoption of SS/SW and ICT web technological for teaching and learning purposes. They believe that the adoption of ICT web technologies can improve quality education and mode of delivery; learners' performance; learners' enthusiasm; can increase educational opportunities and can improve ease access to education. AC1-INT8 also felt that the adoption of ICT web tools could increase learning enthusiasm.

6.2.1.2 The responses of interviewees 1, 8 and 9 to the interview questions from Part C: SS/SW adoption and its usefulness in universities

The above findings revealed that educators are in support of the adoption of ICT in HES. It is fundamental to explore how educators perceive or view these web technological tools. Research studies have explicitly justified the integration and use of these web technologies and their applications for educational purpose. For some reason, not many universities have been able to use these tools to their full potential. This part of the question took a closer look at how SS/SW and ICT tools and application are perceived. AC1-INT9 said that SS/SW and ICT are *"personal learning environments (PLEs) or personal virtual environments (VLEs) which offer learners the possibilities to get hold of information, integrated learning and social presence"*. AC1-INT1 said *"well I think they are useful in supporting learning, in my case, I find some of these tools useful"*. AC1-INT1 and AC1-INT9 confirmed this, as these participants felt that the Web 2.0 and 3.0 technologies and applications are becoming more affordable. AC1-INT9 said that *"it is efficient in meeting most university's needs, say for instance, it plays crucial part in improving universities' business processes towards information management's, decision-making, quality education and Innovation and knowledge creation amongst learners"*. AC1-INT8 insisted that this platform *"makes the distribution and communications more accessible"*.

This findings show that educators have the perception that SS/SW and ICT are knowledge creation platforms; that they increase educators' productivity and create room for change. However, AC1-INT9 explained that educators might still be accustomed to the traditional approach of teaching. Participants also felt that these technologies increase business processes and enable content personalization. AC1-INT8 remained positive, regardless of the issues associated with content personalization. The participant still perceived SS/SW and ICT web tools as useful within the pedagogical context. AC1-INT1 and AC1-INT9 suggested that pedagogical Web 2.0 and 3.0 may be employed to coordinate students' learning activities and assessments. It can serve as student management and supports blinded and integrated learning.

6.2.1.3 The responses of interviewees 1, 8 and 9 to interview questions from Part D: educators' confidence level with ICTs

The previous parts established how academic staff members view SS/SW and the usefulness of integrating these web applications in educational systems. Following this, it is important to look at confidence levels. It is one thing to view web tools as useful and another to be willing, ready and confident enough to use such web technological tools. This section of the interview questions addressed two separate concerns. The first concern related to the benefit of using Web 2.0/3.0 and the second spoke to educators' ICT confidence levels to use ICT web tools to support learning.

All three participants agreed that ICT web technologies and applications in HES would bring interoperability, personalization, virtualization, and intelligence. The use of instructional web technologies in HES can have positive effects in terms of information quality, content-drivenness, innovation and collaboration. It may provide students with several learning platforms, which would support participatory learning. The questions on confidence asked participants to indicate which of the SS/SW and ICT tools they use on a daily basis for teaching. The findings show that various LMS/VLEs are in use, but every institution has adopted a specific LMS. AC1-INT1, AC1-INT8 and AC1-INT9 mentioned that they have been exposed to eFundi LMS. They also indicated that "overhead projector is something used for facilitation of learning". The question of educators' ICT confidence also came up. The responses show that all three interviewees indicated that they do not lack confidence when it comes to SS/SW and ICT instructional web technologies. This implies that the participants selected for this study were all knowledgeable and experienced. This could be due to their academic field of study. When asked if they use social networking sites like Facebook, Skype, YouTube, blogs, wikis, podcasts and many other tools for learning purposes. AC1-INT1, AC1-INT8 and AC1-INT9 indicated that although, they are familiar with these tools, however, they do not use some of these web tools for teaching. When asked their reasons, they claimed that the university's policy restricts them. Some participants believed that these tools are not readily available and that they are not incorporated in their eFundi LMS/VLEs.

6.2.1.4 The responses of interviewees 1, 8 and 9 to interview questions from Part E: controversies and challenges

The interviewees' responses signify that security issues (privacy, IPRs); ethical and legal issues (exploitation, misuse); human factors (culture, behavioural patterns, technophobia, attitudes, beliefs); and a general lack of willingness and readiness to accept change, has always surfaced as on-going issues surrounding technology acceptance in educational environment. The issue of ICT infrastructure (ICT teaching facilities), which is associated with ICT investments (costs, risk and benefit), cannot be overlooked. Participants explained that university policies also restrict educators from using some of the web instructional tools. These challenges may be affecting the adoption of these web tools. AC1-INT1 and AC1-INT9 explained that heavy workloads, insufficient time, difficulty with integrating SS/SW with the facilitation of learning, and inadequate access could hinder the adoption process. AC1-INT8 contended, *"concerning simultaneous access, yes to an extent, I think going to training, workshop and seminars are just not enough to ensure that the educator is adequately equipped".*

6.2.1.5 The responses of interviewees 1, 8 and 9 to interview questions from Part F: educators and learners' development and support

Educators are significant role player in HES. Therefore, support systems should be available to those who need it. In this context, this would refer to educators who find it difficult to incorporate SS/SW and ICT instructional web technologies in learning activities. The participants felt that educators should be able to attend seminars, other training and workshops to boost their ICT confidence. The next section presents the discussion of Case A2.

6.2.2 Case A2-P

6.2.2.1 The responses of interviewees 10, 11 and 12 to interview questions from Part B: SS/SW and ICT web technologies adoption in HES

This section presents the interview responses of the participants that together form Case 2 of University A. The three participants all received the same questions. The findings reveal that educators are familiar with ICT web technologies enabled by SS/SW, ODL and the adoption of ICT technologies in HES and that it can improve learning enthusiasm, performance, easy access and quality education delivery. The findings also establish that ODL has not yet been fully incorporated in their teaching activities.

AC2-INT10, AC2-INT11 and AC2-INT12 all suggested that the adoption of SS/SW and ICT instructional web technologies in HES can improve the quality of education and the mode of education delivery; that it can improve learners' performance and enthusiasm; increase educational opportunities; and ease access to educational contents. They were optimistic that SS/SW and ICT tools have the dynamic power to help educators break away from the traditional method of education delivery.

6.2.2.2 The responses of interviewees 10, 11 and 12 to interview questions from Part C: SS/SW adoption and its usefulness for universities

The findings suggest that the educators view SS/SW and ICT as an avenue for knowledge creation; that it increases educators' productivity and creates opportunities for change. AC2-INT10, AC2-INT11 and AC2-INT12 contended that the adoption of these technologies in the education system can increase the university's business processes and that it allows content personalization. The participants still view SS/SW and ICT web instructional technologies as useful within a pedagogical context.

AC2-INT10 and AC2-INT11 believe that *"it does support an improved business administration and processes if properly managed"*. AC2-INT11, felt that *"yes as a complimentary tool and I think it does increase productivity as an educator"*.

The participants recognized that SS/SW and ICT instructional technologies support student management and blended learning. This signifies that blended learning is viewed as an important approach in a pedagogical environment. Such platforms allow students to work independently and on their own pace, while making face-to-face contact with the educators possible and offering all the necessary educational resources and support that students require to pursue their career. On that same note, AC2-INT10 argued that "*it cannot replace the traditional mode of education delivery*".

6.2.2.3 The responses of interviewees 10, 11 and 12 to interview questions from Part D: educators' confidence level with ICTs

A number of research studies indicate that early preparation is an essential prerequisite for the positive incorporation of ICT instructional web tools in HES. Nevertheless, an educator's choice of an appropriate ICT teaching and learning tool is solely reliant on factors such as willingness, readiness and confidence to accept or use the tool.

The findings show that participants all felt that they have ICT confidence. Participants claimed that they are willing and ready to accept ICT as an integral component of teaching and learning. The participants collectively suggested that educators should adopt a suitable teaching style to deliver learning contents. It should address their teaching specifications or curriculum. In most cases, the use of technology gives educators the opportunity to choose from a wide range of options that may be applicable to their teaching requirements. Regrettably, research shows that a lack of confidence among educators may be linked to a fear of the inappropriate use or failure to use ICT web instructional tools.

According to the interviewees, educators are required to specify which of the SS/SW and ICT web instructional technology they use on daily basis. The eFundi learning system is an LMS/VLE that has been widely adopted by this institution, as mentioned by AC2-INT10, AC2-INT11 and AC2-INT12. They also acknowledged overhead projector as one of the ICT tools that is used on a daily basis. The participants were subsequently asked whether they use social networking sites such as Facebook, Skype, YouTube, blogs, wikis, podcasts and many other tools. Only one [AC2-INT12] could attest that he has made use of YouTube. AC2-INT10 and AC2-INT11 have never used any of these web instructional tools during teaching and learning, and they provided specific reasons. One claimed that the university's policy restricts them. Another participant believed that the institution does not support these web instructional tools, claiming that these tools were not accessible or incorporated for teaching purposes.

Although, the interview responses confirm that integrating Web 2.0/3.0 and ICTs in HES can have benefits. These benefits include better information quality, content-drivenness, innovation and collaboration. The adoption of web instructional technologies in HES does have a direct influence, namely appropriateness, concise and reliable representation of information. The next section deals with the controversies surrounding the adoption of SS/SW and ICT instructional web facilities in HES.

6.2.2.4 The responses of interviewees 10, 11 and 12 to interview questions from Part E: controversies and challenges

The participants have established that SS/SW and ICT web technologies do have a positive influence on education. They serve as extra tools that complement the traditional instructional approach of learning. Unfortunately, there are also negative aspects that adversely affect ICT adoption in HES.

There are issues of security such as anonymity, reputation, intellectual property ownership, patent violations, monetary functions and trust, to mention but a few. These cannot be ignored. Students' online interactions in an open sphere pose serious threats to any educational institution. The findings suggest that security issues (privacy, IPRs); ethical and legal issues (exploitation, misuse), human factors (culture, behavioural patterns, technophobia, attitudes, beliefs), and a general lack of willingness and readiness to accept change, are on-going issues surrounding the technology acceptance in educational environment. There can also be problems with ICT infrastructure (ICT teaching facilities) and ICT investments (costs, risk and benefit). Some of these problems have a minimal impact, while others pose serious threats.

AC2-INT11 avers, *"privacy and safety issues have remained at the forefront over public postings conceivable issues, negatives or online technology"*. AC2-INT12 supports this by saying, *"to some extent like there is of course that aspect of inability to ascertain the authenticity or the originality of the work but we always try to use other tools for example Turnitin application ascertain plagiarism"*. AC2-INT10 argued IPRs *"[are]it's not quite a big threat because at the end of the day you also have to look at the work submitted by the students to see if there is proper referencing that has been done and check the originality of ones work"*.

Other controversies identified were that the university policy framework restricts educators from using some of these web instructional tools for teaching purposes. This may possibly affect the adoption of these web tools [AC2-INT10, AC2-INT11 and AC2-INT12]. The participants explained that heavy workloads; insufficient time; difficulty integrating SS/SW with the facilitation of learning and inadequate access could hinder the adoption process. Only AC2-INT10 disagreed: *"No I don't think so, I don't think there is any constraints on the part of the educator that may mitigate against using those social platforms. Personally, I don't think it takes a lot of time to post and I don't think time is any factor"*. One response disclosed that another possible issue is a lack of student exposure. Participants explained that learners often come from disadvantaged homes. The level of use of a digital tool or computer may be not be sufficient to equip the learner. This affects the learner's assimilation of content and use of ICT applications during class. Such a learner may not be able to adjust as quickly as those who are technologically privileged.

6.2.2.5 *The responses of interviewees 10, 11 and 12 to interview questions from Part F: educators and learners' development and support*

The findings suggest that educators should have access to academic support programmes. Participants also mentioned that such support systems or programmes should address the use of SS/SW and ICT tools as an add-on to the traditional curricula and standardized test systems. More importantly, basic ICT literacy and skills should receive much attention. The next section presents the final case for the University A.

6.2.3 Case A3-V

6.2.3.1 *The responses of interviewees 13, 14 and 15 to interview questions from Part B: SS/SW and ICT web technology adoption in HES*

This section presents the interview responses of the participants that together form Case 3 of University A. The three participants all received the same questions. The findings reveal that educators are familiar with ICT web technologies enabled by SS/SW, ODL and the adoption of ICT technologies in HES and that it can improve learning enthusiasm, performance, easy access and quality education delivery. The findings also establish that ODL has not yet been fully incorporated in their teaching activities, and even less so at this campus.

With regard to the interview questions on SS/SW and ICT adoption, AC3-INT13, AC3-INT14 and AC3-INT15 support the adoption SS/SW and ICT instructional web technologies in HES. The participants explained that the successful adoption of these tools improve the quality of education and delivery. It will encourage students to be actively involved. In so doing, it will advance learners' performance and motivation; and increase educational opportunities and access to educational materials.

6.2.3.2 *The responses of interviewees 13, 14 and 15 to interview questions from Part C: SS/SW adoption and its usefulness at universities*

The findings show that educators hold the opinion that SS/SW and ICT be useful for learning management, and business administration. This aspect of administration increases educators' productivity and creates opportunity for change. AC3-INT13, AC3-INT14 and AC3-INT15 explained that SS/SW and ICT are useful to students in a learning context. Students are able to form social relationships and cohesion through reflective culture, intellectual ideas, collective knowledge, and long-term retention of the academic material. The platform offers prospects for developing shared interactions, building confidence, and optimistic approaches to course programmes. Students may be able to overcome interactive barriers, which can advance social presence among students. The interview responses showed that participants felt that SS/SW and ICT would improve business processes. It enables content personalization and much more. The participants believed that SS/SW and ICT web tools are useful in a pedagogical context.

6.2.3.3 The responses of interviewees 13, 14 and 15 to interview questions from Part D: educators' confidence level of ICTs

The interviewees explained how SS/SW and ICT web instructional technologies incorporated into HES would benefit students in general. They mentioned that these web tools offer learners the ability to bring together new and innovative learning that allows learners to assimilate new viewpoints into their group. Therefore, these tools do offer positive impacts. Participants further explained that these technologies encourage students to be contemplative in their learning process. It offers improved collaboration among students. AC3-INT14 explained that such applications and instructional web tools enable educators to monitor their respective students' online interactions and individual contributions made. The participants found that the benefit of using ICT web technologies and applications in HES is the interoperability, personalization, virtualization, and intelligence. ICT instructional web technologies would influence information quality, content-drivenness, innovation and collaboration.

Having discussed the essential benefits and the impact of ICT web tools, the researcher asked a few interview questions to understand the degree of educators' ICT confidence. AC3-INT14 and AC3-INT15 explained that they do not lack ICT confidence; they were positive and are ready to incorporate these tools in teaching. The participants explained that they had been exposed to web instructional technological tools at their previous institutions. The interviewees listed the ICT web instructional technologies they use during class activities. The finding establishes that these educators only use eFundi and overhead projector. eFundi is the LMS/VLEs supported by this campus. When asked whether they use other ICT tools such as blogging, wikis, podcast/vodcasts, social networking sites, YouTube and many more, all three participants were unsure. They explained that they are not provided with such facilities like other universities.

6.2.3.4 The responses of interviewees 13, 14 and 15 to interview questions from Part E: controversies and challenges

The interviewees listed the challenges that may possibly prevent the adoption of SS/SW and ICT web instructional application and tools at HES as:

- The issue of security (intellectual property ownership, patent violations, monetary function and trust)
- Ethical and legal issues (exploitation, misuse)
- Human factors (culture, behavioural patterns, technophobia, attitudes, beliefs)
- Lack of willingness and readiness
- ICT infrastructure (ICT teaching facilities)
- ICT investments (costs, risk and benefit).

Not all of these issues can be avoided, some will always be there. The human factor, ICT infrastructure, and ICT investment (for instance the cost implication and the risks thereof) cannot be ignore. However, AC3-INT13 and AC3-INT14 believed that most of the problems listed are unavoidable, although the benefits outweigh the risks in their opinion.

6.2.3.5 The responses of interviewees 13, 14 and 15 to interview questions from Part F: educators and learners' development and support

The quality of education at an institution of higher learning directly corresponds to the professional and technical training given to the educators. All the interviewees felt that educators should be offered support. They see educators as crucial and therefore recommend support structures for development. AC3-INT14 explained "that while training, workshops and seminars have *been in place*". This is still not enough, as educator development has not yielded the desired results. AC3-INT14 maintained, "it is easy for me to say that I don't lack ICT confidence, how about educators who are not in same academic domain who still lacks ICT confidence". AC3-INT14 believes that there is more to this than attending workshops, training and seminars. These measures are just not enough for educators' development. The participant mentioned that educators should have that zeal. Regular access to these tools would improve their ICT competence.

6.3 University B – UNISA

UNISA is the second selected university and is referred to as University B. It forms Case B of the study. Case B involved three interview participants. The interviewees are referred to as interviewee 2, 3 and 4. For Case B, the proposition is BC4-INT2, BC4-INT3 and BC4-INT4.

6.3.1 Case 4

6.3.1.1 The responses of interviewees 2, 3 and 4 to interview questions from Part B: SS/SW and ICT web technologies adoption in HES

The first interview questions was whether educators are familiar with any of the SS/SW and ICT web instructional technologies listed in the question guide. This was followed by the second and third questions on ODL and the adoption of SS/SW in HES respectively. The questions explored whether this institution offers ODL and the adoption of ICT technologies in HES to support learning enthusiasm, performance, easy access and quality educational delivery.

In this case, these questions were directed at academic staff whose academic disciplines revolve around ICT and information technology. BC4-INT2, BC4-INT3 and BC4-INT4 are all acquainted, in fact quite experienced, with the use of most of these tools for teaching purposes. This institution is the biggest correspondence university in SA that offers ODL by employing vast flexible SS/SW and ICT instructional tools to reach the learning goals. BC4-INT2, BC4-INT3 and BC4-INT4 confirmed this statement and explained that this institution does offer ODL. BC4-INT2 claimed *"I think this university has over and above 310 000 students from countries worldwide*". The question of whether the adoption of SS/SW and ICT web instructional technologies in HES can improve learning enthusiasm, performance, easy access and quality educational delivery, BC4-INT2 and BC4-INT3 explained that SS/SW and ICT tools *"can complement quality education".* BC4-INT4 confirmed that *"it does improve greatly in quality education and approach of delivery educational contents".* The interviewees were certain that SS/SW and ICT web technological tools do improve learners' performance. BC4-INT3 thought that to some degree, ICT could improve learners' enthusiasm. BC4-INT2 disagreed by saying that, *"enthusiasm, as a lecturer, yes it is an interesting thing, but students themselves if they are not interested to begin with as much as I can upload videos clips, slides, vodcast/podcast and then they don't have the interest or the enthusiasm to go and download or to have a look at it or come back to it. So it all depends on individual students' willingness or interest".* BC4-INT3 added, *"That for me is quite a personal thing for the fact that I put things on blackboard which can be a video which we believe it's interesting thus that then drives enthusiasm I think with some students for me but it's not all".* The participants were confident that ICT does increase people's access to education. BC4-INT2, BC4-INT3 and BC4-INT4 explained that not only will it give access to students, but it will also allow students to learn, as they desire choices when learning.

6.3.1.2 The responses of interviewees 2, 3 and 4 to interview questions from Part C: SS/SW adoption and its usefulness in universities

This section of the study discloses the educators' views on the usefulness of SS/SW and ICT. They deemed these platforms as useful for student management, learning management systems, and business administration. BC4-INT2, BC4-INT3 and BC4-INT4 felt that web instructional technologies in HES can be useful for blended and integrated learning, for knowledge creation, content personalization, or for improved business processes. However, they did not believe that such platforms could be used to manage and assess students' learning progress.

6.3.1.3 The responses of interviewees 2, 3 and 4 to interview questions from Part D: educators' confidence level of ICTs

This section of the interview questions addresses two separate concerns. The first is the benefit of using Web 2.0/3.0 and educators' ICT confidence level to use ICT web tools to support learning. All three participants contented that using ICT web technologies and applications in HES does have benefits. They explained that such benefits include interoperability, personalization, virtualization, and intelligence. The potential features (interoperability, personalization, virtualization, and intelligence) enabled by SS/SW suggest that these tools may perhaps increase constructivist learning enthusiasm, especially for distant learning. The possibility of virtual 3D worlds allows educators and students to meet in a virtual 3D space even though they are geographically removed from one another. Furthermore, participants felt that ICT technologies in HES would definitely impact information quality, content-drivenness, innovation and collaboration.

On the matter of ICT confidence, BC4-INT2, BC4-INT3 and BC4-INT4 indicated that they do not lack confidence when it comes to SS/SW and ICT instructional web technologies. Educators were asked to point out which of the SS/SW and ICT tools they use on daily basis for teaching. The findings reveal that educators from this institution use myUnisa as LMS/VLEs. They also mentioned that they use overhead projector, blogs, wikis, YouTube, podcast/vodcast and discussion forums to facilitate learning. This suggests that the participants are advanced and experienced. The educators sometimes do use social networking sites and other means to communicate with their students.

6.3.1.4 The responses of interviewees 2, 3 and 4 to interview questions from Part E: controversies and challenges

Educators were asked what they regarded as the controversies associated with the adoption and use of SS/SW and ICT instructional application in teaching and learning. They said that it was difficult to integrate and use ICT technologies for facilitation of learning; they had insufficient time; inadequate access; heavy workloads; and a lack of confidence and willingness to accept technology change. However, BC4-INT2, BC4-INT3 and BC4-INT4 explained that the issues of access, heavy workloads, difficulty with incorporating ICT, and insufficient time are not serious issues. They believed that SS/SW and ICT web technologies could help them to manage their students more effectively. They also said that as educators, it is their duty to use these tools to engage with their students.

The issue of security received much attention. The responses show that security; ethical and legal issues; human factors (culture, behavioural patterns, technophobia, attitudes, and beliefs); ICT infrastructure; and ICT investments (costs, risk and benefit) are on-going issues surrounding the acceptance of technology in the educational environment. All of these issues influence ICT adoption negatively. The participants commented on the human factors. BC4-INT3 said, *"I think it is a challenge for some few educators in the social work, I have colleagues in social work, and it might be a bit of a challenge for them".* BC4-INT4 added, *"I think it's easy for us because simply because we are in engineering IT and all of that"* and continued by saying that *"I know some colleagues in humanities for example who struggles".* BC4-INT3 further argued that problems with IPRs for instance are issues that we cannot avoid completely. The interviewee said, *"you know, you cannot for example take a whole textbook and post it out there".* The findings show that several challenges are associated with SS/SW and ICT web instructional technologies in HES.

6.3.1.5 The responses of interviewees 2, 3 and 4 to interview questions from Part F: educators and learners' development and support

BC4-INT2 suggested that for those educators who struggle or find ICT web instructional technologies difficult, *"the first thing is to book yourself on the training, but training is obviously not sufficient to make you or confident. You will need to play around with it and the more you often use it the better you would become and will definitely find amazing features".*

BC4-INT4 felt that *"I think once a week I see an email inviting me for training and it's your propagative as you know the educators they make time to go and learn so that you can actually use the tool".* BC4-INT3 explained that attending training, seminars and workshop could go a long way. The interviewee believes that educators ought to embrace these web instructional tools before it can work for them.

6.4 University C – UP

University C forms Case C of the study. Case C included three interviewees, referred to as interviewee 5, 6 and 7. In Case C, the proposition for the interviewees is CC5-INT5, CC5-INT6 and CC5-INT7.

6.4.1 Case 5

6.4.1.1 The responses of interviewees 5, 6 and 7 to interview questions from Part B: SS/SW and ICT web technologies adoption in HES

This case is the last of the case studies. The participants received the same interview questions and sub-questions than the other cases. The questions related to whether educators are familiar with the concept SS/SW and ICT web instructional tools in HES. CC5-INT6 explained that *"I teach in the area of informatics so I am aware with the Internet and how it evolves over the years and how it got to the point where these technology now offers much more interactivity to users now compared back to 10, 15 years ago*". Participants were asked whether their institution offers ODL and has adopted ICT technologies in HES to support learning enthusiasm, performance, easy access and quality educational delivery. The finding show that the educators recognize SS/SW and ICT tools. They are aware of what it is and understood the concept. CC5-INT5 averred that "I am familiar with some of these tools weblogs, wikis, syndication of RSS, podcasting and videocasting".

According to CC5-INT5, CC5-INT6 and CC5-INT7, *"the process of ODL have recently started*". This implies that this institution does offer ODL. There is the realization that the integration of SS/SW and ICT web instructional technologies in education can contribute to learner enthusiasm, can improve easy access to education, quality education delivery, and learner performance.

The findings reveal that all participant feel that these technologies can improve easy access to educational resources. However, not all participants have similar views of the quality of education, learners' enthusiasm and performance. CC5-INT6 shared the following: *"Well I think it can complement quality education; however, there are a whole range of factors that will influence quality of Education".* CC5-INT5 and CC5-INT7 thought that the adoption of SS/SW will improve quality education. CC5-INT6 believed that *"this can complement the existing strategies which it still needs quality lecturers, quality researchers. You still need a University with a good infrastructure, support system. I don't think you will replace those things with technology".* CC5-INT7 further noted that "*am so sceptical about whether this technology can improve learners' enthusiasm. So until I can see evidence of it, I cannot agree that it will".*

CC5-INT5 disagreed on whether the integration of SS/SW and ICT tools will improve learners' performance: *"I wonder whether other habits are difficult to change am not sure that technology can improve students' performance it will definitely facilitate or support the education process but I don't see this being the driver of student performance"*.

6.4.1.2 The responses of interviewees 5, 6 and 7 to interview questions from Part C: SS/SW adoption and its usefulness at universities

The findings disclose that educators' perceptions of SS/SW and ICT were that they are useful tools in supporting teaching and learning. CC5-INT6 sustained that *"yeah my view is that it is an information tools, so I use it to disseminate information. The types of module that I teach require face-to-face interactions with the students. There is a point where I might use it to upload video clips online or YouTube"*. Therefore, this kind of platform may be termed useful for managing students' academic progress. It can serve as a learning management system and a virtual learning environment and can be used for business administration processes. CC5-INT5, CC5-INT6 and CC5-INT7 supported the view that web instructional technologies in HES can be useful to integrate a blended learning approach and that it can support knowledge creation and content personalization.

CC5-INT5 explained that *"different lecturers have different styles; some of them prefer to use the online technology, while some will be a little bit more of traditional approach in their teaching. For me, I teach informatics that I believe it has a strong link to ICT technologies"*.

CC5-INT6 explained that in terms of increasing educator' productivity, *"as an educator such platforms can be used for providing academic content. I think technology plays a good role and you know just informing students keeping students up to date, reminding students of their assignments and just general communications I find the tools useful"*. Overall, the educators believed that such platforms could be used to manage learners' academic progression and access to educational materials.

6.4.1.3 The responses of interviewees 5, 6 and 7 to interview questions from Part D: educators' confidence level of ICTs

The findings in this section established the effects and impacts of adopting educational web tools supported by Web 2.0 and Web 3.0 and web technologies in HES.

CC5-INT6 explained, *"In the past you know we had to use emailing systems. To email content and information to students using the older web 1.0, now technology has advanced, at least now it makes it a bit more easier for me to collaborate with the learner in a more efficient and effective means"*.

CC5-INT7 sustained that *"in terms of increasing educator' productivity, as educators such platforms maybe used for providing academic content. I think technology plays a good role and you know just informing students keeping students up to date, reminding students of their assignments and just general communications I find the tools useful".*

In addition, the finding signified that these benefits include interoperability, personalization, virtualization, and intelligence.

The researcher continued by asking questions about educators' ICT confidence. CC5-INT5, CC5-INT6 and CC5-INT7 all indicated that they do not lack confidence with SS/SW and ICT instructional web technologies. They mentioned that this institution uses the blackboard system as a VLE. It is a set of software reachable online. CC5-INT6 said that "I don't have any lack of confidence in using technology because I actually teach the design and implementation in technology so I don't have confident issue". CC5-INT7 further suggested that "maybe the old ones do, I know some lecturers, professors, maybe they have issues but I can't say that's true for our department".

The participants claimed that they use overhead projector, blogs, wikis, YouTube, podcast/vodcasts and discussion forums to facilitate learning. Sometimes they also make use of social networking sites and varied tools to communicate with their students. This reveals that the participants are advanced and experienced.

6.4.1.4 The responses of interviewees 5, 6 and 7 to interview questions from Part E: controversies and challenges

Interview findings show that ICT infrastructure poses challenges for the adoption of SS/SW and ICT in HES. CC5-INT5 felt that privacy and safety issues remain at the forefront because of risks with public postings and negative online technology. CC5-INT7 argued that "*the issue surrounding behavioural pattern may exist, dyes yeah that doesn't apply to me*". CC5-INT5 suspected that a lack of student exposure would serve as a challenge, *"especially the undergraduate students enrolled to the system without any ICT privilege, I still think it's difficult to the majority of the poor students".*

CC5-INT7 felt that the issue of ICT investment cost, risks and benefits could not be avoided. The participant felt that internet is often costly and it is difficult for students to afford the interactions between them and their fellow peers. The participant stated that if the cost is not brought down, students might not have access to education materials.

6.4.1.5 The responses of interviewees 5, 6 and 7 to interview questions from Part F: educators and learners' development and support

The findings show that this institution provides staff with the necessary resources to use these tools effectively. They mentioned that educators who struggle or are unable to incorporate this web instructional technologies successfully in their teaching activities, are required to attend seminars, training and workshops. CC5-INT6 suggested that "*I don't know whether it's a lack of information, I am certain that in this institution there is a lot of emails, there is a lot of promotion going on the new technologies inviting educators to attend*".

In conclusion, the participants explained that educators have to be convinced. They should have that motivation and desire to use such web tools. The participants believe that consistency is the only approach to mastering these tools for educational purposes and to boost confidence.

The next section presents a discussion on the overall findings of the study by comparing the findings from Case A, B and C. Before the findings of the study are addressed, the section first revisits the research objectives, themes and the themes findings in correspondence with the research questions.

6.5 An overall discussion of the findings of the research study: a comparison of the findings on Case A, B, and C

The aim of this section is to discuss the overall research findings of the study. Importantly, the section compares the findings from University A, B and C and the literature. The research questions served as a guide.

There are five research questions for this study. Each research question divides into sub-questions that address specific themes. These questions correspond with the interview questions, which can be found in Annexure I: Interview Guide. The interview questions and sub-questions add value to the study by offering a discourse that addresses the research questions to meet the research objectives of this study.

The participants articulated their views in relation to the research questions and objectives. Five themes where generated and each theme is presented in the discussion below by means of a diagrammatical presentation that provides a description of the codes that were developed from the ATLAS.ti analysis of the research findings. The first theme that emerges was the adoption of SS/SW and ICT web technologies in HES.

6.6 Theme 1: SS/SW and ICT web technology adoption in HES

6.6.1 Findings related to the theme of SS/SW and ICT adoption in HES

Overall, ten (10) codes were generated to describe Theme 1: SS/SW and ICT web technology adoption in HES. The first code, 1) ICT improves quality education and mode of delivery, subdivided into five sub-headings, namely: a) creative / integrative learning; b) reflective learning; c) collaborative learning; d) active learning; e) critical thinking. The four remaining codes were: 2) ICT improves learners' performance; 3) ICT improves learners' enthusiasm; 4) ICT increases educational opportunities; and 5) ICT improves easy access to education. These codes form the properties of the core category SS/SW and ICT web technology adoption in HES.

Research Question 1:

> *How can SS/SW and ICT web technologies help to improve learning enthusiasm and easy access to education?*

Sub-questions:

In attempt to address the main research question, three (3) sub-questions were formulated, namely:

- Are educators familiar with any of the SS/SW and ICT web instructional technologies?
- Does the institution offer ODL?
- Do educators think that the adoption of SS/SW and ICT in HES can improve learning enthusiasm, performance, easy access and quality educational delivery?

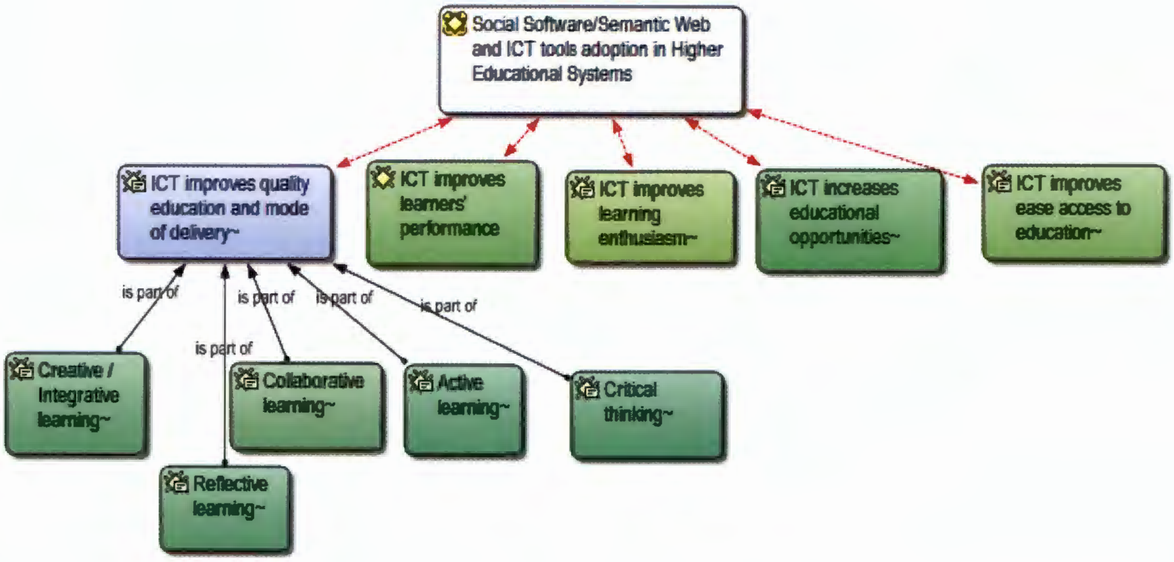


Figure 6-2: Codes Generated for Theme 1

The first two interview questions attempted to establish whether the participants (who are all educators) were familiar with the with the term social software (SS), also referred to as Web 2.0 and semantic web (SW), also referred to as Web 3.0. They were also asked if they are familiar with ICT web technologies and applications such as Facebook, YouTube, blogs, wikis, eFundi, myUnisa, blackboard, to mention but a few. This was followed by a question on whether the relevant university offers open distance learning (ODL). The findings reveal that all the participants across the selected universities were accustomed to, conversant in and comfortable with SS/SW and web tools. Educators from UNISA and UP indicated that their institutions do offer ODL, although UNISA offers much more developed ODL compared to the other universities. Educators from the NWU disclosed that they have not fully incorporated ODL, though some aspects of ODL are present in their conventional educational system.

The findings show that the concept of Web 2.0 and Web 3.0 is not new in the pedagogical environment (Noor Ul Amin, 2013). Many scholars have advocated for the adoption of SS/SW and ICT instructional tools into pedagogical contexts for teaching purposes (Moges, 2013; Madhukar, 2013). Research evidence suggests that Web 3.0 and Web 2.0 technologies are foundational to integrative, reflective and collaborative learning and therefore has the potential to support lifelong skills development (McLoughlin & Lee, 2007, 2008, 2010; Klamma *et al.*, 2007).

Aghaei *et al.* (2012) furthermore suggest that web technologies and applications such as blogs, wikis, podcasts, media sharing applications and social networking sites can serve as a tutoring agent during the learning process. They support and encourage informal conversation, exchange of ideas, collective content generation and the sharing of knowledge, giving students access to a wide range of ideas and representations (Aghaei *et al.*, 2012). When adopted and used aptly, these web technologies have the potential to make student-centred learning a reality by promoting learner agency, autonomy and engagement in social networks. Possibilities include multiple real and virtual communities beyond physical, geographic, institutional and organizational boundaries (McLoughlin & Lee, 2008, 2010; O'Reilly, 2005).

6.6.2 Integration of ICT

The arrival of ICT and web instructional technologies usage has transformed education delivery and has amplified the approach of accessing the web and its applications in HES (Lal, 2011). Badawood and Qureshi (2013) add that educational activists are optimistic about the use of web technologies to advance the quality of education. ICT grants students the convenience of educational resources, upholding flexibility in the sense that students can access educational contents despite geographical barriers (Quadri & Olaojo, 2013; Moges, 2013; Noor Ul Amin, 2013; Madhukar, 2013).

6.6.2.1 The adoption of SS and ICT web technologies and applications in HES can improve quality education and the mode of delivery

The term quality of education in this context implies that an institution or university is more than capable of providing its students with the learning skills, competences and capabilities they require to become economically productive citizens (Noor Ul Amin, 2013). These learning skills should prepare the students for the real world. They should not just be productive, but should be able of developing sustainable livelihoods and enhancing individual well-being. The way in which education is delivered to the learner plays a significant role in how students learn in HES (Madhukar, 2013; Moges, 2013).

The contribution of ICT to quality education was prominent in the responses to the interview questions. Most of the participants believed that ICT integration and adoption in HES has the potential to improve quality education. AC1-INT1, BC4-INT2 and AC2-INT11 suggested that *"ICT in HES can complement quality education"*. CC5-INT6 stated that "*well I think it can complement quality education and can serve by complementing the existing strategies, which still needs quality educators, quality researchers". You still need a University with a good ICT infrastructure, support system, but I don't think you can replace face-to-face physical contact* *with students with those technologies".* AC1-INT1, BC4-INT3, BC4-INT4, CC5-INT5, CC5-INT7, AC1-INT9, AC2-INT10, AC2-INT12, AC3-INT13, AC3-INT14 and AC3-INT15 confirmed that *"it does improve greatly in quality education and approach of delivery educational contents",* whereas AC1-INT8 was of the opinion that *"well for me, I just have a negative perception towards these ICT web technologies and its application enabled by Web 2.0 and 3.0. Don't get me wrong I mean, technology evolution has become parts of our daily lifestyle, but I am discontented with some of the threats that it poses towards students. Hence, if I may answer that question, to an extent yes it does. However, these tools are not key determinant of quality education delivery".* Many authors also assert that ICT can contribute immensely in HES (Noor Ul Amin, 2013; Madhukar, 2013; Moges, 2013; Yuen *et al.*, 2011; Bottino, 2003; Sharma, 2008).

In this section, the concept of quality education divides into five aspects as depicted in Figure 6.2. Quality education entails creative / integrative learning; reflective learning; collaborative learning; active learning and critical thinking.

6.6.2.1.1 Creative / integrative learning

In a creative / integrative learning context, ICT-improved learning can encourage the modification and edification of existing information and the creation of real-world skills as opposed to the regurgitation of received information (Nwosu & Ogbomo, 2012). ICT-improved learning encourages an integrative approach to facilitation and learning. This approach reduces the artificial division between philosophy and practice that symbolizes the traditional classroom environment (Wood, 2015). ICT-improved learning recognizes that there are many varieties of learning processes and several means of comprehending information (Garrison, 2009). Therefore, ICT-improved learning offers students an avenue to discover and explore comparatively instead of just listening and remembering context.

6.6.2.1.2 Reflective learning

Quality education delivery makes reflective learning possible as it allows students to tests their ideas through participation and asking relevant questions in an attempt to make sense of their learning experiences. Instead of being a passive receiver of content, they become active (Schroeder *et al.*, 2010a). A reflective learning process enables students to step a little further from their usual learning experience to developing critical thinking and to enhance performance by analysing their experience.

6.6.2.1.3 Collaborative learning

Collaborative learning involves two or more students learning together to achieve a precise objective (Nwosu & Ogbomo, 2012). It can also be perceived as a combined learning process through concentrated learning to jointly to solve a problem. ICT-improved learning in a pedagogical environment supports active student collaboration, interaction and teamwork among learners, educators and professionals notwithstanding their location.

ICT-improved learning offers students learning opportunities to work with peers from diverse cultures, serving to build students' communicative skills and their global openness (Schroeder *et al.*, 2010b). It is a kind of a learning platform that increases the learning space to include not only peers, but also educators, mentors and experts from different fields. Moges (2013) and Madhukar (2013) sustain that collaborative learning leads to reflective learning, critical thinking, collective comprehension, and long-term knowledge retention of the material taught. It creates the ability to build social and communication capabilities, positive attitudes towards peers and learning resources, and enhances social connections and group cohesion (Moges, 2013; Madhukar, 2013).

6.6.2.1.4 Active learning

ICT-improved learning maintains students' learning culture by allowing a platform for student scrutiny, inspection, inquiry and new knowledge construction. This enables the students to learn as they desire and when they desire and to work on actual problems. This ensures that the learning process becomes less of an abstraction and more relevant and applicable to the student's life situation (Wood, 2015; Nwosu & Ogbomo, 2012).

6.6.2.1.5 Critical thinking

Critical thinking is reasonably a self-controlled process of assessing, creating and actively putting into practice the ideas generated through reflection, involvement, intellectual perspective, or participation as a guide to belief and action. Wood (2015) maintains that the facilitation of teaching and learning using diverse ICT instructional web technologies offers students the ability to absorb instructional content in a way that fits their learning goals in this information age where students have increased their use of digital technologies.

6.6.2.2 The adoption of SS and ICT web technologies and applications in HES can improve learners' performance

The findings suggest that the adoption of SS/SW and ICT web technologies for educational purposes can actually improve learners' performance. It means that students are not restricted to the four walls of the classroom. They can engage actively with fellow peers at any time. Tse *et al.* (2010), notes that this not only enables collaboration among peers, but also promotes students' access to educational contents and reading. This educational content relates to materials such as slides, notes, textbooks and assignments (Tse *et al.*, 2010). All of the participants [AC1-INT1, BC4-INT2, BC4-INT3, BC4-INT4, CC5-INT5, CC5-INT6, CC5-INT7, AC1-INT8, AC1-INT9, AC2-INT10, AC2-INT11, AC2-INT12, AC3-INT13, AC3-INT14] and [AC3-INT15] were optimistic about the adoption of ICT web technologies in HES and said that *"without doubts, that they are positive that it will improve learners' performance".* AC1-INT9 highlighted that, "*these web technologies are supported by Internet web-based educational systems. Online courses and learning management system (LMS) platforms, have added educational value to the traditional system of knowledge distribution in the classroom environment".*

6.6.2.3 The adoption and application of SS and ICT web technologies in HES can improve learners' enthusiasm

The findings showed that not all participants agreed that the SS/SW and ICT web technologies in HES would improve learners' enthusiasm. Among the educators from UP, BC4-INT2 believed that "*enthusiasm for me as a lecturer, is an interesting thing, but students themselves if they are not interested to begin with as much as I can upload videos clips, slides, vodcast/podcast and then they don't have the interest or the enthusiasm to go and download or to have a look at it or come back to it. So it all depends on individual students' willingness or interest".* BC4-INT3 supports the argument *"whether ICT web technologies can improve learners' enthusiasm, that for me is quite a personal thing, for the fact that I put things on blackboard system for student, it can be a video, podcast, which I believe it's interesting thus that then drives enthusiasm I think with some students for me but it's not all".* Participants CC5-INT6 and AC1-INT8 were uncertain as to whether the adoption of ICT tools in education can improve learners' enthusiasm. The remaining responses show that educators do think ICT can improve learners' enthusiasm. To a certain extent, it is good to know that most of the educators do think that ICT can improve learners' enthusiasm.

These findings mean that most of the educators seem to appreciate the integration and adoption of SS/SW and ICT web technologies to facilitate learning in HES. The use of learning management systems (LMS) such as clickUPs, blackboard or e-Fundi may be employed to upload slides, video clips or vodcasts. It is all up to individual students whether they download the materials or clips made available to them.

Several authors claim that ICTs tools such as 3D wikis, intelligent tutoring systems, blogs, podcasting and streaming video services, multimedia computer software and virtual world / avatars can be integrated to provide inspiring and reliable content that will engage the students in the education process (Maged *et al.*, 2007; Madhukar, 2013; Moges, 2013; Jimoyiannis *et al.* 2013). These claims were confirmed as educators from NWU, UNISA and UP [AC1-INT1, CC5-INT5, CC5-INT7, BC4-INT4, AC1-INT9, AC2-INT10, AC2-INT11, AC2-INT12, AC3-INT13, AC3-INT14] and [AC3-INT15] were positive that ICT web technologies in HES can and will improve learners' enthusiasm. AC3-INT13 felt that "*the pedagogy or the science of teaching and learning has to expand its scope and horizon, gone are the days when people understood learning only to be a classroom confined environment, but rather these social tools are quite helpful in increasing the learners" enthusiasm. Since in this generation of (information age, most students uses social media, for communication with each other).*

6.6.2.4 The adoption of SS and ICT web technologies and application in HES can increase educational opportunities

The NWU, UNISA and UP educators explained that effective use of ICTs in HES can provide new and innovative ways to bring educational opportunities to students of all categories and ages, especially those who have historically been omitted. Education can reach rural areas, people who are encountering social challenges, and students with impediments or mental disorder. The most crucial responsibility of any university is to prepare students for the workplace or the industry (Jung, 2005).

By the time learners have gone through all the educational stages and have completed their qualifications, they must have received the best of educational opportunities to qualify and equip them to face the industry (Woo *et al.*, 2011). The findings show that the adoption of SS/SW and ICT web technologies and its applications for educational goals can increase educational opportunities. These ICT web technologies can help universities prepare the current generation of students.

6.6.2.5 The adoption and application of SS and ICT web technologies in HES can improve easy access to education

ICT web technologies can improve ease of access as students can gain access to educational materials at any given point in time or from any place. This has a direct impact on the approach to teaching (Madhukar, 2013; Moges, 2013; Noor Ul Amin, 2013; Angeli & Valanides, 2009; Jaffer *et al.*, 2007). One UNISA participant [BC4-INT4] established that *"it does improve access to educational content, so it makes it easier for the students to get access to content,* *provided that they access to the Internet and the computer, of course, the university gives them access to the computer lab and the Internet, if perhaps they don't have Internet access at home".*

UP [CC5-INT6] and NWU [AC2-INT11] educators added that *"it does improve access to content and you can give students much more different types of content not just the slides and extra reading but you can upload videos just for them".* These findings are supported by Quadri and Olaojo (2013) who mention that several combined ICT web instructional technologies support peer-to-peer interactions. Web technologies such as video blogging, podcasts, weblogs, wikis and several SS tools have been adopted by various universities (Moges, 2013; Noor Ul Amin, 2013; Madhukar, 2013). A number of universities have implemented SS tools into higher education. Crook *et al.* (2008) reveal that UK universities have incorporated blogs and wikis for activities. Minocha (2009) adds that the University of Warwick has approved blog space since 2004 and this has been made accessible to all students, educators and staff.

The anticipation with introducing these ICT web technologies in education is that as soon as students start blogging, it would build a community of social presence and foster collaboration. However, many students do not blog.

Participants BC4-INT2, CC5-INT5, AC1-INT9, AC2-INT10, AC2-INT11, AC2-INT12, AC3-INT13 and AC3-INT14 all expressed the view that the adoption of SS/SW and ICT web technologies can be beneficial to HES. Some were optimistic and believed that ICT in HES:

- can improve quality education and mode of delivery;
- improve learners' performance;
- can improve learners' enthusiasm;
- can increase educational opportunities; and
- can improve ease access to education.

Only a few participants [BC4-INT2, BC4-INT3, CC5-INT6] and [AC1-INT8] doubted whether the adoption of SS/SW and ICT web technologies in HES could increase learners' enthusiasm. Overall, the findings established that ICT web technologies are capable of supporting collective, active, collaborative, creative and integrative learning in educational systems. The next section introduces Theme 2 and discusses the findings.

6.7 Theme 2: Educators' perceptions of SS/SW and ICTs tools in HES

6.7.1 Educators' views of ICT in HES

This section discusses the findings related to educators' perception of SS/SW and ICT in HES. Figure 6.3 offers a visual presentation of this theme. This theme consists of seven main codes, namely 1) the management of knowledge creation; 2) improved business processes; 3) content personalization; 4) transitioning/change; 5) increased educator productivity; 6) student management; and 7) blended and integrated learning.

Research Question 2:

What are educators and students' perceptions of the educational impact of SS/SW and ICT web technologies in the facilitation of learning and business processes?

Sub-questions:

The questions below served to access educators' views on SS/SW and to explore the effectivity of Web 2.0 and Web 3.0 in education for the facilitation of learning and business administration. The following six (6) sub-questions were formulated:

- What do educators know about SS/SW and ICT tools application and their potential to support educational goals?
- Do educators find SS/SW and ICT tools useful for teaching and learning?
- Can the integration and adoption of SS/SW and ICT tools enable educators to accomplish tasks more quickly?
- Can the use of SS/SW and ICT tools increase educator productivity?
- Do educators think that using these tools may pose serious threats related to ethics, privacy, intellectual property rights and misuse and exploitation?
- What other possible issues do educators think may arise as a result of using SS/SW and ICT?

Not all the interview questions included in the interview guide (Annexure I) in relation to main research question 2 are discussed in this section. Some of these questions were leading questions that helped the researcher elicit more information on the interviewees' responses. Only the interview questions that relate to a particular theme are addressed. Seven codes emerged regarding educators' perceptions of SS and ICT tools in HES.

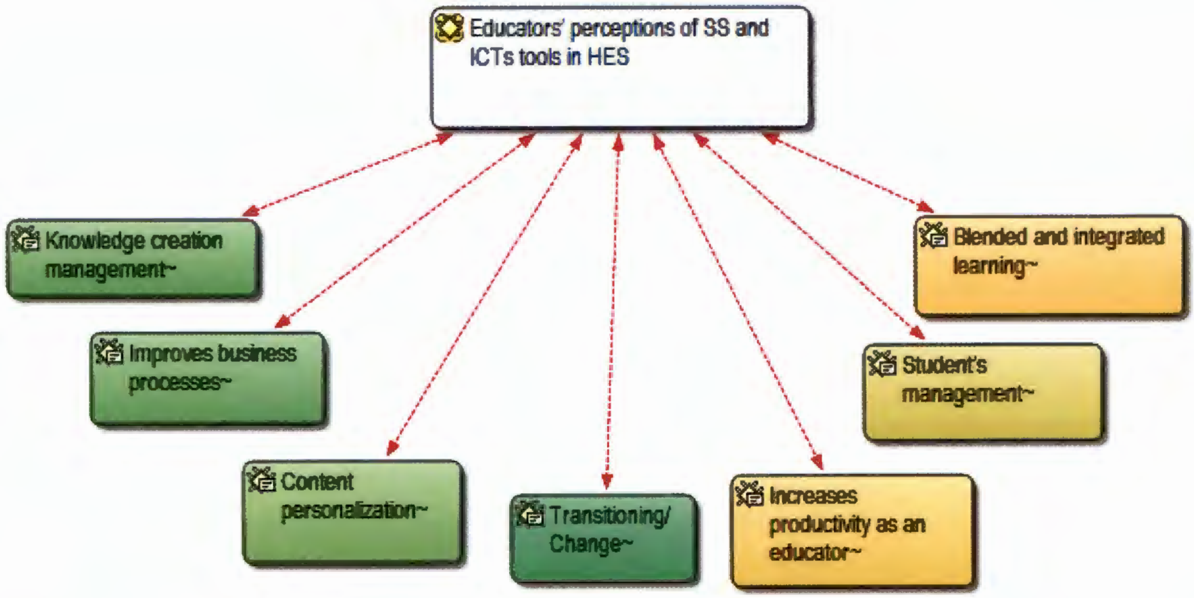


Figure 6-3: Codes Generated for Theme 2

Educator seems to play a prominent role in students' progression within an education system (Jung, 2005). The development of a student relies heavily on the educators' abilities to ensure learning advancement in all aspects (Bowes, 2003). Therefore, the views and opinions of educators should be considered when adopting SS/SW and ICT web technologies into education systems. Theme 2 presents the findings on educators' perceptions of and views on SS/SW and ICT web technologies in a pedagogical context. The seven codes presented in Figure 6.3 are discussed below.

6.7.1.1 Knowledge creation management

The findings disclose that educators perceive or view SS/SW and ICT web technologies in HES as a platform for the management of knowledge creation. Students' activities, assignments and tasks can be completed through these platforms enabled by Web 2.0 and Web 3.0. However, few educators believe that such platforms are currently being used to manage and assess students' learning processes.

Web 3.0 and Web 2.0 both offer a collection of pedagogical instructional tools and applications that allow students to share information and interact with other peers. This is made possible through a network (Trinder *et al.*, 2008). UNISA, the UP and the NWU all support the idea that "*it makes distribution and communications with students much easier for distribution of information*". One participant from UNISA [BC4-INT2] sustained that "*the platform enables students to work independently, in so doing, the student will be able to create new concepts*". This finding shows that discussion forums such as blogs, wikis, vodcasts/podcasts as part of a learning management system (LMS) can improve student knowledge creation (Trinder *et al.*, 2008). LMSs such as eFundi, myUnisa, Blackboard or ClickUP and myTUKS are LMS/VLEs that these universities have integrated. While few educators support the idea of social networking sites, social bookmarking sites are encouraged for the learning process.

6.7.1.2 Improved business processes

The responses reveal that educators from the NWU, UNISA and the UP perceive SS/SW and ICT web technologies in HES as a way of improving the universities' business processes. Not only does this platform support business administration, but educators also explain that they are able to carry out their day-to–day better activities via instructional web tools. A participant from the NWU said "*apparently, yeah I think it does. The web 2.0 and 3.0 technological tools and application are becoming more affordable, efficient in meeting most university's needs, say for instance, this avenue plays crucial part in improving universities' business processes towards information management's, decision-making, quality education and Innovation and knowledge creation amongst students*". Ching and Hsu (2011) and Deng and Yuen (2011) sustain that Web 2.0 and Web 3.0 encourage learning processes through communication and interaction. They furthermore claim that the use of SS/SW web technologies allow the process of capturing learners' intellectual and cognitive learning activities.

One educator from the NWU made a comment based on his experience at a previous institution, "*to the best of my knowledge, I believe it does support an improved business administration and processes if properly managed*". Quadri and Olaojo (2013) state that the adoption of web instructional technologies in a pedagogical environment enhances learning and administration processes.

6.7.1.3 Content personalization

Studies show that ICT web applications offer possibilities for content creation, publishing, editing and collaboration for knowledge creation (Lal, 2011; Chisega-Negrila, 2012; Woo *et al.*, 2011; Wood, 2015). This implies that students may be able to carry out their learning activities collaboratively. Participants suggested that the use of SS/SW and ICT web applications and technologies afford students the possibility of content personalization. The NWU participants were positive that *"it encourages students not to be consumers of content but generation of contents so there is a participatory aspect when we use ICT web technologies and its application".*

However, participants indicated that there are challenges related to ICT platforms. One participant specifically referred to issues that relate to intellectual property rights. AC1-INT1, a participant from the NWU, stated *"I believe, it poses some challenges given the fact that these platforms allows open access to information and content personalization, it will be difficult to assuredly ascertain who's work or content is published on such platform".* Quite a number of the educators from UP and NWU felt this way about content personalization. However, AC2-INT12 and AC2-INT8 from the NWU and the remaining participants from UP (CC5-INT6 and CC5-INT6) and UNISA (BC4-INT2, BC4-INT3 and BC4-INT4) still felt that, despite the challenges related to content personalization, SS/SW and ICT web applications and technologies can still assist with learning objectives. AC2-INT12 explained that there are instances where a *"student may use a paraphrasing tool and then get it back to the educator, that's a challenge, that's such challenges exists doesn't simply means that the web 2.0 technologies are supportive in achieving educational goals. I think to a large extent they are more advantages than the disadvantages".*

6.7.1.4 Transitioning/Change

Chetty (2012) and Bingimlas (2009) aver that change is inevitable when an institution decides to invest in ICT web technology for HES. There is certainly a driving force that propels institutions towards venturing into such ICT projects. At times, such driving forces are linked to its business processes or administration (Lefever & Currant, 2010), at other times it has to do with providing quality services. In some cases institutions feel that it is necessary to change traditional method of operation and to keep up with the changes in technology. Educators often tend to be reluctant and unwilling to accept changes. Transitioning processes may result in an educator having to learn a whole new system. The next section provides a discussion of the findings on ICT and the productivity of educators.

6.7.1.5 Increased productivity as an educator

Broadly speaking, an educator's job description is to organize, formulate and offer learning to all students in the class (Angeli & Valanides, 2009; Schroeder *et al.*, 2010b). They have to facilitate teaching and learning in accordance with the university's educational needs and policy and curriculum framework that governs the university. This section explores the views of educators on web technologies and productivity. The findings show that participants from the NWU, UNISA and the UP affirmed that technologies increase educators' productivity.

Participant AC3-INT15 from the NWU testified that *"I do find the tools useful, I think it gives me more access to my student's or rather better access to the students in terms of communicating with them, it is much easier if we can post message or announcement and things like that. In all essence the distribution of contents is much easier because then, they can download it in their own time and use it the way they deem fit unlike the hard copies".* Another participant [AC1-INT9] claimed that *"I believe it does help me accomplish tasks more efficiently, as well as being productive, judging from my past academic experiences from my previous institutions where I worked. Although, in this institution, I haven't use such tools and applications, reasons may be that I am lecturing a different module here as opposed to the once I lectured in other institutions".*

AC1-INT8 sustained that *"it is quite helpful in teaching and learning. In the sense that you don't have to be confined in a particular Geographical complex. Sometimes you don't have to come to classroom to be able to interact with your students and to be able to share knowledge between you and your students. As long as the learners are connected to the Internet it's easy to share content. It's easy to share knowledge. Especially in today's world were most people have smart phones and they can access the Internet from anywhere".* In addition, BC4-INT4 and CC5-INT5 mentioned that most often, educators *"use such platform for communication, information sharing, keeping students informed. Perhaps, students' collaboration and integrated learning as well as student management".*

BC4-INT3 said that *"it can serve as a complimentary tool and it does increase my productivity as an educator. It helps me to achieve my goal as my goal is, I want the student to be able assimilate contents and to do it willingly so that it becomes part of their lives and help also in generality in content".*

6.7.1.6 Student management

Student management in this context relates to the ability of an educator to ensure that the learning process runs smoothly and in the most convenient, effective and productive manner (Garrison, 2009). Student management simply means that the educator must have the necessary skills to manage countless learning activities, tasks, assignments and situations that occur in the learning environment. Managing students is a challenging task. With the support of ICT web technologies in HES, these tasks are more attainable (Garrison, 2009).

The findings signify that ICT web technologies in HES contribute towards student management. Most of the participants referred to the LMS provided at the individual institutions.

6.7.1.7 *Blended and integrated learning*

Blended learning is sometimes referred to as hybrid learning or mixed-mode learning. Right from the development plan for education and educational reform sector, educators have emphasized the approach of blended learning in a pedagogical context (Klamma *et al.*, 2007). A blended learning approach combines the use of traditional learning through face-to-face contact and online learning systems. Blended learning permits several possible advantages, which in most cases rely on the quality of its adoption and the execution. With such an approach, students are able to work individually and at their own pace while also benefitting from face-to-face contact with the educators and acquiring all the necessary educational resources and support that students require (Klamma *et al.*, 2007).

From the educator's perspective blended learning supports the educator in organizing courses and offering the course contents in a more creative and flexible manner (Sharma, 2010). However, many educators claim that face-to-face personal contact is not adequate to support learning objectives (Sharma, 2010, 2008; Klamma *et al.*, 2007). Traditional face-to-face personal contact and the online learning platform should fuse together.

The findings on how participants perceived SS/SW and ICTs tools in HES suggest that they all feel that these SS/SW and ICT web technologies can serve as complementary tools to support educational goals. It cannot replace the traditional mode of education delivery. The response from one UNISA participant [BC4-INT4] suggests that blended learning *"offers different ways of delivering educational content and having to stand-up and speaking is considered as one way dimension. But then, obviously the technology can be a supplementary tool in education systems which supports both ways".* One participant from the NWU [AC3-INT15] argued that *"I lecture advance database management and modelling, and sometimes some concepts needs projectory or perhaps requires me to draw the model for an in-depth understanding. Therefore, these tools cannot replace that aspect of face-to-face contact which is sometimes the most crucial part of learning process. But can serve as complementing tools and applications".*

Some educators doubt whether this approach offers students sufficient attention, especially learners who are not self-driven and self-motivated. Participants BC4-INT3, CC5-INT6, AC1-

INT8 and AC2-INT10 felt that *"students still need that physical touch (for an instance, that face-to-face contact and interaction with their educators)".*

These participants further explained that *"different educators have different styles some of them may desire to use the online technology and some of them desire to be a little bit more traditional in their teaching approaches".* The different reactions prove that technology will not replace traditional ways of teaching, but they can serve as supplementary or supporting tools to enhance teaching and learning.

In summary, blended learning permits educators to spend less time in a conventional four-wall classroom setting, but allows a reasonable amount of time directed at addressing student needs. Educators can assist individual learner with precise concepts, skills or tasks more successfully. Overall, blended learning allows universities to accommodate a large number of students effectively while reducing institutional expenses.

6.8 Theme 3: Educational impact and benefits of Web 2.0/3.0 and ICTs in HES

6.8.1 Themes related to the educational impact and benefits of SS/SW in HES

Theme 3 relates to the educational impact of Web 2.0 / Web 3.0 and ICT tools in HES. Nine codes were derived as a result. The two main codes were 1) tutoring agent systems complements the facilitation of learning; and 2) interoperability, personalization and virtualization. The remaining codes were sub-codes, including: 3) information quality; 4) content-drivenness; 5) innovation; 6) collaboration; 7) learning management systems; 8) social networks; and 9) semantic blogging.

Research Question 3:

What are the extent of educators and students' ICT confidence, readiness and willingness to ensure a systematic approach in supporting and sustaining technological innovation in HES?

Sub-questions:

This area explores the extent of educators' ICT confidence, readiness, willingness, and their digital competence when using ICT tools to ensure a systematic approach to supporting and sustaining technological innovation in teaching and learning. Five (5) questions emanated to provide an answer to the research question stated above:

- Which of these SS/SW tools do you often make use of for you daily activities?
- What inspired you to use these tools and applications when facilitating learning?
- Why don't you use the SS/SW and ICT tools that you did not mention?
- Does your institution provide the necessary ICT infrastructure to enable you to use SS/SW and ICT tools and applications?
- Does your institution provide you with the support system (training, workshops, and seminars) to advance your knowledge of using SS/SW and ICTs tools and applications?

This section of the study entails two parts. The first part aims to establish the educational effects and the benefits of using or adopting Web 2.0 and Web 3.0 and web technologies in HES. The second part endeavours to understand the extent of educators' confidence, willingness and readiness to use tutoring agent systems.

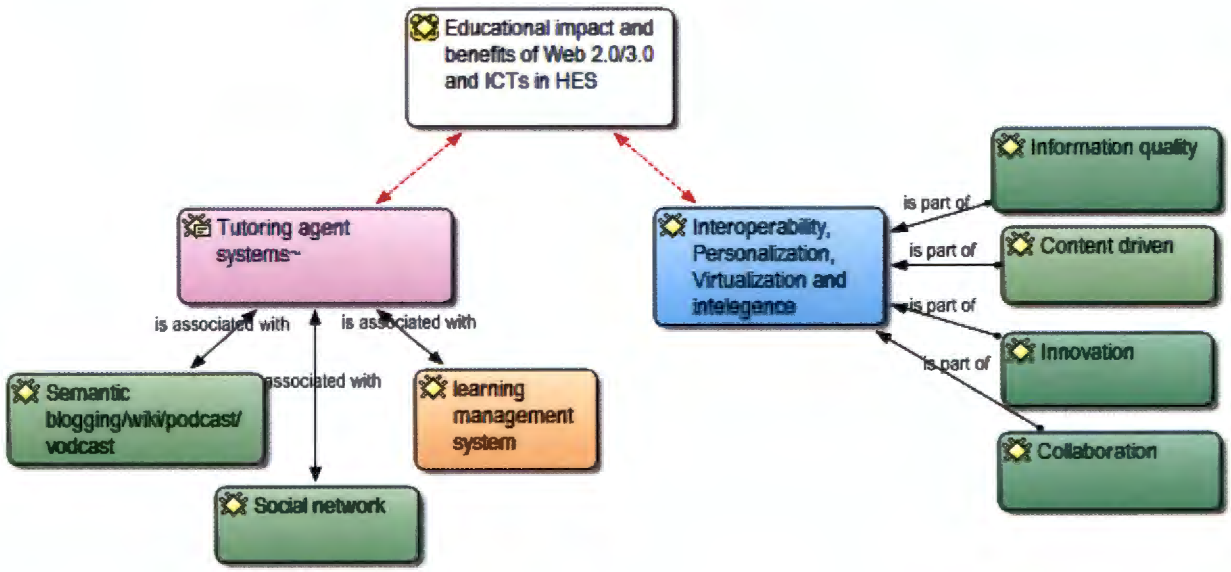


Figure 6-4: ***Codes Generated to present Theme 3***

6.8.1.1 Interoperability, personalization, virtualization and intelligence

With the rapid rate of technological advancement ICT technologies will impact greatly on education. These technologies offer learners a variety of platforms that allows them to participate as opposed being passive consumers of content (McLoughlin & Lee, 2007, 2008, 2010; Klamma *et al.*, 2007). The successful adoption of Web 2.0 and Web 3.0 technologies in

HES will benefit both students and educators as it opens up more avenues to goal-driven and effective learning and it supports lifelong competence development. Notably, it enhances universities' business processes towards information management, performance, decision-making and the integration of knowledge creation and use (Davies *et al.*, 2007).

The term interoperability describes ways in which LMS/VLEs can interface with external learning tools to make them accessible from within the learning platform in an intuitive and concise way. Personalization is a method that offers the student optimum support in terms of accessibility, retrieval and capturing information based on the different characteristics of that specific student (Davies *et al.*, 2007; Kurilovas *et al.*, 2014).

6.8.1.1.1 Information quality

In a learning environment, information quality is essential. The integration of Web 2.0 and Web 3.0 for educational purpose has direct benefits in terms of achievement and productivity and is intertwined with other traits (applicability, assessment, added value, appropriateness, completeness and capability) (Dotsika, 2012; Zhu & Wang, 2010). In relation to representation, it includes ease of comprehension, concise and reliable representation, user-friendliness/access, safety and inherent document qualities (accuracy, fairness and uniformity).

6.8.1.1.2 Content drivenness

Educational benefit is related to content generation, delivery, repository, reuse, retrieval and distribution. Content generation parades noticeably better-quality enactment, with delivery lagging behind and progressive automation that allows for networking to be content – as well as user-directed (Dotsika, 2012; Dabbagh & Reo, 2010).

6.8.1.1.3 Innovation

Innovation in education systems entails new ideas, concepts or creativities or the ability to progress or advance (Wood, 2015; Dotsika, 2012). It is the application of a better solution for problems or challenges. The traditional mode of education delivery may not always address the needs of the digital age. Web 2.0/Web 3.0 may complement the traditional approaches within HES.

6.8.1.1.4 Collaboration

The educational impact of SS/SW and ICT web technologies on HES includes the capability it offers students in a learning environment to synchronize discussions and to communicate more with fellow peers and educators in real time (Parmar & Siwach, 2010). In addition, it offers the capability to carry out activities, tasks, assessment or projects and finally, the capability to manage communication flow or information distribution. The participants all referred to these benefits that SS/SW and ICT in HES can bring. It includes interoperability, personalization, virtualization, and intelligence and the potential features aided by Web 2.0/3.0 (O'Reilly, 2005).

6.8.1.2 Tutoring agent systems complementing the facilitation of learning

6.8.1.2.1 Learning management systems

Educators are exposed to numerous tutoring agent systems or learning management systems (LMS). Every specific university has adopted a certain type of LMS/VLEs for the facilitation of learning and business administration processes. The NWU uses eFundi Sakai as an LMS. UNISA adopted myUnisa portals as learning management and administration tool, and the UP uses MyTUKS, clickUP portal. However, the most commonly accepted LMS/VLEs platform at the UP is the Blackboard system. Blackboard is the chosen LMS/VLE which is a set of software accessible in the online space. All administration is undertaken through a control panel and access is limited to staff and students.

Each university manages its business operations differently. The findings show that educators can only use the LMS/VLEs provided by that specific university. The NWU is limited to eFundi, UNISA to myUnisa and UP to Blackboard.

The next part endeavours to understand the extent of educators' ICT confidence when using tutoring agent systems. A participant [CC5-INT6] from UP said *"I don't have any lack of confidence in using technology because I actually teach the design and implementation in technology so I don't have confident issue".* The participants were selected from the departments of information systems, computer sciences, and a school of computing and informatics due to their exposure and knowledge areas. This means that the participants would not have been likely to lack ICT confidence.

6.8.1.2.2 Social networking sites

All the participants agreed that they are confident with ICT web technologies. A sub-question asked whether educators use social networking sites such as Facebook and YouTube during the facilitation of learning. The participants [BC4-INT2 to BC4-INT4] from UNISA revealed that they *"frequently use YouTube to post video contents and uses it in class as well. Then, later upload the class material for students who want to look at it again in their own time".* The UP participants (CC5-INT5 and CC5-INT7) supported the use of YouTube for educational purposes. The NWU educators do not make use of Facebook and YouTube during facilitation of learning. The participants believed that the university's policy framework restricts them or does not provide them with such platforms. AC2-INT12 revealed that *"I may not have used other unconventional tools, you see so that I don't get on the wrong side of the law or the University's' policy"*. The NWU participant said that *"I am confined as an educator to what is at your disposal given your institution, but on personal level, of course I can use any ICT web technologies"*. Moges (2013) emphasizes that a university's' policy framework on the adoption of ICT tools into educational systems can be revisited to reposition it to function as a necessary tool for the development of the university.

Tess (2013) and Minocha (2009) denote that social networking sites make provision for collective individuals to facilitate connections among themselves on the networks. McLoughlin and Lee (2008, 2010) this openness can help students gain both communal and communicative expertise, and at the same time they can become involved in the sharing culture of SS/SW. In so doing, Sharma (2008) states that students have a platform to contribute to suitable learning, reproductive and communicative forms of performance and identity seeking, while building a range of digital literacies. Dabbagh and Reo, (2010), Redecker (2009), Parmar and Siwach (2010) and McLoughlin and Lee (2008) add that information dissemination is fostered by a wide range of SS/SW and ICT web technologies and applications that supports both students with vast knowledge and novices to broadcast or make their work publicly available to the rest of the online world by means of blogs, wikis and podcasts. In this way, students with related interests can learn from each other. The massive uptake of Really Simple Syndication (RSS), as well as related technologies such as podcasting and vodcasting (which involves the syndication and aggregation of audio and video content), is indicative of a move to collecting material from many sources and using it for personal needs (Minocha, 2009).

6.8.1.2.3 Semantic blogging/wikis/podcasts

Blogging is the new social feature supported by SS/SW (Minocha, 2009; Passant *et al.*, 2008). Tse *et al.* (2010) establish that if innovative practices such as blogs, wikis, podcasts and social networking sites are incorporated in HES, the use of these web applications will allow students to publish their respective opinions online to an open audience. Microblogging permits students to discuss short messages within their community or simply to write in brief to the general public on the web (Lal, 2011).

Lal (2011) and Yang (2009) state that blogs offer a sociable interface podium for easy dissemination and delivery of audio, video and photo content online. Blogs have features that allow the students to alter, personalize or add comments posted by readers. Where a multitude of students are blogging on the same subject matter in shared collaboration, they build up a collection of incorporated ideas by merging posts and comments received from users (Marsden & Piggot-Irvine, 2012). Such discussion groups may be useful for students in a subject area, cheered and motivated and monitored by educators.

Educators can regularly offer responses to students, and students can relate with peers. Lal (2011) posit that a blog may be adopted as a complimentary tool for instruction in distance learning.

The findings of this section shows that the participants are not yet participating in the practices explained above. The participants from the NWU do not use blogging, wikis, podcasts or vodcasts. When asked to clarify their reasons for not using these web applications for teaching and learning, AC1-INT8 stated that *"tools such as your Facebooks, Skype, wiki, blogs and many other tools, those, I don't use. I use eFundi to post announcements, study material as well as for students' assessments"*. Some of the NWU participants indicated that they were not aware that these instructional tools exist and that the conventional eFundi LMS/VLEs do not have such web application features enabled. They claimed that eFundi, which serves as the basic learning system, lacks blogs, podcast, vodcast, RSS, wikis and other discussion platforms. AC3-INT15 argued that *"I still believe that eFundi has been the usual VLEs that we have at the moment, speaking of blogging; wiki; podcast platforms, I am not aware of such application in place"*. AC2-INT10 though that these application can be useful, *"unfortunately I don't use some of these tools and applications in my teaching. I only use an overhead projector and the VLEs (eFundi)"*. Quite a few of the educators said that they do not view such applications as supportive for educational goals. They felt that such web applications might be a distraction to students.

Some UNISA and UP participants confidently said that they have incorporated these ICT web applications for educational purposes. This discrepancy between the universities can be explained based on the extent of the ODL offered by the different universities. UNISA has the biggest population of distance learners of all South African universities. Given the nature of UNISA, the adoption and integration of SS/SW and ICT web technologies for instructional purpose would be highly recommended. An ODL initiative has been supported at UP, although the impact of ODL at UP cannot be compared with UNISA.

The use of ICT web instructional tools for education at these selected universities may differ based on their cultures and ways of operation. Tess (2013) and Aghaei *et al.* (2012) state that web applications offer services for prolonged discussions outside the classroom and for questions and queries that may be answered by guest speakers/experts. Blogs can be used to support teaching and learning explicitly. Lal (2011) and Anderson (2007) suggest that podcasting can also be used in a learning environment.

6.9 Theme 4: Controversies and challenges related to adopting SS/SW in HES

6.9.1 Issues that hinder the use and adoption of SS/SW in HES

Twenty codes emerged as part of this theme on the hindrances associated with educators' inability to successfully use and adopt SS/SW and ICT web technologies to complement teaching and learning. There are five main codes, namely 1) security issues; 2) ethical and legal issues; 3) human factors; 4) ICT infrastructure; and 5) other possible issues. Each of the five codes divides into sub-codes that are interconnected. Under the security issues, there is 6) privacy; and 7) intellectual property rights (IPRs). The second code, ethical and legal issues, includes 8) exploitation; and 9) misuse. The category human factors entails 10) behavioural patterns (i.e. technophobia, attitude, belief); 11) lack of willingness and readiness to accept change; and 12) lack of confidence.

The code ICT infrastructure comprises of six sub-codes, namely 13) ICT teaching facilities; 14) ICT investments (costs, risk and benefits); 15) heavy workloads; 16) insufficient educator time; 17) difficulty integrating SS/SW for the facilitation of learning; and 18) not enough simultaneous access. The remaining sub-codes belong to other possible issues such as 19) a lack of student exposure; and 20) university policy framework.

Research Question 4:

What are the hindrances associated with the adoption of SS/SW and ICT web technologies and their application in the teaching and learning environment?

Sub-questions:

In this section, the sub-questions were framed to support this question in Theme 4 regarding the challenges and controversies associated with the adoption and use of SS/SW and ICT web technologies and their applications in HES. Five (5) interview questions emerged. Educators were asked to explain to what extent they agree with the following statements.

- Is it difficult to integrate and use SS/SW and web technologies for facilitation of learning? If so, please explain?
- There is insufficient time, a lack of simultaneous access and a massive workload. If so, please comment?
- There is a lack of confidence and willingness to accept technological change. If so, please justify your reason?
- Phobia, attitudes towards web technologies. If so, explain?
- There is a lack of resources (ICT infrastructure/facilities; technical assistance training) and policy. If so, comment?

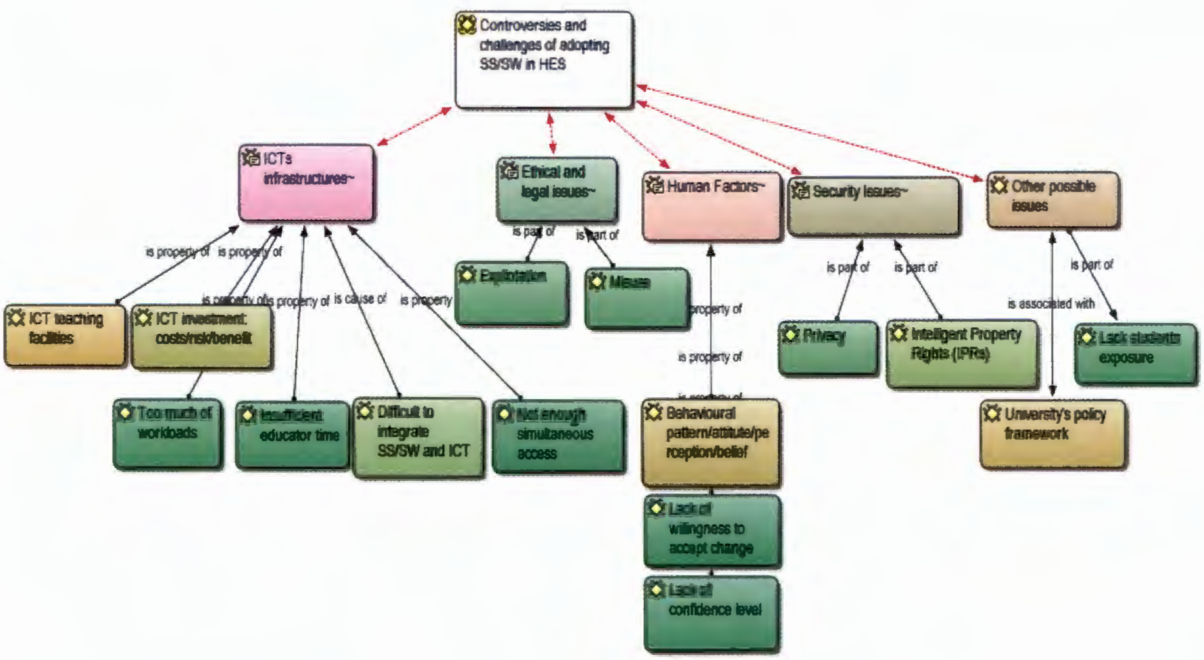


Figure 6-5: ***Codes Generated in Relation to Theme 4***

6.9.1.1 Security issues

Dotsika (2012) and Schroeder *et al.* (2010a) mention that the legal and ethical aspects associated with the uses of SS/SW in the public domain should receive special consideration.

For this reason, the researcher provides the findings pertaining to the issues and challenges that hamper the adoption of SS/SW and ICT web instructional tools in HES.

The interaction between students in a public space poses challenges related to data security and privacy. In most situation, it is assumed that it is the university's responsibility to ensure that students using these publicly available tools are protected (Schroeder *et al.*, 2010a). Dotsika (2012) adds that institutionally focused criticisms relate to technology dependence, security issues and information overload. Ethical and legal issues such as anonymity, reputation, intellectual property ownership, patent violations, monetary function and trust are other controversies (Dotsika, 2012). Pereira *et al.* (2013) mentions that the issues regarding privacy, reputation, identity, and cultural crises (beliefs, behavioural patterns) have raised notable concerns.

6.9.1.1.1 Privacy

All the participants addressed the issue of privacy. A participant from the NWU explained that *"to some extent like there is of course that aspect of inability to ascertain the authenticity or the originality of the work but we always try to use other tools for example Turnitin application ascertain plagiarism".*

Another participant (AC3-INT14)said that *"in an highly technological environment or highly network environment where there is a lot of technology especially on social platforms, there will always be that negative effects of it and some of those effects are even criminal in nature".* AC3-INT14 added that *"you see people can use it for malicious reasons bullying. It could be even identity theft it could be anything but still there are laws in place, and new laws are being enacted, to reduce these criminal elements on a social environment or a social network environment".*

The focus is on falling victim to predatory unidentified outsiders online and augmented victimization by peers. There is an indication that most individuals are somewhat more naive about the internet and its potential dangers than the documented reports assume (Crook *et al.*, 2008; Yan, 2006). Wolak *et al.* (2008) examines the nature of the dangers emerging from these online applications. These should be better understood if there is to be effective education on safe behaviour. Another response suggests that *"criminals will always be there you see even if we don't have the semantic web there will be other forms of criminality but, there are law and policies that makes sure that the environment becomes relatively safer, I say relatively safer because it can never be hundred percent safe there is always an ignore element".*

6.9.1.1.2 Intellectual Property Rights (IPRs)

IPRs are a serious matter and universities may receive serious penalties if they are found encouraging practices that infringe upon these rights (Siemens, 2014). That is all the more reason why careful consideration should be given to such challenging issues in an academic environment. The educators from the UNISA expressed their concerns as BC4-INT3 stated *"you know, you cannot for example take a whole textbook and post it out there".* NWU participant AC1-INT9 supported this by saying *"categorically yes, the issues surrounding exploitation, privacy and contemporary the IPR are obvious issues regarding education as whole. For example, the issue of plagiarism, the issues of posting some else work and a lot more".* Such issues are unavoidable, although measures should be in place to reduce the impact so that the university is not found on the wrong side of law.

There are also concerns about the distribution of content without the permission of the original author of the content (Rheingold, 2010). Another participant from the NWU mentioned that there tools *"like Turnitin used to check for ascertain the right author of contents presented by the students at the event of carrying out their daily academic activities".* AC2-INT10 and BC4-INT3 echoed the remaining participants from UNISA and UP by stating that "*it's not quite a threat because at the end of the day you also have to look at the work submitted by the students to see if there is proper referencing that has been done and check the originality of ones work".*

6.9.1.2 Ethical and legal issues

6.9.1.2.1 Exploitation

Several ethics issues are involved with SS/SW and ICT use (Mix, 2010). One UNISA participant explained that as an educator who has been in the academic field, *"I haven't had such experience. For example the use wikis and blogs were students are supposed to have group discussions or share things ideas and the students discusses things that are not related to the course. It happens and you can't really stop students from posing things that are not relate to the course or somebody posting things that are not related to the group".* According to UP participant who believes that *"to some point, web application in public domain, may expose students to being vulnerable to like privacy and those kinds of issues".* What the participant is not certain about, is whether "*if the risk is that high though" so I don't see it a major risk".*

6.9.1.2.2 Misuse

Students are sometimes difficult to control. In some cases they may deviate from the content and touch on their personal views as opposed to using a discussion forum judiciously as intended. One participant from NWU said that *"you might find out that some students maybe dwelling into topics they are not supposed to be dwelling"*. AC1-INT8 said, *"with regards to unethical issues, privacy, intellectual property right, miss use and exploitation, Internet in an open space, there Internet bulling may occur. Students indulging into an illegal use of these platforms is highly possible"*.

6.9.1.3 Human factors

Research studies suggest that human factors have a great influence with whether educators would use SS/SW and ICT web instructional technologies in their teaching and learning (Ozer, 2013). Human factors may include behavioural factors such technophobia, perceptions and attitudes on whether to use such applications or not. Jaffer *et al.* (2007) contend that an educator's choice of a more applicable platform for the purpose of teaching and learning activities depends on various factors, such as the curriculum specifications, module objectives or the university's policy framework. The next section looks at how behavioural patterns may affect the adoption of SS/SW and ICT web technologies in HES.

6.9.1.3.1 Behavioural patterns (technophobia, attitudes, beliefs)

In the pedagogical environment, human behavioural patterns and willingness to use educational technologies influence the adoption process. Omona *et al.* (2010) suggest that when educators are presented with new instructional web technologies, a set of issues influences their decision on how and when they will use it. This includes perceived usefulness, ease of use, external variables and the intentions/attitudes of educators. The findings presented in this section revealed otherwise, although the claims in the literature may be applicable in some instances.

One NWU participant said that *"for me as an educator, I don't think I have phobia and attitudes towards the use ICT technological tools. Thus, I disagree that it may be a challenge. Maybe for other educators who are in different academic disciplines aside from ICT/IS related fields, probably may perceive phobia, attitude to use technology"*. Another participant from the NWU who made it clear that *"the issue of technophobia may arise where some educators who are so used to traditional style of teaching"*.

The findings show that most of the educators, if not all the participants, trust that they have no issues with the adoption of SS/SW and ICT web instructional technologies for educational purposes. They were quite convinced that they do not have technophobia related to these web application tools and its usage.

One of the participants from the NWU felt that the only thing that limits or restricts them from not adequately absorbing these web instructional applications in their teaching and learning is the university policy framework and the nature of the modules that they facilitate. They felt that their domain requires them to possess the necessary experience, but they highlighted that issues such as technophobia, negative attitudes and perceptions may occur among other academic educators who are in different fields.

One UNISA participant said, *"I think it is a challenge for some few educators in the social work, I have colleagues in social work, it might be a bit of a challenge for them".* Another UNISA participant said that *"I think it's easy for us because we are in engineering IT and all of that"* and added that *"I know some colleagues in humanities for example".* One UP participant sustained that "*the issue surrounding behavioural pattern may exist, "yes but that doesn't apply to me".*

6.9.1.3.2 Lack of willingness and readiness to accept change

The UNISA participant averred that *"well this has always been an on-going issue surrounding the technology acceptance in educational environment, whether to accept, adopt or use it is matter of an individual ability".* The NWU participant maintained that *"I think change makes educators to feel a bit uncomfortable and they don't want to find themselves trying out new things in class and they start malfunctioning, and they get stressed and time is passing and you know the next class is waiting outside to start so I think they are not really willing to change but stick to what they know already".* NWU participant AC1-INT8 stated that *"the intention to use or not, maybe highly be determined by the level of educators' individual ability, exposure experience to willingly accept technology".*

6.9.1.3.3 Lack of ICT confidence

Many research studies prove that a lack of ICT confidence, readiness and willingness among educators are linked to fear and an inability of use or failure to use technology. Balanskat *et al.* (2006) suggest another factor that hinders educators from using ICT instructional technologies in teaching and learning, namely a lack of ICT knowledge. This leads to educators being nervous about using technology in facilitating learning. Bingimlas (2009) concludes that educators who are not confident or skilled with the use of ICT tools have this fear and nervousness to make use of SS/SW tools in front of their subjects (student). Perhaps they fear that their students may be more knowledgeable than they are in lecture halls.

In the precious section, almost all the participants indicated that they do not lack ICT confidence to use SS/SW and ICT web instructional technologies for teaching purposes. Given their domain teaching, it is unlikely that they would lack ICT confidence. They did highlight that the policy frameworks sometimes limit them.

6.9.1.4 ICT infrastructure

6.9.1.4.1 ICT teaching facilities

ICT teaching facilities may also pose some challenges to the adoption of SS/SW and ICT web applications in educational systems. Some universities do not have the necessary ICT facilities to incorporate these web applications and tools for educational purposes (Bingimlas, 2009; Korte & Hüsing, 2007). One interview question was asked to establish whether the respective universities do provide the necessary ICT facilities. The findings show that the NWU does have the necessary ICT facilities as stated by AC1-INT1 *"yes, but we as an institution still need improvement. I still believe that there has been enabling platform from the institution to use SS/SW web tools"*. The UNISA participant [BC4-INT2] persisted that *"I think the UNISA does. They give us access to the software's and the tools and the Internet access etc. and there is education and innovative unit so if you want the IT department to help you do extra things on blackboard"*.

The UP participant [CC5-INT6] is confident that UP *"is very privileged institution with such ICT infrastructure enabled,"* while participant [AC1-INT8] from the NWU was not able to establish whether the institution has all the necessary required ICT facilitation tools *"I am not sure"*. AC1-INT9 thought that they do: *"yes, I believe they do"*.

6.9.1.4.2 ICT investments (costs, risk and benefits)

This section summarizes the findings on ICT investment in terms of cost, risks and benefits as part of SS/SW and ICT investment. The issue of risks associated with software crises is not yet over. Haigh (2010) notes that the term "software crisis" was coined in 1968 at NATO conference on software. Software crises occur due to a lack of adequate budget, design and execution, low productivity, lack of quality in the software and inability to meet users' expectations (Colburn *et al.*, 2008). To date, many research studies have been conducted concerning the causes, effects and solutions to the crisis, but to no avail. IT projects tend not to be deliver on time, within budget and at a stage when it is needed in the organization.

The issues of cost implication, benefits, flexibility and risks for SS/SW and ICT investment may have been underestimated by most universities. One UNISA participant suggested that *"cost implication in adopting SS/SW should be reflected upon, to invest into ICT projects may require finance to maintain it throughout the duration of operation. As we all know that broadband is expensive this days to keep such applications up and running".* A UP participant argued that, besides the benefits that these SS/SW and ICT web technologies could bring to these institutions, *"virtual reality is problematic and costly to establish and have it up and running requires a lot of time and expertise to implement".* The NWU participants claimed that *"broadband is very costly, except the cost implication have been brought down, interaction among students may be limited".*

Findings show that costs can become a controversy that can prevent the adoption of these SS/SW and ICT web instructional technologies in HES. This concern was expressed by the participants from the selected universities. CC5-INT5 and AC1-INT9 confirmed that *"absolutely, the issue of costs, broadband cost, investing into ICT tools and it applications, maintenance, monitoring and controlling the contents that students may publish in an open domain requires finance".* A UP participant emphasized the benefits that may be associated with investing in ICT technologies in HES. CC5-INT5 stated, *"I believe that using these ICT instructional technologies and its applications for education purposes towards to teaching and learning, may reduce cost through resource sharing, and increase collaboration across national and institutional borders as I have experienced. However, investing in an ICT tools and integrating it requires costs such as broadband adoption, software-as-a-service business models".* The findings confirm that SS/SW and ICT adoption should involve thorough consideration and evaluation as part of the business process of adoption.

6.9.1.4.3 Heavy workloads

The issue of workload may not be applicable in this instance. All the participants disclosed that workload was not factor that they considered a challenge that may hinder the adoption of ICT web technologies in education. Chisega-Negrila (2012) in turn believes that the integration of ICT instructional web technologies and applications into learning context would create an additional workload for students and educators.

6.9.1.4.4 Insufficient educator time

Lefever and Currant (2010) discovered that time is an institutional-level challenge that sometimes prohibits educators from integrating SS/SW and ICT tools in teaching and learning. They declare that educators require adequate time to incorporate these technologies effectively. They need time for surfing the internet, organizing lessons and for growth through training programmes (Bingimlas, 2009; Al-Alwani, 2005).

Participants did not feel that time limited them from effectively carrying out the required activities on a daily bases. BC4-INT3 from UNISA said *"no I don't think so, I don't think there's any constraints on the part of the educator that may mitigate against using those social platforms. Personally, I don't think it takes a lot of time to post and I don't think time is any factor".*

6.9.1.4.5 Difficulty with integrating SS/SW for the facilitation of learning

One UP participant claimed to have no difficulty integrating SS/SW and ICT web instructional tools in HES: *"I think in the UP context in particular that shouldn't be a hindrance because from my experience the IT support service are there to assist those that struggles and the infrastructure is also there the access is there and the training is there".* The NWU participant contributed by saying that *"it's not difficult because it's a question of if you are embracing the ICT instructional web tools and using it in your field of teaching or learning, hence, am able post anything on a platform as long as the student has access to it".*

6.9.1.4.6 Not enough simultaneous access

The participants all disagreed with the statement that simultaneous access is an issue. They believed that using these SS/SW and ICT web technologies actually helps them to manage their students in a more effective way. They further sustained that as educators, it is also their responsibility to use these tools, most specifically to engage with their students.

One of the participants from the NWU said that *"In terms of simultaneous access, I can't really answer that. I believe that issues with not having simultaneous enough access may not be controversies as I do not fall under these category. Maybe some educators maybe challenged in those aspects".* Supported by another participant who also *"disagree that not enough access is an issue".* AC1-INT8 argued that *"concerning simultaneous access, yes. I think going to training, workshop and seminars are just not enough to ensure that the educator is adequately equipped. I am of the view that once an educator has gone through the training, they should also try to use these tools to ensure mastery of these tools*".

The rest of the participants felt that access is not issue when using these kinds of platforms for teaching and learning. They were positive that educators should use such platforms regardless of whether they find the time to do so or not. Some went on to state that it is the responsibility of educators to ensure that the learning process takes effect.

6.9.1.5 Other possible issues

6.9.1.5.1 Lack of student exposure

Lack of student exposure was suggested by the educators during the interviews, something that the researcher did not anticipate. The participants explained that some students come from disadvantaged homes. Their experience with computers may be limited. This poses a challenge to their learning process. The mode of assimilation of content and the use of ICT web technological applications of that particular student is limited. In such cases the student may not be able to cope as well as those that are technologically advanced (Cain, 2008; Mann, 2008).

One NWU interviewee said that there are other possible issues that should be considered. The participant suggested that *"we should not rely so much on SS/SW and ICT with technologies tools as a total way of doing things,"* continuing that *"I think these tools should serve as complementary to traditional ways but the effects will be for example there's isolation. You see when one is working on his or her own without being directed, sometimes maybe misguided".*

AC1-INT1 continued the discussion on the issue of a lack of student exposure: *"In instances whereby some students are not really exposed to this kind of tools and if you are going to be having some kind of assessments using these tools, some students might be a bit disadvantaged in the sense that they are only seeing these things at Tertiary levels they were never really exposed to them back at high school so it might deprived the poor or those who are not really exposed".*

6.9.1.5.2 University policy framework

The findings show that participants from UNISA and the UP did not feel that policy frameworks were stumbling blocks. They further ascertained that their policy framework actually requires them to use these web tools and applications for learning goals. At the NWU, all fingers point towards the university's policy framework. All participants in the NWU were positive that the university's policy framework restricts them. They also mentioned that they are confined to using what the university provides for them to use. Some of the participants believed that a lack of awareness also played a part since it limits them from actually using these tools. Participants indicated that they were exposed to use these web instructional tools at their previous employers. Unfortunately, they discovered that such platforms where not supported at their current institution. Some said that ICT web instructional technologies such as semantic blogging, discussion forums, wiki and other tools were not incorporated in their eFundi

LMS/VLEs. For that reason, educators are not able to integrate such applications during the facilitation of learning.

The next section introduces the last theme, Theme 5, which addresses educator development and support.

6.10 Theme 5: Educator development and support

6.10.1 Theme findings on support systems in HES

A smaller number of codes were identified in relation to educational development and support programmes. Yet, these codes provide insight into educators' development. Educators play an essential role in students' lifelong learning. There is one main code with three sub-codes attached to it. The main code is 1) educators' support; and the three sub-codes are 2) training; 3) seminars; and 4) workshops.

Research Question 5:

What strategies could be put in place to develop and support teachers and learners to use of SS/SW and ICT web technologies in HES?

Sub-question:

This section required the interview participants to propose strategies for educator support. Only one interview questions emerged from this section.

- Educators were asked to suggest approaches or recommendations for the development and support of educators.

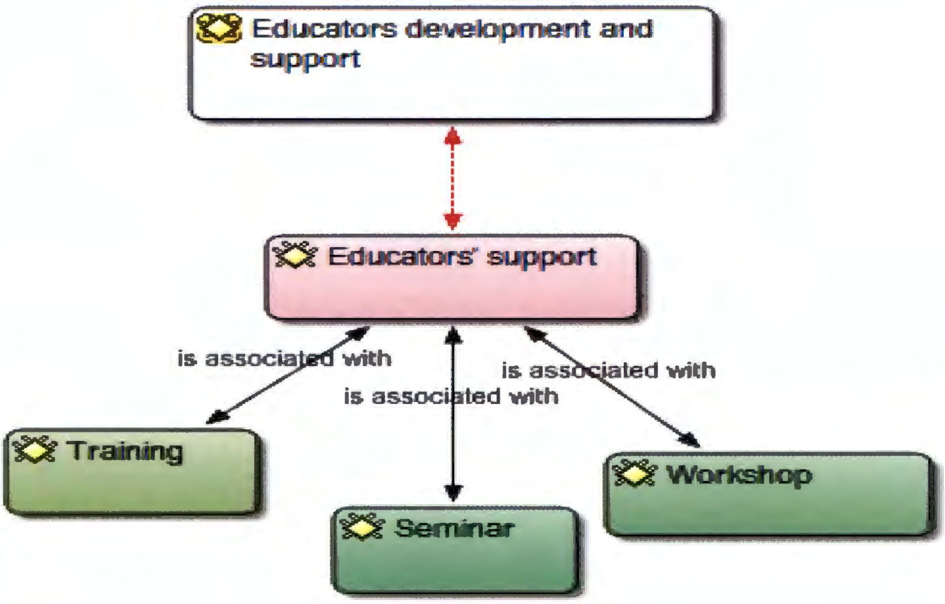


Figure 6-6: Codes Generated to Represent Theme 5

6.10.1.1 Educator support

Educators are significant people in HES. The success and the level of knowledge and experience of the students all depend heavily on the educators. However, the inability of educators to integrate SS/SW and ICT web instructional technologies in their teaching successfully has drawn much attention. There is a realization that educators lack the necessary ICT skills. Wood (2015) states that many educators are still not on same page with digital competence as their students. Many authors (Quadri & Olaojo 2013; Noor Ul Amin, 2013; Hooker *et al.*, 2011; Angeli & Valanides 2009; Trinder *et al.*, 2008; Kumar *et al.*, 2008; Olakulehin, 2007) feel that educators are not making use of the possible features of ICT. Blogs, wikis, podcasts, vodcasts, and YouTube can be supportive to administer quality education and to create improved learning environments. Even though many educators are optimistic about the benefits of SS/SW, they continue to struggle with SS /SW and ICT technologies. The findings on educator support reveal that there is a need for workshops, training and seminars.

The NWU participants indicated that *"they do provide training, seminars and as well as workshops to the educators, if I can remember, I have attended quite a lot of training, workshops and seminars both on campus and externally"*. Participants from UNISA and UP suggested that for those educators who struggle or who find ICT web instructional technologies difficult, *"the first thing is to book yourself on the training but coming out of the training, is not obviously sufficient to sort of make you or confident or comfortable you have to play around with these web instructional tools and the more you often use it the better you would become and will definitely find amazing features".* NWU participant AC2-INT10 added that *"when I first came to UP in 2012, you know I book myself in the training because I didn't know what the blackboard system".*

BC4-INT4 from the UP further explained that *"I think once a week I see an email inviting me for training and it's your propagative as you know the educators they make time to go and learn so that you can actually use the tool".* The NWU participants revealed that their university does "provide workshops, seminars and training required". Another participant said that *"of course training is necessary the reason why most people will want a new thing it's because of they don't know how it works you see but if there is support services especially in term of training, if somebody is trained on how these new technology works that person becomes confident in using it because she/he has been trained so that's one strategy".*

Participants from all three universities revealed that they would recommend workshops, seminars and training. Hooker *et al.* (2011) further sustain that educators have to go through four stages, namely emerging, applying, infusing and the transforming stage. There is need for educator support programmes and it is important at any institution.

6.11 Chapter summary

The primary objective of this chapter was to discuss and interpret the findings of the interviews with the participants from the NWU, UNISA and UP. The report discusses each of the themes derived from the open coding using a qualitative data instrument (ATLAS.ti). The chapter provided an extensive detailed analysis of all the themes as supported by the existing literature.

Five themes emerged from the interviews. These themes relate to SS/SW and ICT web technology adoption in HES, educators' perceptions of SS/SW and ICTs tools in HES, educational impact and benefits of Web 2.0/3.0 and ICTs in HES, controversies and challenges related to adopting SS/SW in HES and educator development and support. These themes from the qualitative research are paired with the quantitative results to support a framework for social software adoption in HES.

In summary, this chapter shows how the integration and adoption SS/SW and ICT web instructional technologies would impact positively on quality education and mode of delivery, improved student performance, enthusiasm, educational opportunities and easy access to educational resources. It furthermore explored the associated benefits that SS/SW and ICT technologies could bring to the institution. These findings also presented educators' views and perceptions of web technologies for teaching purposes and expounded on the challenges that may influence the adoption process in HES. Finally, it elaborated on the need for a development support system. Chapter 7 details the quantitative data analysis and offers an interpretation.

CHAPTER 7

QUANTITATIVE DATA ANALYSIS AND INTERPRETATION

7.1 Introduction

Chapter 6 detailed the results of the first part of the MMR, namely the qualitative research (see Figure 4.1). This chapter analyses and discusses the second research methodology adopted as part of the MMR, namely quantitative research. The chapter presents the quantitative data analysis and interpretation through the use of questionnaires that tested students' views about the adoption of SS/SW and ICT tools as supplementary resources in pedagogical settings.

The Statistical Package for Sciences (SPSS) version 22 and Microsoft Excel (showing descriptive and inferential statistics such as frequencies, tables, figures, percentages, and correlation tests) were used in the data analysis.

7.2 Data sampling and collection procedure

This study aims to present a framework for social software adoption in HES, with the primary objective being to overcome the flaws of existing traditional methods of teaching and learning and to venture further into ICT-enabled technologies (Web 2.0/3.0). A questionnaire was deployed as the second data collection instrument and data was gathered by means of the personal administration of the questionnaire and an online survey using QuestionPro services. The questionnaire consists of sections A to G (see Annexure I: Questionnaire guide). This allowed participants to communicate and to share their views. The online survey enabled by QuestionPro services offered respondents the ability to consent to participation in the survey by simply clicking on the link which automatically directed them to the main questionnaire. The questionnaire took between 5 and 10 minutes to complete.

The questionnaire was directed at the targeted audience (students) from across the three selected universities. The responses gathered from participants and the online survey (QuestionPro services) were captured in a database, which was then transferred to SPSS (version 22) for analysis and interpretation. The SPSS was deemed useful for analysing quantitative data. SPSS was useful during the coding process. Descriptive statistics and frequencies were derived according to the structures and variables of the questionnaire.

The rest of the chapter is divided into sections and sub-sections as follows: Section 7.2 presents the data sampling and collection procedure. Sections 7.2.1–7.3.5 present the descriptive statistics analysis and frequencies of the demographic variables. Section 7.3.4 entails cross-tabulation, interpretation and discussion of results from section B to G. Section 7.5 presents the reliability analysis. Section 7.6 discusses the correlational measures and Section 7.7 summarizes the whole chapter.

7.2.1 Descriptive Statistics and Frequencies

The descriptive statistics process began with Section A of the questionnaire as categorized below:

- Section A: Demographic variables
- Section B: Internet awareness and access
- Section C: Integrating ICT tools and application in HES
- Section D: Framework analysis of semantic web-based in educational systems (SWBES)
- Section E: Students' digital competences and confidence level
- Section F: Controversies/challenges associated with the adoption of SS/SW and ICT web technologies encountered by educators
- Section G: Student development and support programme.

7.3 Analysis of demographic results

7.3.1 Section A: Demographic variables

This section analyses the results in correspondence with the research objectives. These results were organized in frequency tables and figures. Respondents' background information such as gender, age, institution, qualification and academic background are demonstrated below.

7.3.1.1 Gender

The questionnaire was administered across three selected universities and targeted students from various academic domains and programmes. The aim was to establish students' views on the adoption of social software in HES and on the application of these social software and ICT tools as complimentary to teaching and learning processes.

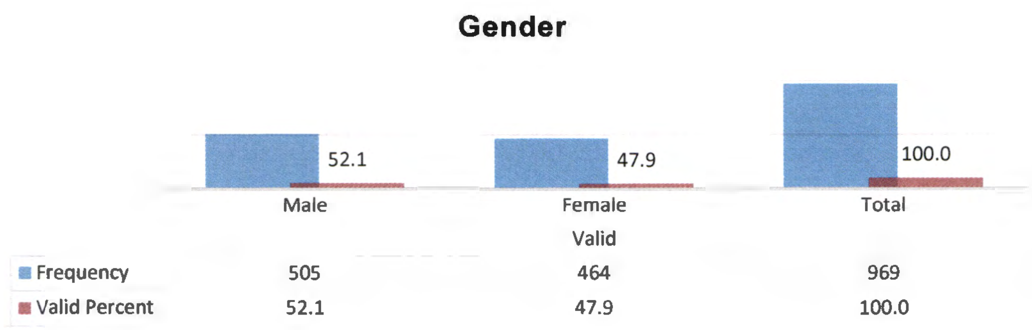


Figure 7-1: *Gender*

A total of nine hundred and sixty nine (969) respondents completed the questionnaires. Male students had a slightly higher representation than females with 52.12% compared to 47.88%. The slight imbalance did not have any significant bearing.

7.3.1.2 Age

Respondents could choose between the age categories 18–25; 25–31 and 31 and above. Out of 969 respondents, the majority were students between the age of 18 and 25 (72.1%); followed by 20.6% between 25 and 31 and 7.2% aged 31 and above. This implies that the younger generation is more likely to accept change as opposed older people. Change is inevitable, and several higher education institutions are beginning to realize that new models of teaching and learning are needed to meet the needs of members of information age societies (Angeli & Valanides 2009; Minocha, 2009).

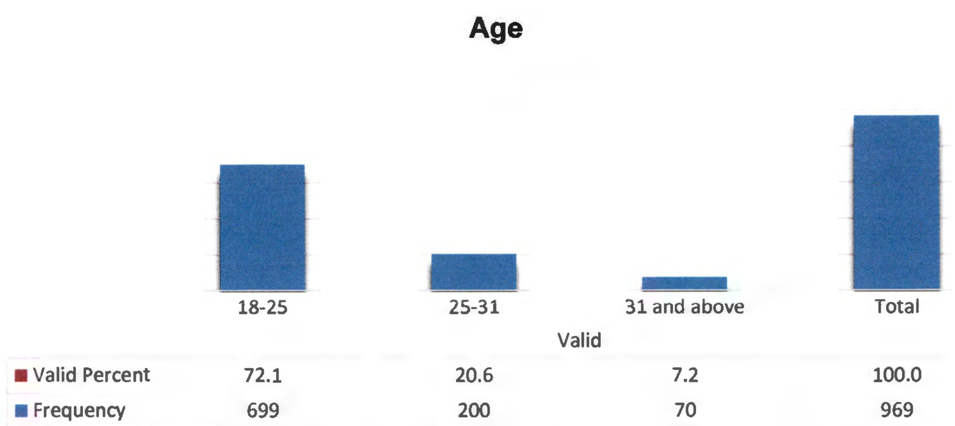


Figure 7-2: *Age*

7.3.1.3 *Name of Institution*

The three universities were selected based on their location, mode of education delivery and infrastructure.

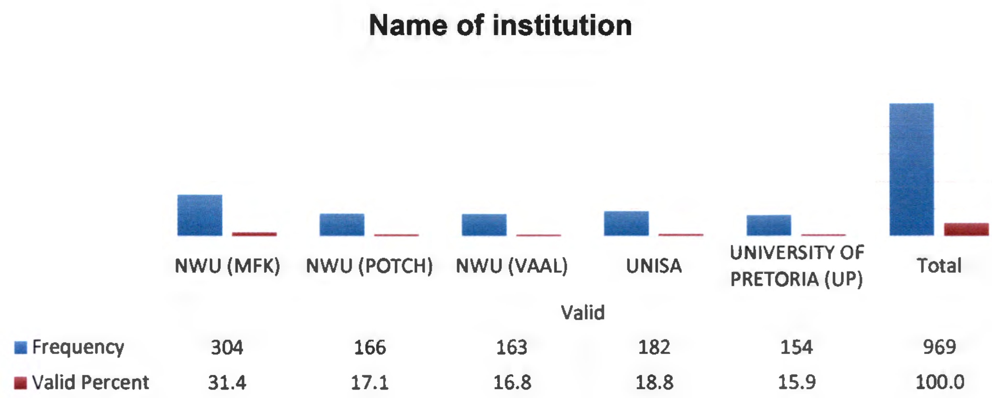
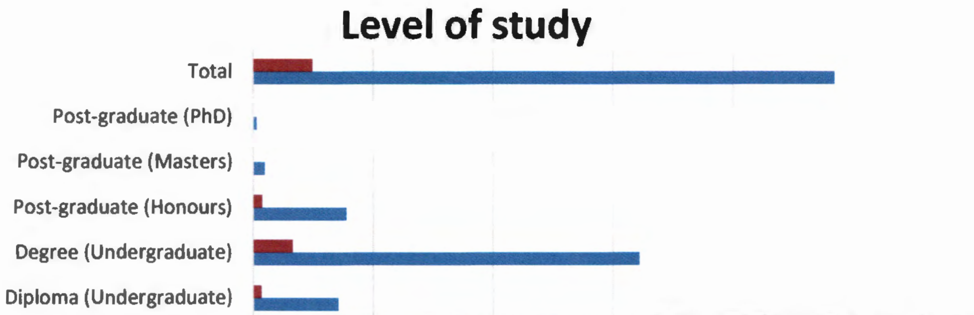


Figure 7-3: Name of Institution

7.3.1.4 *Level of Study*

The researcher anticipated that undergraduate students would be most likely to absolve these SS / ICT tools and its applications in their teaching and learning as compared to post-graduate students who have already been inducted into the educational system. This would signify that students should be exposed to these ICT tools during the course of their learning processes as it helps them with their career. The result denotes that the majority (66.6% – 645) were students who are currently doing their degree (undergraduate); followed by 14.7% (142) who are currently doing diploma (undergraduate).

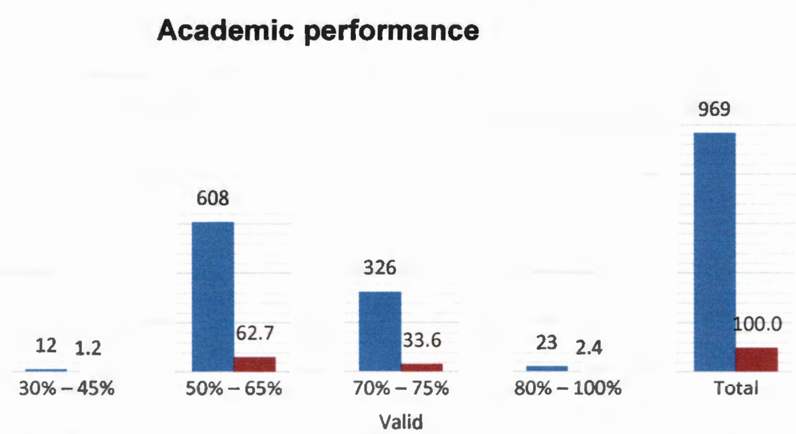


	Diploma (Undergraduate)	Degree (Undergraduate)	Post-graduate (Honours)	Post-graduate (Masters)	Post-graduate (PhD)	Total
Valid Percent	14.7	66.6	16.1	2.1	0.6	100.0
Frequency	142	645	156	20	6	969

Figure 7-4: Level of Study

7.3.1.5 Academic performance

The table below demonstrates what percentages of students believe that they are performing well in their area of studies. The respondents were asked to rank their academic performance between 30-45%; 50-65%; 70-75% and finally, 80-100%. Most students (608 – 62.7%) indicated that they achieve between 50-65%.



Valid	30% – 45%	50% – 65%	70% – 75%	80% – 100%	Total
Frequency	12	608	326	23	969
Valid Percent	1.2	62.7	33.6	2.4	100.0

Figure 7-5: Academic performance

7.4 Cross-tabulation and interpretation of results

7.4.1 Section B: Internet awareness and access

Section B and C of the study addressed the first literature matrix theme in Chapter 2, which relates to ICT. The first aim was to answer the first research question: How will SS and ICT tools help improve learning enthusiasm and ease access to education when it is successfully adopted? This section also aimed to determine students' basic computer skills and their internet awareness, access and usage. It cannot be overemphasized that the use of SS offers students freedom to follow other distance training programmes, to determine their own pace, to choose the way they learn best, and to engage in a learning relationship with peers.

Minocha (2009) mentions that it is difficult to measure the extent to which online forums, wikis, blogs, podcasts, and so on, are actually used in virtual learning environments (VLEs). There is also ongoing debate as to whether SS initiatives should be concealed behind the structures of an institutional VLE, or whether they should be openly published on the internet for the benefit of students everywhere. McLoughlin and Lee (2008) aver that when considering the representations and the discussions presented before us, there can be no doubt that the learning process occurs in a socio-cultural system within which students use diverse technological tools and several platforms to engage and to produce collective activity, enabled by technology affordances. Based on this claims, the researcher posed questions to respondents and their responses were as discussed below.

This section of the questionnaire included six questions (B1, B2, B3, B4, B5 and B6, see Annexure J: Questionnaire Guide). There questions were as follows: "Do you have basic computer skills (Ms Word, Excel, PowerPoint, Access, Internet etc)?"; "Do you have access to the internet?"; "How/when do you often access the internet?"; "Where do you basically have access to the internet?"; Can you approximate the number of hour (s) you spend using the internet in a day?" and "When you access the internet, what purpose do you use the internet for?" Respondents' responses were compared across the three (3) selected universities so that a cross-tabulation was used in analysing the responses (Section B).

For the benefit of this study and the consistency of the data analysis, the responses "completely agree" and "agree" were merged to represent agree or affirmative and the responses "disagree" and "completely disagree" were merged to represent disagree or negative. Out of 304 respondents from the first campus who were asked in the questionnaire (B1), "Do you have basic computer skills (Ms Word, Excel, PowerPoint, Access, Internet etc), 261 of 85.8% agreed that they have basic computer skills, internet awareness, access and usage. At the NWU Potchefstroom Campus, 132 out of 166 answered positive. This implies that 79.5% affirmed that they do have computer skills. At the NWU Vaal Triangle Campus, 163 respondents answered the question, and 79.8% confidently agreed that they possess basic computer skills and internet awareness, exposure and have access.

Out of 182 respondents at Unissa, 146 (80.2%) affirmed that they do have basic computer skills. This result may be due to the fact that Unisa offers open distance learning (ODL). In this case learners are expected to know the basic concepts of computer skills to enable them fulfil tasks and learning activities. Respondents of the 154 respondents from the UP, 78.6% agreed. When all 969 responses are viewed together, 81.6% affirmed that they have basic computer knowledge and knowledge of how to use the internet.

The second question in this section (B2) was whether respondents from these universities have access to the internet. The majority of the respondents (92% – NWU; 89.2% and 89% Unisa; 79.1% and 89.7% UP) agreed that they do have internet access. When viewing all 969 respondents together, a comfortable 88.3% agreed.

Third question in this section (B3) attempted to understand how often students access the internet, since the second question (B2) revealed that majority of students do have access to the net. The variables used were "every day", "2–3 days", "and once a week", "more than a week". The responses are presented in Annexure Section B. The NWU (MFK) responses were 65.1% were "every day"; 20.4% "2–3 days"; 9.9% "once a week" and 4.6% "more than a week". The NWU Potchefstroom Campus responses were 62% were "every day"; 21.7% "2–3 days"; 11.4% "once a week" and 4.8% "more than a week". The NWU Vaal Triangle Campus responses were 60.1% "every day"; 22.7% "2–3 days"; 14.7% "once a week" and 2.5% "more than a week". The Unisa responses were 38.5% "every day"; 41.8% "2–3 days"; 15.4% "once a week" and 4.4% "more than a week". Finally, the UP responses were 57.8% "every day"; 22.7% "2–3 days"; 13.6% "once a week" and 5.8% "more than a week". When viewed together, the majority of respondents (57.6%) responded with "every day"; 25.4% with "2–3 days"; 12.6% with "once a week" and 4.4% with "more than a week".

The fourth question in this section (B4) aimed at determining where students carry out their day-to-day activities. Respondents of the respondents from the NWU Mafikeng Campus, 46.4% indicated campus; 11.2% were home; 42.4% both (campus and home). Respondents from the NWU Potchefstroom Campus, 33.7% indicated the campus; 15.7% were home; 50.6% both (campus and home). Respondents from the NWU Vaal Triangle Campus, 46.4% indicated campus; 11.2% were home; 42.4% both (campus and home). This implies that most students accesses internet both on the campus and at home. The percentage of students who access the internet on the campus is slightly higher at 41.7%, with 41.1% accessing it at home. Smaller percentages indicated other places (15.1% and other work place 2.2%).

The fifth question in this section (B5) related to the number of hour(s) spent using the internet in a day. The result shows that quite a reasonable number of hours are spent on the internet. Those who spend between 3–4 hours made up 39.3%; 1–2 hours made up 37.9%; 0–1 hour made up 12.4% and 5 and above with 10.4%. The final question in this section (B6) focused on understanding the purpose for which respondents use the internet and the results revealed that 30.3% would use the internet for entertainment, educational uses, information searching/filtering, and research activities.

7.4.2 Section C: Integrating ICT tools and application in HES

In Section C, the aim was to ascertain whether the integration of SS and ICT tools and its applications in HES will compliment teaching and learning. With the successful integration of ICT tools into educational systems, learners can source and browse e-books, and have easy access to educational resources and personnel (mentors, experts, researchers, professionals, and peers all over the world). A number of authors (Madhukar, 2013; Moges, 2013; Bonifacio, 2013; Noor Ul Amin, 2013; Yuen *et al*, 2011; Bottino, 2003; Sharma, 2008) mention that the use of ICT can improve performance, teaching, administration, and develop relevant skills in disadvantaged communities. They maintain that it also improves the quality of education through facilitation of learning by doing self-learning, problem solving, information seeking and analysis, and critical thinking, as well as the ability to communicate, collaborate and teach. In an effort to test these claims, the researcher posed a series of questions to participants on SS and ICT integration/adoption higher learning.

Five questions in the questionnaire guide, namely C1, C2, C3, C4 and C5, asked the respondents to indicate the extent to which they agree or disagree with the following statements in Section C: "The adoption of social software and Information and Communication Technologies (ICTs) tools and application in teaching and learning: can assist learners with their course module", "can improve easy access to education at any given time and place", "can improve quality education delivery", "can improve learners' performance", and "can increase learning motivation, enthusiasm and collaboration".

The table below provides a breakdown of the answers. The majority of students were very optimistic about the adoption of SS/SW and ICT web technologies to support teaching and in HES.

Table 7-1: C1 – SS/SW and ICT web technologies in HES can assist learners with their course module

Item	Frequency	Percent	Valid Percent	Cumulative Percent
Completely agree	281	29.0	29.0	29.0
Agree	345	35.6	35.6	64.6
Disagree	221	22.8	22.8	87.4
Completely disagree	122	12.6	12.6	100.0
Total	969	100.0	100.0	

Table 7.1 clearly shows that out of the 969 respondents from the three selected universities, 345 (35.6%) respondents agreed. Two-hundred and eighty-one respondents (29%) completely agreed. When viewed together, 626 (64.6%) out of the total sample of 969 affirmed that adopting SS/SW and ICT tools in HES can assist students with their course modules.

The next question in this section (C2) related to whether the adoption of SS/SW and ICT web technologies would improve or guarantee easy access to education, educational materials and contents at any point in time and place. The table below shows the responses to this question.

Table 7-2: C2 – SS/SW and ICT web technologies in HES can improve easy access to educational contents and resources at any given time or place

Item	Frequency	Percent	Valid Percent	Cumulative Percent
Completely agree	277	28.6	28.6	28.6
Agree	388	40.0	40.0	68.6
Disagree	201	20.7	20.7	89.4
Completely disagree	103	10.6	10.6	100.0
Total	969	100.0	100.0	

Out of the total number of responses, 277 (28.6%) completely agree; 388 (40%) agree; 201 (20.7%) disagree, while 103 (10.6%) completely disagree. This signifies that respondents view the adoption of ICT web technologies as positive, not only will it assist students with their course module, but it will also improve students' access to educational materials. It will promote quality education delivery. The third question (C3) sought to determine whether SS/SW and ICT tools in HES will improve the method, mode and style of education delivery and possibly replace the traditional approach of educational delivery.

Table 7-3: C3 – SS/SW and ICT web technologies in HES can improve quality education and ways of offering education to students

Item	Frequency	Percent	Valid Percent	Cumulative Percent
Completely agree	303	31.3	31.3	31.3
Agree	406	41.9	41.9	73.2
Disagree	195	20.1	20.1	93.3
Completely disagree	65	6.7	6.7	100.0
Total	969	100.0	100.0	

This table depicts the extent to which respondents agreed or disagreed with the question on quality education delivery. The table denotes that the majority of respondents were positive that the adoption ICT web technologies for the facilitation of learning would improve the quality of education delivery (Noor Ul Amin, 2013). However, whether the adoption of SS/SW and ICT web technologies can replace the old traditional approach of education delivery is debatable. Moreover, these SS/SW and ICT web technologies can be adopted as embedded tools to complement the traditional approach for quality education delivery.

The table above shows that 303 (31.3%) respondents completely agreed and 406 (41.9%) agreed. Respectively 195 (20.1%) and 65 (6.7%) disagreed and completely disagreed. When viewed together, 709 out of 969 (73.2%) respondents agreed.

Table 7-4: C4 – SS/SW and ICT web technologies in HES can improve learners' performance

Item	Frequency	Percent	Valid Percent	Cumulative Percent
Completely agree	199	20.5	20.5	20.5
Agree	447	46.1	46.1	66.7
Disagree	212	21.9	21.9	88.5
Completely disagree	111	11.5	11.5	100.0
Total	969	100.0	100.0	

The table reveals respondents that the majority of students (66.6%) felt that integrating and adopting SS/SW and ICT tools would improve their academic performance. This implies that learners think they will be more active, participative, creative, interactive, and collaborative and that they would build community of presence. It is clear that students will have increased educational opportunities. McLoughlin and Lee (2007, 2008, 2010) and Klamma *et al.* (2007) affirm that the emergence of new Web 2.0 and 3.0 concepts and technologies are opening doors for an effective learning and have the potentials to support lifelong competence development.

The final research question in this section (C5) related to whether the adoption of SS/SW and ICT web technologies into HES can or will increase learning motivation, enthusiasm and collaborative learning.

Table 7-5: C5 – SS/SW and ICT web technologies in HES can increase learning motivation, enthusiasm and collaboration

	Frequency	Percent	Valid Percent	Cumulative Percent
Completely agree	274	28.3	28.3	28.3
Agree	436	45.0	45.0	73.3
Disagree	150	15.5	15.5	88.8
Completely disagree	109	11.2	11.2	100.0
Total	969	100.0	100.0	

Table 7.5 displays the results of the final question of this section. When this result is viewed together, the majority of respondents (73.3%) affirmed that the integration of web technology tools for the purpose of enriching educational contents would increase learners' satisfaction. This implies that students will be motivated, enthusiastic and will be offered a platform for collaboration and peer-to-peer engagement.

The results of this section (C1, C2, C3, C4 and C5) are supported by several authors (Moges, 2013; Madhukar, 2013; Wood, 2015) who are of the opinion that ICT has the potential ability to improve ease of access and the teaching methods so that learners are able to access information at any given point in time or place. It has a direct effect on the approach taken to transfer learning to learners (Madhukar, 2013; Moges, 2013; Bonifacio, 2013; Noor Ul Amin, 2013; Angeli & Valanides, 2009; Jaffer *et al.* 2007). Therefore, ICT supported education will ultimately lead to the democratization of education (Madhukar, 2013). This in turn prepares learners for lifelong learning. Madhukar (2013), Moges (2013) and Bonifacio (2013) state that the ultimate contribution of SS/SW and ICT web technologies in the context of education is easy access to learning. This is particularly true for emerging countries such as India. India has over a billion citizens and a large young population, which means that it needs a large recognized educational system (Madhukar, 2013; Moges, 2013; Bonifacio, 2013; O'Reilly, 2005).

The figure below provides an overview of the responses to all questions in this section (C1, C2, C3, C4 and C5) and demonstrates the extent to which students agree or disagree with the adoption of SS tools in HES.

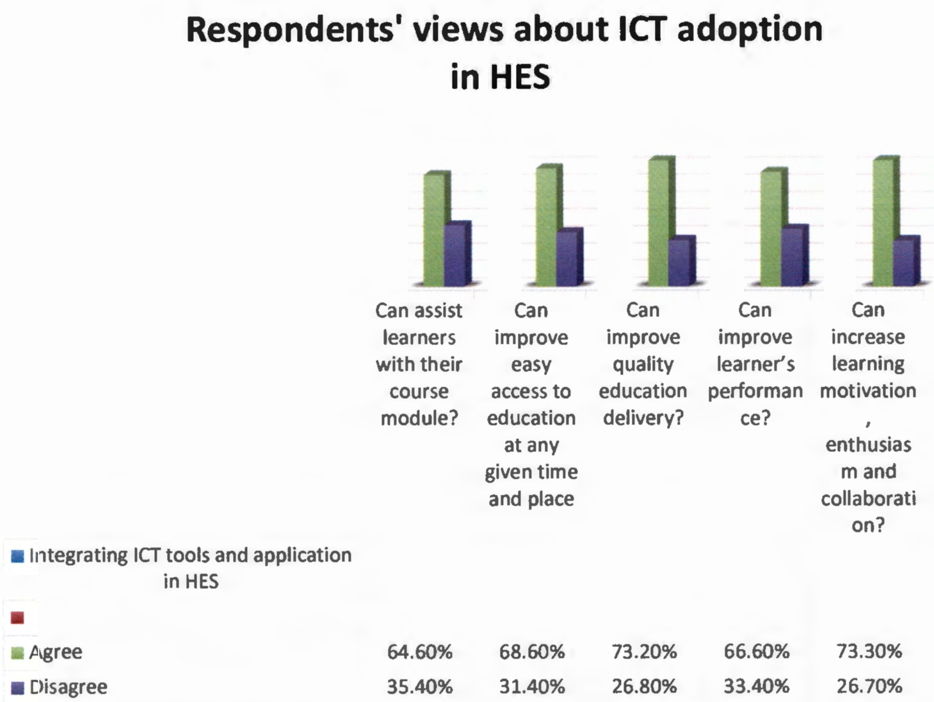


Figure 7-6: General views of the respondents on the adoption of SS/SW and ICT web technologies in HES

In conclusion, SS/SW and ICT technologies in education has paved the way for a reformation of pedagogical business administration process and the facilitation of learning (Arkorful & Abaidoo, 2015; Livingstone, 2015). One of the arguments in the literature as discussed in Chapter 2 is that adopting and integrating new ICT technologies into HES (Livingstone, 2015) will propel the drive for pedagogical innovation.

Over the past two decades, technological inventions have paved the way for the consideration of different tactics in educational contexts, with consideration of the design scheme, delivery and assessment of facilitation of the learning process (Tse *et al.*, 2010; Sheehy, 2008; Woo *et al.*, 2011; Jimoyiannis *et al.*, 2013). With the advent of SS/SW and ICT technologies, there has been a move away from the mere delivery of content to the creation and facilitation of rich and diverse kinds of interactions between students, educators and course content

(Livingstone, 2015; McLoughlin, 2010; Bolliger & Shepherd, 2010; Ching & Hsu, 2011; Deng & Yuen, 2011; Yang, 2009; Zorko, 2009).

Both educators and students are now confronted with a range of possibilities and ICT technologies. This makes varied approaches to education possible, enabling students to be self-directed, self-governed, enthusiastic and vigorously engaging in the learning process. This is fundamental and is a move away from the traditional approach to learning and teaching (Wood, 2015; Woo *et al.*, 2011; McLoughlin, 2010). HES has crucial part to play, one of its mandates is that, apart from just completing a degree, students should be prepared to face the work industry, and this linked to when and how students learn (Davies *et al.*, 2007). The combined use of SS/SW and ICT technologies as complementary tools to support teaching and learning will assist HES to fulfil this mandate (Klamma *et al.*, 2007). SS/SW will therefore continue to be recognized in the pedagogical arena (Klamma *et al.*, 2007).

The drive is now for educators to advance onward by adopting these web technologies and to be acquainted with them as complementary tools for educational purposes. They should do so as it will ensure that their students are provided with the best teaching facilities so that effective learning can take place (Livingstone, 2015; McLoughlin & Lee, 2010).

7.4.3 Section D: Framework analysis of SWBES

The primary goal of this section of the study is to explore the concept of Web 2.0 and web 3.0 using the proposed framework to analyse the strengths, weaknesses, opportunities and threats of SWBES. This concept of SWBES is in alignment with the fifth literature matrix theme in Chapter 2 (Sections 2.8, 2.8.1, 2.8.2, 2.8.3, 2.8.4 and 2.8.5 – 2.9, 2.9.1, 2.9.2, 2.9.3, 2.9.4 and 2.9.5). It answers the second set of research questions, namely "What are students' perceived views on SS?" and, "How can the proposed framework and a SWOT analysis explore the flaws and effectiveness of Web 2.0 and Web 3.0 in education?" In order to address these questions, the researcher attempted to determine whether students are aware of SS/SW and its possibilities and capabilities. Two main questions were directed to students as depicted in the questionnaire guide, Section D. The first question in section D1 is "Would you agree that you are familiar with some of the following social SS/SW & ICT tools application such as Facebook, Twitter, YouTube, Skype, Blog, Wiki, Digital Library, Podcast, myUnisa, eFundi, clickUP, MyTUKS, Blackboard/WebCT, Overhead projector?"

To answer this question, a cross-tabulation was generated using the SPSS statistical package tool based on the respondents derived from the questionnaire among the three selected universities and the results are shown in the below tabulation.

Table 7-6: A3 – A cross-tabulation of respondents who are familiar with SS/SW and ICT web technologies and applications

Name of institution		Comp. agree	Agree	Disagree	Comp. disagree	Total
NWU (MFK)	Count	112	92	59	41	304
	% within A3. Name of Institution	36.8%	30.3%	19.4%	13.5%	100.0 %
NWU (POTCH)	Count	41	83	28	14	166
	% within A3. Name of Institution	24.7%	50.0%	16.9%	8.4%	100.0 %
NWU (VAAL)	Count	50	57	32	24	163
	% within A3. Name of Institution	30.7%	35.0%	19.6%	14.7%	100.0 %
UNISA	Count	102	59	13	8	182
	% within A3. Name of Institution	56.0%	32.4%	7.1%	4.4%	100.0 %
UNIVERSITY OF PRETORIA (UP)	Count	57	70	19	8	154
	% within A3. Name of Institution	37.0%	45.5%	12.3%	5.2%	100.0 %
Total	Count	362	361	151	95	969
	% within A3. Name of Institution	37.4%	37.3%	15.6%	9.8%	100.0 %

The above table suggests a cross-tabulation which supports the justification and responses concerning the level of students' familiarity with these SS/SW and ICT web technologies and its applications (Facebook, Twitter, Youtube, Blog, Wiki, Digital Library, Podcast, myUnisa, eFundi, Google classroom, Blackboard). Among these three universities, the NWU (MFK) was the first to be represented in table. Out of 304 respondents from the NWU Mafikeng Campus, 112 (36.8%) and 92 (30.3%) respectively completely agreed and agreed that they are familiar with the concepts of SS/SW and ICT web technologies tools as mentioned above. A majority of 67.1% therefore confirmed that they are familiar with these tools. Out of 166 respondents from the NWU Potchefstroom Campus, 41 (24.7%) and 82 (50%) completely agreed and agreed respectively. Therefore implies that 74.7% agreed. Similar results were found at the NWU Vaal Triangle Campus. Out of 163 respondents from the NWU Vaal Triangle Campus, 107 either completely agreed or agreed. This comes to a total of 65.7%.

A total sample of 182 Unisa students were asked about their degree of familiarity with ICT web technologies and applications, and 102 (56%) and 59 (32.4%) respondents completely agreed and agreed respectively. When viewed together, a remarkable 161 (88.4%) respondents indicated a high level of confidence with these ICT tools and applications. Finally, 154 respondents from the UP were asked about their level of familiarity, and 57 (37%) and 70 (45.5%) respondents were completely agreed and agreed respectively. In total, a majority of 127 (82.5%) respondents concurred.

In summary, when viewed together, out of the total sample size of 969, 723 (74.7%) respondents revealed that they are familiar with the concepts of ICT SS/SW and ICT web technologies and its applications for teaching and learning. Two-hundred and forty-six (27.1%) respondents disagreed. This result is supported by Noor Ul Amin (2013), who mentions that ICT has been present in a pedagogical context for a while, so it is not a new concept. In addition, research studies highlight that the advent of Web 3.0 and Web 2.0 technologies are fundamental for integrative, reflective and shared learning and therefore offers possibilities of supporting lifelong skill development (Moges, 2013; Madhukar, 2013; McLoughlin & Lee, 2007, 2008, 2010; Klamma *et al.*, 2007).

The second question in this section, D2, asked: "Based on your understanding of these tools, what is your view of the application of these SS/SW and ICT tools to support teaching and learning in higher education?" This question was divided into sub-questions (D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D2.7, D2.8, D2.9, D2.10 and D2.11) using the ranking order (1 = Very supportive; 2 = Supportive; 3 = Not aware; 4 = Not supportive) to help understand students' views on SS/SW and ICT web technologies and its application to support teaching and learning.

Table 7-7: **D2 – Respondents from NWU's (MFK) perceived views on SS/SW and ICT tools in supporting teaching and learning in HES**

Items	V. Supportive	Supportive	Not aware	N. supportive
D2.1. Overhead projectors	40.1%	26.6%	28.3%	4.9%
D2.2. Blackboard/WebCT	18.1%	33.2%	34.9%	13.8%
D2.3. Digital library	26.6%	44.4%	24%	4.9%
D2.4. Learning with 3D wiki	28.6%	42.8%	27%	2.3%
D2.5. Social networking sites (Facebook, Twitter, YouTube, and Skype)	32.2%	39.8%	23.7%	4.3%
D2.6. Semantic blog/Micro blogging	28.3%	43.4%	25%	3.3%
D2.7. Podcast/vodcast	30.6%	34.9%	30.9%	3.6%
D2.8. eFundi	66.8%	20.1%	10.9%	2.3%
D2.9. MyUnisa	0%	0%	45.7%	54.3%
D2.10. ClickUP	0%	0%	71.1%	28.9%
D2.11. MyTUKS	0%	0%	32.6%	67.4%

The terms "very supportive" and "supportive" were combined to represent supportive and "not aware" and "not supportive" were combined to represent not supportive. The results of the three campuses of the NWU indicated that students use e-Fundi extensively on all three campuses. On all three campuses it seems that this is the tool used most frequently. When the question in section D2.9 was raised with the respondents from Unisa to indicate whether they regard myUnisa as supportive or not, the majority of the respondents (67%) indicated that the myUnisa learning platform is supportive. The majority of the respondents from the University of Pretoria indicated that the ClickUP (84.10%) and MyTUKS (91%) learning platforms are supportive.

The interesting finding to note from the answers to the questions in this section, is that students seem to have a more positive attitude towards the different LMSs than to any of the other technologies. This means that these learning platforms do make a great contribution to teaching and learning. The next section provides the researcher with a detailed interpretation of the results of student digital competence and confidence levels.

7.4.4 Section E: Students' digital competences and confidence levels

This section aims to answer the third research question: "What is the extent of educators and students' ICT confidence, readiness, willingness, and their digital competence to ensure a systematic and systemic approach to supporting and sustaining technological innovation in teaching and learning?"

This section included a series of questions. Question E1 tested whether technophobia exists among the participants. The participants were asked "Do you have phobia towards ICTs and web technologies?" The results are shown below.

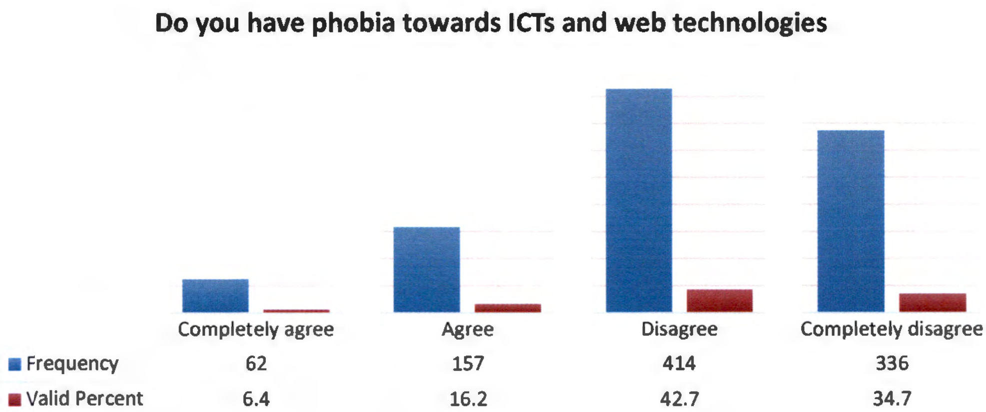


Figure 7-7: E1 – Phobia of ICTs and web technologies

The figure above reveals that the majority (77.4%) of the participants disagreed with question E1, which implies that they do not have phobia when using ICTs and web technologies.

E2 and E3 concerned behavioural patterns, attitudes and difficulties when using SS/SW and ICT tools and application such as Facebook, Twitter, YouTube, Skype, blogs, wikis, myUnisa, eFundi, clickUP, MyTUKS etc. The results are illustrated in Figure 7.8. The respondents completely agreed, 79.4% had a positive attitude when using ICTs web technologies. This also implies that the students are digital natives. Trinder *et al.*, (2008) mentions that the term digital native implies that students are able to make use of technological tools to meet their essential needs. They can for instance capture photographs for projects through the use mobile devices and distribute them among fellow students using different SS/SW and ICT web technologies and applications.

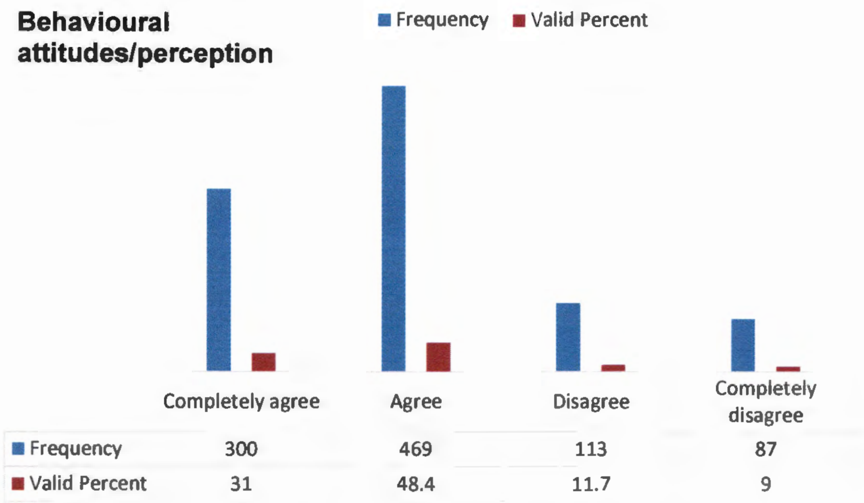


Figure 7-8: ***E2 – Students' behavioural attitudes and technophobia***

Although the majority of the respondents indicated in question E2 that they do not feel negative about using ICT web technologies, a follow-up question was asked to determine their level of confidence when using these tools. It is clear that a positive attitude and confidence do not always go together, since the majority (70.8%) of the respondents agreed that some of these ICTs tool and web applications can be challenging to use at times, despite their positivity about it.

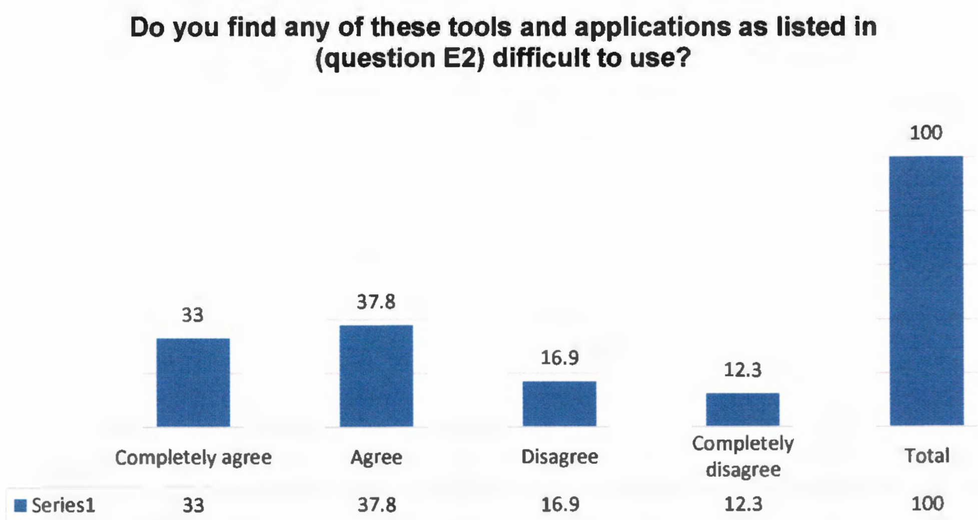


Figure 7-9: ***E3 – Difficulties to use ICTs and web technologies***

Question E4 attempted to establish the students' confidence level with the question: "How is your confidence level when using any of the ICT tools and application such as Facebook, Twitter, YouTube, Skype, blogs, wikis, Digital Library, podcasts, myUnisa, eFundi, clickUP, MyTUKS etc. in your learning?", and E5 asked "How is your willingness/readiness to use ICT tools and application in your learning?"

The following rating was used to answer E4 and E5: 1 = "Outstanding" 2 = "Standard 3 = "Average" 4 = "Basic" and, 5 = "Poor". As well as "Willing", "Enthusiastic", "Not willing", "Not interested" and "Normal". For question E6, choices included completely agree, agree, disagree and completely disagree (see Table 7.9).

Table 7-8: Confidence level, willingness/readiness to use ICTs web technologies supporting teaching and learning in HES

	Items	Frequency	Percent
E4. How is your confidence level when using ICTs?			
	Outstanding	369	38.1
	Standard	376	38.8
	Average	168	17.3
	Basic	39	4.0
	Poor	17	1.8
E5 How is your willingness/readiness to use ICTs?			
	Willing	445	45.9
	Enthusiastic	341	35.2
	Not willing	52	5.4
	Not interested	31	3.2
	Normal	100	10.3
E6 Would you agree that your educators/supervisors use ICT applications to facilitate learning?			
	Completely agree	283	29.2
	Agree	543	56.0
	Disagree	104	10.7
	Completely disagree	39	4.0

Section E4 aimed to determine students' confidence levels. Out of 969 participants, 376 (38.8%) participants could attest that their confidence level is standard, while, 369 (38.1%) of respondents believed that their confidence is outstanding. The respondents who indicated average confidence levels numbered 168 (17.3%). The remaining were those by minority with

39 and 17 of 4%; 1.8%. Table 7.9 provides an overview of the frequencies and the percentages of respondents' level of confidence. A cross-tabulation table was plotted to compare the responses using an age distribution in an effort to provide a true reflection.

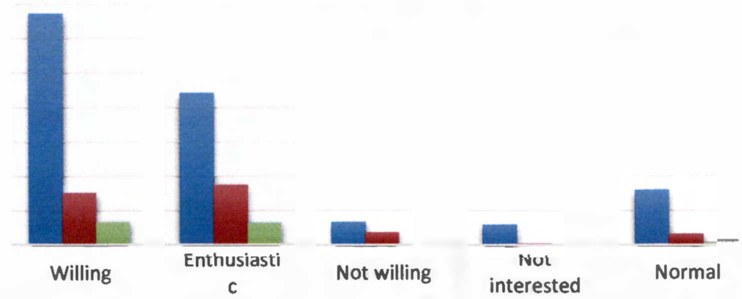
Table 7-9" A2 – Age * E4 – Cross-tabulation of confidence level when ICT tools and applications such as Facebook, Twitter, YouTube, Skype, Blog, Wiki, Podcast, myUnisa, eFundi, clickUP, MyTUKS etc. in learning

Items		Outstanding	Standard	Average	Basic	Poor
A2. Age	18–25	274	265	123	23	14
	25–31	65	87	29	16	3
	31 and above	30	24	16	0	0
Total		369	376	168	39	17

The table shows that age is a determinant of students' level of confidence. Of the 376 participants who attested that their confidence level is standard, 265 fell into the age category of 18–25. If the 369 participants who believed that the confidence levels were outstanding, 274 ranged between the ages 18–25.

Question E5 was designed to establish students' willingness/readiness to use ICTs. The majority indicated their willingness and readiness to accept and use ICTs and web technologies. A large number of respondents were enthusiastic to accept and use ICTs web technologies in there learning process. This means that 45.9% indicated that they are willing, 35.2% enthusiastic; 5.4% not willing; 3.2% not interested and 10.3% normal.

Cross-tabulation Age * How is your willingness/readiness (ICTs) tools and application



	Willing	Enthusiastic	Not willing	Not interested	Normal
A2. Age 18-25	336	221	33	29	80
A2. Age 25-31	76	88	18	2	16
A2. Age 31 and above	33	32	1	0	4

Figure 7-10: Cross-tabulation of age * willingness/readiness to use ICT tools

Of the students who indicated their willingness/readiness to accept and use ICT tools and applications, 336 (45.9%) were in the age category between 18–25, followed by 221 who indicated that they are enthusiastic.

Question E6 attempted to examine whether educators use some of these SS/SW and ICTs web tools in their teaching and learning. This question was directed at all students as they would be able establish whether their educators incorporate these tools. Nevertheless, in the previous chapter, the researcher already provided evidence about the tools that educators use. This question was to support the claims presented by the educators in alignment with what students observed during learning. Respondents were asked to what extent they would agree or disagree that their educators/supervisors use some of these ICT tools application to facilitate learning.

Out of 969, 826 (85.2%) respondents affirmed that their educators use some of these ICT web tools. When respondents were asked in question E7 section (E7.1–E7.11) to identify which among these social software and ICT tools their educators/supervisors use most frequently to facilitate teaching and learning, the results reveals that out of 969 respondents, 755 (77.9%) indicated that their educators use overhead projectors most frequently, 526 (54.3%) and 519 (53.6%) said that blackboard/WebCT and digital tools were never in use. In terms of learning with 3D wiki and social networking sites; 57.7% and 53.8% agreed.

When asked about semantic blogging and podcasting/vodcasting, respondents (55.2% and 57.5%) revealed that these tools where not in use by their educators. One has to bear in mind that the NWU Mafikeng holds the highest targeted sample size of 304 participants among the selected universities, something that would influence the results.

Two-hundred and forty-nine respondents (81.9%) from the NWU Mafikeng Campus, 131 (78.9%) from the NWU Potchefstroom Campus, 123 (78.5%) from the NWU Vaal Campus, 123 (67.5%) Unisa, and 124 (80.5%) from the UP indicated that their educator/supervisors use overhead projectors to facilitate teaching and learning. Only UP respondents (105 – 68.1%) would attest that their educators use Blackboard, while the rest of the universities do not.

Only respondents from Unisa (128 – 70.3%) and from the UP (124 – 80.5%) were able to confirm that that their educators incorporate learning with 3D wikis in their teaching. Unisa (98 – 53.8%) and UP (134 – 87%) combine the use of social networking sites with their teaching.

Questions were asked with regard to the use of semantic blogging/micro blogging. These types of blogging create the avenues or platforms where learners are able to communicate with fellow peers and their educator in the form of discussion forums. Question E7.6 was directed at participants from the selected universities to establish whether their educators use this type of forums to engage with students. The results showed that Unisa (116 – 63.7%) and UP (135 – 87.6%) respondents use this platforms frequently during teaching and learning, while the three campuses within the NWU do not. A similar result is visible with question E7.7. The NWU was found not to be using podcasting/vodcasting, while the Unisa (113 – 62%) and the UP respondents (117 – 75.9%) do use this platform

When respondents were asked to indicate whether their educator use these learning management systems (eFundi, myUnisa, clickUP and MyTUKS), the responses generated from each university's respondents differed because each use different learning management systems. However, it was clear that all universities do uses some of these LMSs extensively.

Crook *et al.* (2008) describe how UK campus universities have willingly adopted and incorporated both blogs and wikis. The Newport University's site, called Mylearning essentials (Newport, 2008), offers an online learning atmosphere for learners by delivering university information updates, study and library resources and the news about the university services, with photographs. Sharma (2008) reports on the use of Elgg at Athabasca University, Canada's Open University. The author discusses how social network tools such as Elgg are essential and convenient for education given its many e-learning features. The research defines social presence as the capability of students to arrange themselves into a community of inquiry. Sharme (2008) discovered that social activity is associated with learner fulfilment and increases performance on learning outcomes.

Question E8 asked respondents to indicate to what extent they agreed or disagreed with the following statements using 1 = completely agree; 2 = agree; 3 = disagree; 4 = completely disagree: "What do you think inspired your educators/supervisors to use any of these Information Communication Technologies (ICTs) tools application to facilitate and support learning?" The table presents the justification for educators to use these ICT tools.

Table 7-10: Inspiration and motivation associated with the use ICT tools and applications

Items	Motivation to use
E8.1. Collaborative learning	69%
E8.2. Student's relationship management	73.4%
E8.3. Quality service delivery	76.7%
E8.4. Improved administration processes	69.9%
E8.5. Transitioning/Change	65.8%
E8.6. Easy access to learners	81.8%
E8.7. Improved learning theories (connectivism)	64.5%
E8.8. Knowledge creation management	79.7%
E8.9. Improved and integrated learning	72.4%
E8.10. Information quality	71.6%

The table reveals that educators across the board were motivated by easy access to learners (81%). Other motivations included knowledge creation management (79.7%); quality service delivery (76.7%); student relationship management (73.4%); improved and integrated learning (72.4%); information quality (71.6%); improved administration processes (69.9%); collaborative learning (69%); transition (65.8%) and improved learning theories (connectivism) (64.5%). Research reveals evidence that SW /SS can improve learners' management by offering the learner control over their own learning as discussed above.

The proposed diagrammatic representation suggests the educational impact into four leaves: innovation/collaboration, content-drivenness, information quality and transformation or sustainability (Dabbagh & Reo, 2011; Parmar & Siwach, 2010; Wheeler, 2010; McLoughlin & Lee, 2010; Minocha, 2009; O'Reilly, 2005).

7.4.5 Section F: Challenges associated with SS/SW and ICT adoption

In this section of the chapter, the focus is on the controversies and challenges associated with the adoption of SS/SW and ICT web technologies into HES for educational purposes. Question F in the question guide was aimed at understanding the opinion the challenges that keep educators/supervisors from using these ICT tools during facilitation of learning.

The challenges represent the sixth and the seventh literature matrix themes. The results of the analyses have shown that the integration and adoption of SS/SW and ICT web technologies into HES is crucial for distinctive reasons. Schroeder *et al.* (2010b) argue that specific consideration should go to the legal aspects associated with the use of SS/SW in the public domain. The public domain raises the issues such as data protection and privacy as it is the duty of the institutions to protect students using public tools for student assessment (Schroeder *et al.*, 2010b).

The analysis presented depicts the variables that serve as associated factors that may pose challenges for the successful adoption of these web tools. The respondents mentioned the following variables as challenges: "difficult to integrate ICT into teaching" (57.3%); "difficult to use" (56.5%); "insufficient educators' time" (57.2%); "heavy workloads" (67.7%); "not enough simultaneous access" (61.1%); "phobia to use web technologies" (50.5%); "attitudes/perceptions" (68.2%); "lack of proper knowledge, skills and capacity" (60.9%); "lack of confidence level" (61.2%); "lack of willingness to accept change" (60.8%); "lack of resources (computer facilities)" (54.1%) and "technical assistance/training" (68%). Bingimlas (2009) groups the variables into extrinsic and intrinsic challenges. Extrinsic challenges include access, time support resources and training, while intrinsic challenges included attitudes, beliefs, practices and resistance (Bingimlas, 2009). This result were confirmed by Angeli and Valanides (2009), who disclosed educators' lack in integrating ICT tools into learning prospectus. Kumar *et al.*, 2008 added that educators are encountering challenges in the use of ICT web tools.

Other issues include privacy, reputation, identity, beliefs, and behavioural patterns as presented in the proposed diagrammatical framework (Crook, 2008; Yan, 2006). The issues of costs implication, benefits, risk associated with software crises and flexibility were all considered in Chapter 6 (Lefever & Currant, 2010, Omona *et al.*, 2010; Colburn *et al.*, 2008).

7.4.6 Section G: Student development and support programmes

In section G, the aim was to test ideas on the development of a support programme that would provide learners with the right exposure and skills that they would require in pursuit of career development. This is in alignment with the seventh literature matrix theme. This matrix theme answers the final research question: The focus has shifted from the educators to the students. Given this study's research problem, the lack of ICT knowledge/skills among learners continues to be a major challenge confronting several universities as South African universities continue to accommodate new applicants who have little experience with use of ICT in during their school years. Learners require thorough support to bridge the gap in the required knowledge and skills exposure (Ohei *et al.*, 2015; Jaffer *et al.*, 2007; Ohei & Lubbe, 2013; Paras, 2001).

Table 7-11: Respondents' suggestions for learner development support

Items	Frequency	Percent
Not specified	198	20.4
Be referred to academic support programme	402	41.5
Introduce ICT as compulsory module	369	38.1
Total	969	100.0

The majority of respondents suggest that learners who struggle should be referred to the university's academic support programme. Others suggested the introduction of ICT module as compulsory for all students as they enrol at their universities. This will help them gain the required knowledge, skills and the ability to familiarize themselves with ICT tools and applications. The next section discusses the reliability analysis test for consistency within the research instruments used.

7.5 Reliability analysis

The Cronbach's alpha (α) reliability coefficient measures the reliability (or internal consistency) of the items on the Likert scale (Likert scale of 1-5, where 5 = completely agree and 1 = completely disagree). The Cronbach's alpha's numerical value ranges from 0 to 1. A high value (close to 1) for the Cronbach's alpha reliability coefficient indicates good internal consistency among the items in the scale. Reliability simply signifies consistency. It is the degree to which an instrument will give similar results for the same variables at different times. Reliability can take on values of 0 to 1.0. For this study the researcher used the reliability analysis test to check the questionnaire from Section C to F. The results are represented below.

Table 7-12: **Reliability test**

Dimension/Section C–F	Cronbach's Alpha (α)	No. of Items	Variables	Remarks
Integrating ICT tools and application in HES (Sec C)	0.382	5	C13-C17	Scale is almost 40% reliable
Framework analysis of SWBES (Sec D)	0.276	10	D1, D21-D2.11	Scale is almost 40% reliable
Level of students' digital competences and confidence level (Sec E)	0.551	26	E1-E6;E7.1-E7.11 & E8.1-E8.10	Scale is almost 60% reliable
Controversies/challenges (Sec F)	0.825	12	V59 -V70	Good reliability

The Cronbach's alpha coefficients in Table 4.12 above suggests that a score that is below 0.7 indicates that the items within the dimension may not be measuring the same basic concept. This in turn means that alpha tends to miscalculate the degree of internal consistency of a scale when errors are uncorrelated. In addition, the Table 7.12 above suggests that alpha's estimation of reliability can also be inflated when the errors for each item are correlated or the number of items is significantly increased. The degree of alpha's baseness has also been revealed to depend on the consistency of the samples from which scores are derived. Furthermore, the reliability analysis as seen in the above tabulation shows that the scales are less reliable (α<0.7) in terms of the first three dimensions. This is due to some inconsistent responses by the correspondents. Nevertheless, the scale in terms of the challenges that limits educators/supervisor from not using ICT tools during facilitation of learning is 0.825 relaible.

7.6 Correlation analysis

Correlation is a statistical way of determining whether or not there is an association or relationship between two variables. It also used to indicate the level of strengths, weaknesses and the direction of a linear relationship between two variables. Furthermore, the level of association or relationship is basically within the range of +1 and -1. For this study, the correlation is measured by the p-values, when the p-values is < (less than or equals) to 0.01, it means that the correction is significant and the opposite is insignificant. The motivation behind this statistical approach in a research study is that variables may be interrelated, and as such, their level of dependence and association should be tested. This is intended to monitor and establish the level of interrelatedness of variables. The below table provides a brief demonstration for clarity.

Table 7-13: Correlation coefficient

Correlation coefficient range	
- 1 = Strong downhill	Negative
- 0.70 = Strong downhill	
- 0.50 = Moderate downhill	
- 0.30 = Weak downhill	
0 = No linear relationship	
0.30 = A weak uphill	Positive
0.50 = Moderate uphill	
0.70 = A strong uphill	
1 = A perfect uphill	

7.6.1 Correlation analysis of questions in Section B: Internet awareness and access

In this section of correlation analysis, the researcher conducted three (3) separate statistical analysis tests, namely the analysis of variance (ANOVA), the Spearman's rank rho correlation analysis and the Chi-square (X^2) test of independence. All these statistical analysis tests were applied to the questions in Sections B–F of the questionnaire guide, starting with section B.

7.6.1.1 Analysis of Variance (ANOVA) Test

The purpose of the ANOVA test is to compare the average responses of more than two populations. Samples are selected randomly from these populations and the variances of the populations' responses are assumed to be equal. The population responses are also assumed to be normally distributed. The difference of opinions (views) among the populations is statistically significant if the p-value is less than a 0.05 level of significance.

Factor: Name of the University (A3)

Dependent variables: B1 and B2

ANOVA Results: Statistically this implies that there is no significant difference between the population means.

Table 7-14: Basic Computer Skills

Table B1. Do you have basic computer skills (Ms Word, Excel, PowerPoint, access, internet etc.)?		
		Subset for alpha = 0.05
A3. Name of University/Institution	N	1
NWU (MFK)	304	1.724
NWU (POTCH)	166	1.837
NWU (VAAL)	163	1.865
UNIVERSITY OF PRETORIA (UP)	154	1.903
UNISA	182	1.945
Sig.		0.104

In this case, the p-values are larger than 0.05, which signifies that the equality variance assumption is not satisfied. There is a slight difference in the population samples across the three institutions. This ultimately denotes that the responses derived from the institutions may differ slightly since the group sizes were unequal. The harmonic mean of the group sizes was used. In simpler terms, when respondents were asked in (B1) whether they have basic computer skills (such as Ms Word, Excel, PowerPoint) and the results were compared with the name of the university to establish if there was variance, it shows that there is no significant correlation between these responses as the universities differ. Their responses also differ with regard to B1–B6 as their p-values are greater than >0.05.

7.6.1.2 Correlation analysis (Spearman's rank rho test)

A Spearman's correlation coefficient is a statistical measure of the strength of a monotonic relationship between paired data. In a sample coefficient, the coefficient is represented by ρs for a population parameter and r_s for a sample statistic (Mukaka, 2012). Its interpretation is related to that of Pearson's, e.g. the closer r_s is to ±1, the stronger the monotonic relationship. Correlation is an effect size and so the researcher can label the strength of the correlation. For a correlation between variables x and y, the formula for calculating the sample Spearman's correlation coefficient is given below. This test is concerned with the relationship between two ranked variables (X and Y). The relationship is statistically significant when the p-value is (less than) 0.05.

The coefficient of Spearman's rank correlation is given by

$$r = 1 - \frac{6\sum D^2}{N(N^2-1)}$$

Where

D = differences of ranks of corresponding values of X and Y

N = number of paired values in the data

$-1 \le r_s \le 1$

Table 7-15: Spearman's rank correlation between age (A2) and views of respondents concerning the frequency with which they access the internet (B3)

Items		
How/when do you often access the internet? (B3)	Correlation coefficient(r)	-0.071
	p - value	0.028

SPSS 22 was used to perform the correlation analysis and the results are shown in Table 7.16. Since the p-value was less than 0.05, the correlation between age and views of respondents about the items listed in Table 7.16 is significant. A negative correlation coefficient (r = -0.071) implies that older respondents tend to access the internet every day, whereas younger respondents tend to access the internet rarely. See Figure 7.11 below.

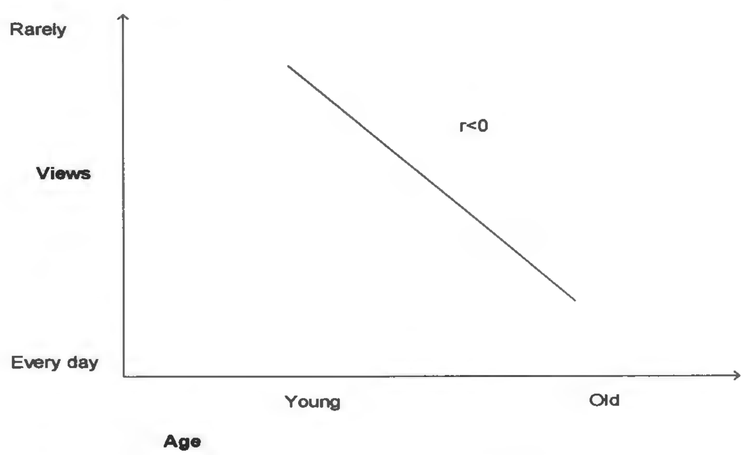


Figure 7-11: Views of respondents versus age (r < 0)

This denotes that the results shown in Figure 7.2 signify that students between the ages of 18–25 access the internet more. Figure 7.11 reveals that older respondents have the tendency to use the internet more frequently as opposed to the younger generation. This may be due to the fact that older students are post-graduates. They perhaps use the internet for research studies that require them to access the internet frequently for a reasonable amount of time. On the other hand, some of these post-graduate students may be employees and may have to carry out their day-to-day activities. Next, the multivariate correction was conducted against each variable in the section and the result is demonstrated below.

Table 7-16: Multivariate correlation of the internet access

Research question	Correlation	P-value	Type of correlation	Significance
B1/B3	0.277**	0.000	Weak positive	Significant
B1/B2	0.469**	0.000	Weak positive	Significant
B3/B2	0.293**	0.000	Weak positive	Significant
B1/B6	-0.159	0.000	Weak negative	Significant
B5/B6	0.099**	0.002	Weak positive	Significant

The table above establishes the association between the variables. All the variables shown were significantly correlated at 1% in a range to the internet access and awareness. The correlation between (B1) and (B3) were carried out to ascertain whether students have basic computer skills and how this relates to how/when students access the internet. The correlation (B1) attempts to understand whether students have basic computer skills against (B2) if students do have internet access. A correlation analysis of (B1) whether students do have basic computer skill against (B6) if students do have computer skills, what purpose they use the internet for. Since all these variables' p-values are at 1%, the correlation range depicts weak positive and negative correlation. However, it is significant to the study. See Annexure L: Cross-tabulation section B correlation table.

7.6.1.3 Chi-square test of independence

A chi-square (X^2) test is where tentative frequencies are compared to theoretical frequencies based on a hypothesis that may be applicable to various situations. This X^2 test then tests the structure of outputs to ascertain whether a single variable approach represents similar output (Wegner, 2012). Eventually, this test of independence is concerned with the relationship between two different factors (or categories) in a population under study. The X^2 can be used to:

- test whether two independent variables are related;
- test for dependency of both variables relatedness; and finally
- test for superiority or equality of two more variables.

When the p-value is less than or equal to 0.05 p≤ 0.05, statistically there is a significant difference between the variables. When the p-value is greater than 0.05 p> 0.05, statistically there is NO significant difference between the variables. However, note that p indicates probability.

Table 7-17: Cross-tabulation of respondents' views about their computer skills by gender

	Do you have basic computer skills? (B1)				
Gender (A1)	**Completely agree**	**Agree**	**Disagree**	**Completely disagree**	**Total**
Male	234	165	82	234	505
Female	162	229	38	162	464
Total	396	394	120	396	N = 969
	p-value = 0.000 chi-square statistic = 40.008 df = 3				

SPSS 22 was used to perform a chi-square test of independence for the data in Table 7.17. The observed frequencies, chi-square statistics and the p-value with 3 degrees of freedom (df) are shown in Table 7.17. Since the p-value (0.000) is less than <0.05 level of significance, the views of the respondents about their basic computer skills are significantly dependent on their gender. It means that the majority (82/120 = 68%) of the respondents who disagree with the item listed in Table 7.17 are men, whereas the majority (229/394 = 58%) of the respondents who agree are women.

Table 7-18: Cross-tabulation of respondents' views about access to internet by gender

	How/when do you often access the internet? (B3)				
Gender (A1)	**Every day**	**2–3 days**	**Once a week**	**More than a week**	**Total**
Male	278	121	91	15	505
Female	280	125	31	28	464
Total	558	246	122	43	N = 969
	p-value = 0.000 chi-square statistic = 31.833 df = 3				

Since the p-value (0.000) is less than <0.05 level of significance, then the views of the respondents about Internet access are significantly dependent on their gender. It means that the majority (125/246 = 51%) of the respondents who access Internet after 2 -3 days are women, whereas the majority (91/122 = 75%) of the respondents who access Internet once a week are men.

Table 7-19: Cross-tabulation of respondents' views on the length of time on the internet by gender

Can you approximate the number of hours you spend using the internet in a day? (B5)					
Gender(A1)	**Less than 1 hour**	**1–2 hours**	**3–4 hours**	**5 hours and above**	**Total**
Male	52	201	222	30	505
Female	68	166	159	71	464
Total	120	367	381	101	N = 969
	p-value = 0.000	chi-square statistic = 30.853		df = 3	

The p-value (0.000) shown in the table above is less than the 0.05 level of significance. This suggests that the views of the respondents about internet access are significantly dependent on their gender. It means that the majority (68/120 = 57%) of the respondents who spend less than one hour using the internet in a day are women, whereas the majority (201/367 = 55%) of the respondents who spend 1–2 hours using the internet in a day are men. More women (females) were found to use the internet for less than an hour than men. The majority of the men (males) would use the internet for about 1–2 hours on daily basis.

The next X^2 test in this section of the chapter is to determine the degree of freedom between the use of the internet and access. The table shown below compares two variables to distinguish when students do have access to the internet, what purpose they use it for (B6). This variable was also tested against (A4) level of studies. The table below depicts the result from the Chi-square test performed on both variables. The X^2 distribution arrived at the level of 16 degree of freedom, and the X^2 value at 31.903 with the level of significance of 0.01, which is perceived to be less than the level of significance of 0.05. This implies that at the level of 0.05 level of significance, the p-values are less than <0.05 (0.01), which suggests that the views of respondents is significant

Table 7-20: Respondents' views about access to the internet and the purpose for which they use the internet * A4. Level of study

	Value	Df	Asymptotic significance (2-sided)
Pearson Chi-square	31.903[a]	16	0.01
Likelihood Ratio	33.683	16	.006
Linear-by-Linear Association	9.574	1	.002
N of Valid Cases	969		

7.6.2 Correlation analysis of questions in Section C: Integrating ICT tools and application in HES

7.6.2.1 Analysis of Variance (ANOVA) Test

Factor: Name of the University (A3)

Dependent variables: C1 – C5

ANOVA Results: No significant difference of the population means (p-values > 0.05, equality variance assumption not satisfied)

7.6.2.2 Correlation Analysis (Spearman's Rank rho Test)

Table 7-21: Spearman's rank correlation between age (A2) and views of respondents concerning the integration of ICT tools in education (C2

Items		
The adoption of social software and Information and Communication Technologies (ICTs) tools and application can improve easy access to education at any given time and place? (C2)	Correlation coefficient(r)	0.071
	p - value	0.027

Since the p-value is less than the 0.05 level of significance, the correlation between age and views of respondents about the item listed in Table 7.21 is significant. A positive correlation coefficient (r = 0.071) implies that older respondents tended to disagree with the item listed in Table 7.21, whereas younger respondents tended to agree. See Figure 4.11 below.

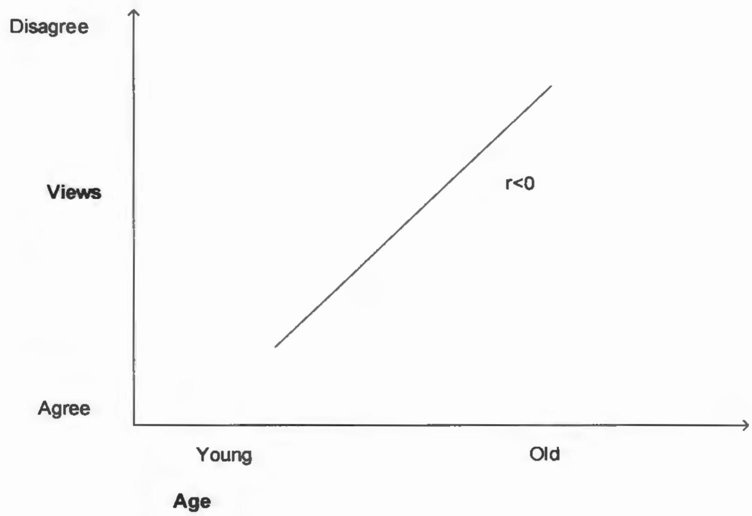


Figure 7-12: Views of respondents by age (r > 0)

7.6.2.3 Chi-square test of independence

In this section, the use of Chi-square hypothesis test was deployed to decide the degree of freedom between independent variables against gender to adequately reflect on the views of respondents on whether to accept the adoption, integration of SS/SW and ICT web technologies into HES.

The tests below were performed to test the null hypothesis and the alternative hypothesis on whether to accept or reject the hypothesis. At the significance level of 0.05 where the p-value is less than or equals to $\leq$0.05, the null hypothesis is rejected and we accept the alternate hypothesis. The same applies to be were the p-value is greater than > 0.05, we fail to reject the null hypothesis, but accept the null hypothesis.

The Chi-square distribution table emerged to assist in determining the degree of freedom. The X^2 test was performed to establish whether the adoption of social software and ICT tools and its applications in teaching and learning can assist learners with their course module (C1) against (A1) Gender.

Table 7-22: Views of respondents about ICT assisting learners with course module

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-square	2.526[a]	3	0.471

Likelihood Ratio	2.530	3	0.470
Linear-by-Linear Association	0.015	1	0.902
N of Valid Cases	969		

Zero cells (0.0%) have an expected count of less than 5. The minimum expected count is 53.15.

H_0: The adoption of social software and ICT tools and application in teaching and learning can assist learners with their course module (null hypothesis)

H_1: The adoption of social software and ICT tools and application in teaching and learning will not assist learners with their course module (alternate hypothesis)

The demonstration depicted in the tabulation table reveals that the value of X^2 is 2.526 on probability, with the df at 3 and the p-value of 0.471, which is greater than the conventional significance level of 0.05 (i.e. $p>0.05$), hence this fails to rejects the null hypothesis.

H_0: The null hypothesis [students] that the integration of SS/SW and ICT web technologies into HES can assist learners with their module, is accepted.

Table 7-23: Views of respondents on whether integrating ICT tools provides easy access to educational resources and contents

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-square	0.715^a	3	0.870
Likelihood Ratio	0.715	3	0.870
Linear-by-Linear Association	0.083	1	0.773
N of Valid Cases	969		

Zero cells (0.0%) have an expected count of less than 5. The minimum expected count is 49.32.

H_0: The adoption of social software and ICT tools and application in teaching and learning can improve easy access to education at any given time and place (null hypothesis).

H_1: The adoption of social software and ICT tools and applications in teaching and learning will not improve easy access to education at any given time and place (alternate hypothesis).

In this case the value of X^2 is 0.715 on probability, with the df at 3 and the p-value of 0.870, which is greater than the conventional significance level of 0.05 (i.e. $p>0.05$). This fails to reject the null hypothesis.

H_0: The null hypothesis [students] that the integration of SS/SW and ICT web technologies into HES can improve easy access to education and contents at any given time or place, is accepted.

Table 7-24: Views of respondents on web technologies improving quality education delivery

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-square	5.843[a]	3	0.120
Likelihood Ratio	5.861	3	0.119
Linear-by-Linear Association	4.282	1	0.039
N of Valid Cases	969		

Zero cells (0.0%) have an expected count of less than 5. The minimum expected count is 31.12.

H_0: The adoption of SS and ICT tools and application in teaching and learning can improve quality education delivery (null hypothesis).

H_1: The adoption of social software and ICT tools and applications in teaching and learning will not improve quality education delivery (alternate hypothesis).

From the tabulation table, the value of X^2 is 5.843 on probability, with the df at 3 and the p-value of 0.120, which is greater than the conventional significance level of 0.05 (i.e. $p>0.05$). This fails to rejects the null hypothesis.

H_0: The null hypothesis [students] that the integration of SS/SW and ICT web technologies into HES can improve quality education delivery, is accepted.

Table 7-25: Views of respondents on ICT web technologies improving learners' performance

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-square	3.137[a]	3	0.371
Likelihood Ratio	3.136	3	0.371
Linear-by-Linear Association	2.325	1	0.127
N of Valid Cases	969		

Zero cells (0.0%) have an expected count of less than 5. The minimum expected count is 53.15.

H_0: The adoption of SS and ICT tools and applications in teaching and learning can improve learners' performance (null hypothesis).

H_1: The adoption of SS and ICT tools and applications in teaching and learning will not improve learners' performance (alternate hypothesis).

From the tabulation table, the value of X^2 is 3.137 on probability, with the df at 3 and the p-value of 0.371, which is greater than the conventional significance level of 0.05 (i.e. $p>0.05$). This fails to reject the null hypothesis.

H_0: The null hypothesis [students] that the integration of SS/SW and ICT web technologies into HES can improve learner's performance, is accepted.

Table 7-26: Views of respondents on ICT web technologies increasing learning motivation, enthusiasm and collaboration

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-square	7.323[a]	3	0.062
Likelihood Ratio	7.353	3	0.061
Linear-by-Linear Association	0.302	1	0.583
N of Valid Cases	969		

a. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 52.19.

H_0: The adoption of SS and ICT tools and applications in teaching and learning can increase learning motivation, enthusiasm and collaboration (null hypothesis)

H_1: The adoption of SS and ICT tools and application in teaching and learning will not increase learning motivation, enthusiasm and collaboration (alternate hypothesis)

From the tabulation table, the value of X^2 is 7.323 on probability, with the df at 3 and the p-value of 0.062, which is greater than the conventional significance level of 0.05 (i.e. $p>0.05$).This fails to reject the null hypothesis.

H_0: The null hypothesis [students] that the integration of SS/SW and ICT web technologies into HES can increase learning motivation, enthusiasm and collaboration, is accepted.

In conclusion, there is no significant relationship between gender (A1) and the opinions of the respondents about the integration if ICT tools application in education (C1 – C5, p-values > 0.05). In this instance, H_0 accepts the adoption and integration of SS/SW and ICT web technologies to complement teaching and learning in HES (null hypothesis), while on the other hand H_1 does not accept the adoption and integration of SS/SW and ICT web technologies to complement teaching and learning in HES (alternate hypothesis). Since all the p-values of respondents in section C1–C5 questions against A1 are greater than the conventional significance level of 0.05 (i.e. $p>0.05$), this justification of the result in the X^2 tests fails to rejects the null hypothesis. Therefore:

H_0 Accept the null hypothesis [students] that the adoption and integration of SS/SW and ICT web technologies complement teaching and learning in HES (null hypothesis)

7.6.3 Correlation analysis of questions in section D: Framework analysis of SWBES

7.6.3.1 Analysis of Variance (ANOVA) Test

Factor: Name of the University (A3)

Dependent variables: D2.1, D2.2 and D2.6 (D2.3-D2.5 and D2.7-D2.11), not significant, p-values > 0.05)

Table 7-27: Views of respondents on the application of SS/SW and ICT tools to support teaching and learning in higher education

Item	p-value
Overhead projectors support teaching and learning in higher education (D2.1)	0.002
Blackboard/WebCT supports teaching and learning in higher education (D2.2)	0.013
Semantic blog/Micro blogging supports teaching and learning in higher education (D2.6)	0.000

SPSS 22 was used to perform an ANOVA test for the data in Table 7.27. Since the p-values are all at a less than 0.05 level of significance, there is a significant difference between the population means of responses among the respondents in the three universities. It means that the respondents at these three universities do not equally agree on the items listed in Table 7.27.

7.6.3.2 Correlation Analysis (Spearman's rank rho test)

Table 7-28: Spearman's rank correlation between age (A2) and views of respondents concerning the framework analysis of SWBES

Items	Spearman's rank	Sig
Digital library supports teaching and learning in higher education (D2.3)	Correlation coefficient(r)	-0.103
	p - value	0.001
Learning with 3D wikis supports teaching and learning in higher education (D2.4)	Correlation coefficient(r)	-0.078
	p - value	0.015
Social networking sites (Facebook, Twitter, YouTube, and Skype) support teaching and learning in higher education (D2.5)	Correlation coefficient(r)	-0.066
	p - value	0.040
e-Fundi supports teaching and learning in higher education (D2.8)	Correlation coefficient(r)	-0.158
	p - value	0.000
ClickUP supports teaching and learning in higher education (D2.10)	Correlation coefficient(r)	0.097
	p - value	0.003
MyTUKS supports teaching and learning in higher education (D2.11)	Correlation coefficient(r)	0.139
	p - value	0.000

Since all the p-values are less than the 0.05 level of significance, the correlation between age and the views of respondents about the items listed in Table 7.27 is significant. The correlation coefficient shown in Table 7.28 are very low and suggest a very weak correlation. Negative correlation coefficients (r= -0.103, -0.078, -0.066 and -0.158) imply that older respondents tended to agree with the listed items, whereas younger respondents tended to disagree. Positive correlation coefficients r=0.001, 0.015, 0.040, 0.000, 0.097, 0.003 and 0.139) imply that older respondents tended to disagree with the listed items, whereas younger respondents tended to agree. See Figure 7.13 below.

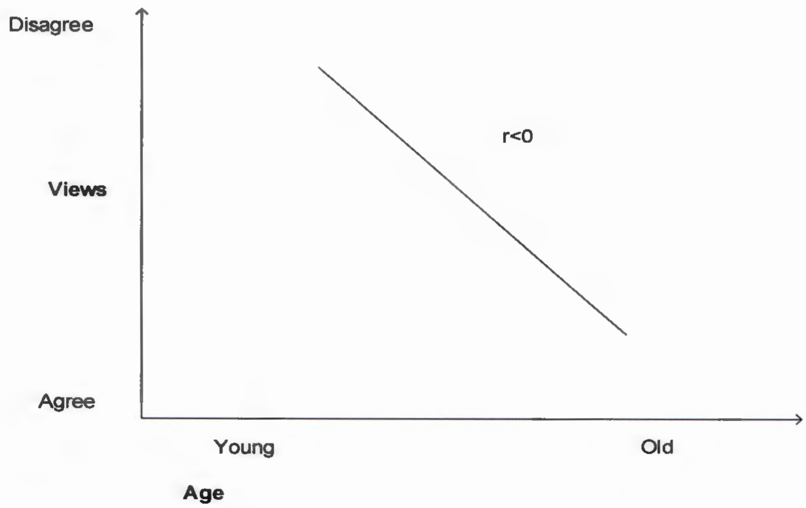


Figure 7-13: (a): Views of respondents by age (r < 0)

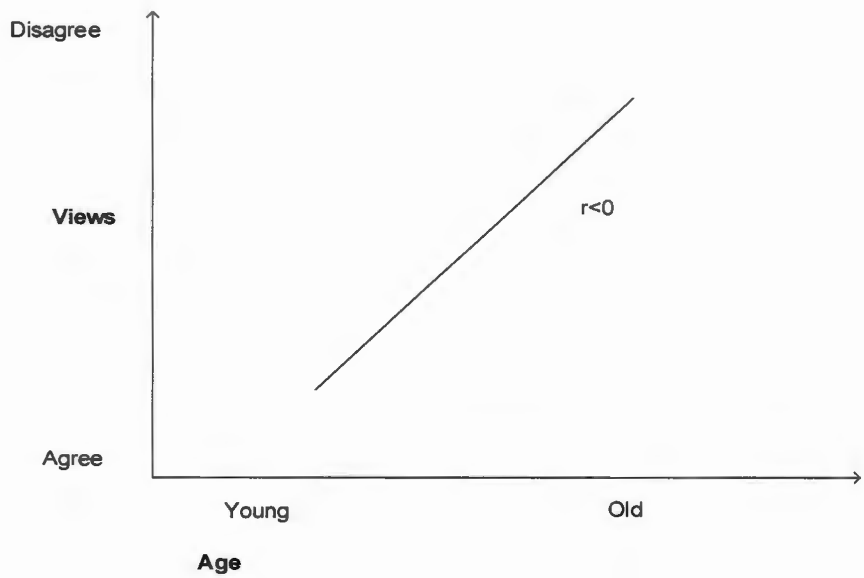


Figure 7-14: (b): Views of respondents by age (r > 0)

(Variables D2.1, D2.2, D2.6, D2.7 and D2.9) not significantly correlated with A2, p-values > 0.05.

7.6.3.3 *Chi-square test of independence*

Table 7-29: Cross-tabulation of respondents' views on SWBES by gender

(a)	**Learning with 3D wikis supports teaching and learning in higher education (D2.4)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely disagree	Total
Male	103	253	137	12	505
Female	129	178	145	12	464
Total	232	431	282	24	N = 969
	p-value = 0.002 chi-square statistic = 14.483 df = 3				
(b)	**Social networking sites (Facebook, Twitter, YouTube, and Skype) support teaching and learning in higher education (D2.5)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely disagree	Total
Male	195	161	118	31	505
Female	129	201	90	44	464
Total	324	362	208	75	N = 969
	p-value = 0.000 chi-square statistic = 22.192 df = 3				
(c)	**Semantic blog/Micro blogging supports teaching and learning in higher education (D2.6)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely disagree	Total
Male	122	258	102	23	505
Female	137	181	134	12	464
Total	259	439	236	35	N = 969
	p-value = 0.000 chi-square statistic = 20.472 df = 3				

Since the p-values are less than the 0.05 level of significance, the views of the respondents about SWBES are significantly dependent on their gender.

In Table 7.29 (a), the majority (253/431 = 59%) of the respondents who agree that learning with 3D-wikis supports teaching and learning in higher education are men, and the majority (145/282 = 51%) of the respondents who disagree are women.

In Table 7.29 (b), the majority (201/362 = 56%) of the respondents who agree that social networking sites (Facebook, Twitter, YouTube, and Skype) support teaching and learning in higher education are women, and the majority (118/208 = 57%) of the respondents who disagree are men.

In Table 7.29 (c), the majority (258/439 = 59%) of the respondents who agree that semantic blog/micro blogging supports teaching and learning in higher education are men, and the majority (134/236 = 57%) of the respondents who disagree are women.

(Variables D2.1, D2.2, D2.7 – D2.11 are not significantly dependent on gender, p-values > 0.05).

7.6.4 Correlation analysis of questions in section E: Students' digital competences and confidence level

7.6.4.1 Analysis of Variance (ANOVA) Test

Factor: Name of the University (A3)

Dependent variables: E7.1 and E8.10 (E1 – E2, E3 – E6, V39 – E8.9) not significant, p-values > 0.05, equality variance assumption not valid.

Table 7-30: Respondents' views on educators'/supervisors' use of ICT tools on a daily basis for teaching purposes

Item	p-value
Educators/supervisors use overhead projectors most frequently to facilitate teaching and learning (E7.1)	0.010
Information quality inspires educators/supervisors to use ICT tools application to facilitate and support learning (E8.10)	0.000

Since the p-values are all at a less than 0.05 level of significance, there is a significant difference of the population means of responses among the respondents in the three universities. It means that the respondents at these three universities do not agree on the items listed in Table 7.30.

7.6.4.2 Correlation Analysis (Spearman's rank rho test)

Table 7-31: Spearman's rank correlation between age (A2) and views of respondents concerning the digital competences and confidence level

Items	Spearman's rank	Sig
Educators/supervisors use overhead projectors most frequently to facilitate teaching & learning (E7.1)	Correlation coefficient(r)	-0.078
	p - value	0.016
Educators/supervisors use semantic blog/micro blogging most frequently to facilitate teaching & learning (E7.6)	Correlation coefficient(r)	0.074
	p - value	0.022
Educators/supervisors use e-Fundi most frequently to facilitate teaching & learning (E7.8)	Correlation coefficient(r)	-0.176
	p - value	0.000
Educators/supervisors use MyUnisa most frequently to facilitate teaching & learning (E7.9)	Correlation coefficient(r)	0.120
	p - value	0.000
Educators/supervisors use ClickUP most frequently to facilitate teaching & learning (E7.10)	Correlation coefficient(r)	0.121
	p - value	0.000
Educators/supervisors use MyTUKS most frequently to facilitate teaching & learning (E7.11)	Correlation coefficient(r)	0.105
	p - value	0.001
Improved administration processes inspire educators/supervisors to use ICT tools application to facilitate and support learning (E8.4)	Correlation coefficient(r)	-0.065
	p - value	0.042
Transitioning/change inspires educators/supervisors to use ICT tools application to facilitate and support learning (E8.5)	Correlation coefficient(r)	-0.069
	p - value	0.031
Knowledge creation and management inspire educators/supervisors to use ICT tools application to facilitate and support learning (E8.8)	Correlation coefficient(r)	-0.067
	p - value	0.038
Information quality inspires educators/supervisors to use ICT tools application to facilitate and support learning (E8.10)	Correlation coefficient(r)	-0.105
	p - value	0.001

Since all the p-values are less than the 0.05 level of significance, the correlation between age and views of respondents about the items listed in Table 7.31 is significant. Negative correlation coefficients imply that older respondents tended to agree with the listed items, whereas younger respondents tended to disagree. Positive correlation coefficients imply that older respondents tended to disagree with the listed items, whereas younger respondents tended to agree. See Figure 7.13a and Figure 7.14b above. The variables (E7.2 – E7.5, E7.7, E8.1-E8.3, E8.6 – E8.7 and E8.9) are not significantly correlated with V2, since all the p-values are greater than> 0.05.

7.6.4.3 Chi-square test of independence

Table 7-32: Cross-tabulation of respondents' views on digital competences and confidence level by gender

(a)	**Do you have a phobia of ICTs and web technologies (E1)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	42	88	156	219	505
Female	20	69	258	117	464
Total	62	157	414	336	N = 969
	p-value = 0.000 chi-square statistic = 64.581 df = 3				
(b)	**Would you agree that your educators/supervisors use ICT tools and applications to facilitate learning? (E6)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	179	259	52	15	505
Female	104	284	52	24	464
Total	283	543	104	39	N = 969
	p-value = 0.000 chi-square statistic = 21.408 df = 3				
(c)	**Educators/supervisors use overhead projectors most frequently to facilitate teaching and learning (E7.1)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	311	113	70	11	505
Female	179	152	108	25	464
Total	490	265	178	36	N = 969
	p-value = 0.000 chi-square statistic = 53.216 df = 3				

(d)	Educators/supervisors use social networking sites most frequently to facilitate teaching and learning (E7.5)				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	102	185	112	106	505
Female	107	127	123	107	464
Total	209	312	235	213	N = 969
	p-value = 0.021 chi-square statistic = 9.704 df = 3				
(e)	Students' relationship management inspires educators/supervisors to use ICT tools application to facilitate and support learning (E8.2)				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	190	143	124	48	505
Female	145	233	57	29	464
Total	335	376	181	77	N = 969
	p-value = 0.000 chi-square statistic = 55.441 df = 3				
(f)	Improved learning theories inspire educators/supervisors to use ICT tools application to facilitate and support learning (E8.7)				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	145	157	123	80	505
Female	153	170	88	53	464
Total	298	327	211	133	N = 969
	p-value = 0.016 chi-square statistic = 10.302 df = 3				
(g)	Information quality inspires educators/supervisors to use ICT tools application to facilitate and support learning (E8.10)				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	194	156	127	28	505
Female	154	190	94	26	464
Total	348	346	221	54	N = 969
	p-value = 0.011 chi-square statistic = 11.226 df = 3				

Since the p-values are less than the 0.05 level of significance, the views of the respondents about digital competences and confidence levels are significantly dependent on their gender.

Variables E2-E5, E7.2 – E7.4, E7.6 – E8.1, E8.3 – E8.6, E8.8 – E8.9 are not significantly dependent on gender, p-values > 0.05.

7.6.5 Correlation analysis of questions in section E: Controversies/challenges associated to educators' inability to use ICT web tools in HES.

7.6.5.1 Analysis of Variance (ANOVA) Test

Factor: Name of the University (A3)

Dependent variables: F11 (F1 – F10 and F12 were not significant, p-values > 0.05, equality variance assumption not valid.

Table 7-33: Respondents views of challenges associated with ICT integration and use in HES

Item	p-value
Lack of resources (computer facilities) limit educators/supervisors from not using ICT tools during facilitation of learning (F11)	0.000

Since the p-value is less than the 0.05 level of significance, there is a significant difference in the population means of responses among the respondents at the three universities. This means that the respondents at these universities do not agree on the items listed in Table 7.33.

7.6.5.2 Correlation Analysis (Spearman's Rank rho Test)

Table 7-34: Spearman's rank correlation between age (A2) and respondents' views concerning the controversies/challenges

Items		
Difficulty to integrate ICT with teaching keeps educators/supervisors from using ICT tools during facilitation of learning (F1)	Correlation coefficient(r)	-0.127
	p - value	0.001
Not enough simultaneous access keeps educators/supervisors from using ICT tools during facilitation of learning (F5)	Correlation coefficient(r)	-0.075
	p - value	0.019
Lack of proper knowledge, skills and capacity keeps educators/supervisors from using ICT tools during facilitation of learning (F8)	Correlation coefficient(r)	-0.155
	p - value	0.000
Lack of confidence level keeps educators/supervisors from using ICT tools during facilitation of learning (F9)	Correlation coefficient(r)	-0.064
	p - value	0.047

Since the p-values are less than the 0.05 level of significance, then the correlation between age and views of respondents about the items listed in Table 7.34 is significant. Negative correlation coefficients imply that older respondents tended to agree with the items listed in Table 4.25, whereas younger respondents tended to disagree.

7.6.5.3 Chi-square test of independence

Table 7-35: Cross-tabulation of views of respondents about controversies/challenges by gender

(a)	**Heavy workload keeps educators/supervisors from using ICT tools during facilitation of learning (F4)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	131	191	149	34	505
Female	112	222	113	17	464
Total	243	413	262	51	N = 969
	p-value = 0.005 chi-square statistic = 12.714 df = 3				
(b)	**Phobia of web technologies keeps educators/supervisors from using ICT tools during facilitation of learning (F6)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	145	100	177	83	505
Female	130	114	171	49	464
Total	275	214	348	132	N = 969
	p-value = 0.031 chi-square statistic = 8.876 df = 3				
(c)	**Attitudes/perceptions keep educators/supervisors from using ICT tools during facilitation of learning (F7)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	118	238	93	56	505
Female	118	186	130	30	464
Total	236	424	223	86	N = 969
	p-value = 0.000 chi-square statistic = 18.675 df = 3				

(d)	Lack of confidence keeps educators/supervisors from using ICT tools during facilitation of learning (F9)				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	136	158	133	78	505
Female	130	169	127	38	464
Total	266	327	260	116	N = 969
	p-value = 0.005 chi-square statistic = 12.725 df = 3				
(e)	**Lack of resources keeps educators/supervisors from using ICT tools during facilitation of learning (F11)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	80	175	165	85	505
Female	126	143	136	59	464
Total	206	318	301	144	N = 969
	p-value = 0.000 chi-square statistic = 19.280 df = 3				
(f)	**Technical assistance/training keeps educators/supervisors from using ICT tools during facilitation of learning (F12)**				
Gender (A1)	Completely agree	Agree	Disagree	Completely agree	Total
Male	132	210	100	63	505
Female	138	179	124	23	464
Total	270	389	224	86	N = 969
	p-value = 0.000 chi-square statistic = 22.085 df = 3				

Since the p-values are less than the 0.05 level of significance, the views of the respondents about digital competences and confidence level are significantly dependent on their gender. The rest of the remaining variables (F1 – F3, F5, F8 and F10) are not significantly dependent on gender, their p-values are larger than 0.05. This section clarified the use of correlation analysis, which strengthens the research findings and discussions represented in this study.

7.7 Chapter summary

This chapter extensively detailed the overall views of respondents. The chapter focused on providing detailed data analysis, a true reflection of the data as well as meaningful data interpretation of the information gathered from the questionnaires.

The chapter began with a justification of the data sampling and collection procedure, and continued to provide extensive descriptive statistics and frequencies in the form of charts and tables. It started off by analysing the demographic variables. The next section offered a discussion and interpretation of the results, starting with section B down to the last section G. During this process, the use of cross-tabulation analysis, charts and tables were used as it assisted in providing a comprehensive demonstration of the opinions of the participants in question.

The chapter subsequently presented the correlation analysis, which is sometimes perceived as the most significant part of a quantitative research approach. This correlation analysis was then carried out in three (3) different ways, namely the ANOVA, Spearman's rank test and Chi-square test. These tests were performed on all the sections represented in the questionnaire guide (section B-F). The reliability test of variance was also conducted to test the equality of variance. This chapter has significant value for academics as it provides results through the use of a quantitative method.

7.8 Closing remarks

7.8.1 Discussion and findings

The section presents a brief discussion of the findings on Section A–G. The questionnaire was divided into sections (A–G). with the sections corresponded to the research objectives and questions, which offered the researcher a clearer view of what should be addressed in the study. Section A provided the demographic variables.

7.8.1.1 Section B: Internet awareness and access

Sections B and C addresses the first literature matrix theme, which relates to ICT itself. It answers the first research question, namely: How will SW and ICT tools help improve learning enthusiasm and ease access to education when it has successfully been adopted> Six questions (see section B1, B2, B3, B4, B5 and B6) were raised to address this main question and the findings were as presented in 6.4.1. It revealed that all students across three universities affirmed that they possess basic computer skills (Ms Word, Excel, PowerPoint, Access, Internet etc).

7.8.1.2 Section C: Integrating ICT tools and application in HES

The aim of Section C was to ascertain whether the integration of SS and of ICT tools and its applications in HES will compliment teaching and learning. With the successful integration of ICT tools into educational systems, learners can source and browse e-books, and have easy access to educational resources and personnel (mentors, experts, researchers, professionals, and peers-all over the world). Five questions were raised to tackle the first main question as mention above in section B. The results show that the use adoption of ICT web technologies as complementary to traditional education will not only assist students with their course module, but will also improve students' access to educational materials. It will promote quality education delivery, student motivation, engagement, performance and collaboration with peers and educators. Learning processes have become an activity where the geographical position gradually becomes less of a concern. Learning is no longer limited to the classroom, but can actually take place anywhere, at any point in time, regardless of the location. See Section 7.4.2 for the rest of the analysis and discussions.

7.8.1.3 Section D: Framework analysis of SWBES

The objective of Section D is to answer the second research question, namely: What are students' perceived views of social software and how the use of the proposed framework supports the arguments and explore the flaws and effectiveness of Web 2.0 and Web 3.0 in education to facilitate learning and business processes? The findings suggest that students across the universities are aware of the potential benefits of the use of these web technologies in education systems. They were familiar with Web 2.0 and Web 3.0.

Question D2 related to students' views of these SS/SW and ICT tool application in supporting teaching and learning in higher education. This question was divided into sub-questions (D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D2.7, D2.8, D2.9, D2.10 and D2.11). The findings portray that some web technologies provided by Web 2.0/Web 3.0 may be supportive, while some are not.

The findings also showed that each campus uses its own LMS extensively.

7.8.1.4 Section E: Students' digital competencies and confidence levels

Section E attempted to answer the third research question: What are the extent of educators and students' ICT confidence, readiness, willingness, and their digital competence to ensure a systematic and systemic approach to supporting and sustaining technological innovation in teaching and learning? Most of the educators and students indicated adequate knowledge, confidence and positivity.

This section also tried to determine educators' digital competence and confidence level when using these tools. Respondents revealed that not all the educators use some of these web technologies tools and applications during the course of learning. Those educators who use these web technologies during their teaching across the three selected universities were motivated easy access to learners.

7.8.1.5 Section F: Challenges associated with SS/SW and ICT adoption

Section F answers the fourth research question on the challenges associated with SS/SW and ICT web technology adoption in HES. The findings imply that educators are challenged with several hindrances when using ICT web technologies in education. The policy framework seemed to be the greatest hindrance to the use of technology for teaching and learning.

The facilitation of learning through diverse instructional web technologies as mode of education delivery permits the learner/student to grasp information content in such a manner that fits appropriately to that precise learner. The learners of today absorb digital technologies. On the contrary, not many educators speak the same digital language as their subjects/students (Wood, 2010). Therefore, the challenges associated with the adoption of SS/SW and an ICT web technology that has persisted in the HES may be that the pedagogical and epistemological beliefs of educators who are "digital immigrants," affect this adoption and integration of these tools for teaching and learning purposes. Therefore, the adoption of SS/SW and ICT web technologies in HES is linked to the diffusion and adoption theories, adoption models, and patterns of adoption suggested in the proposed diagrammatical framework.

7.8.1.6 Section G: Student development and support programmes

In section G, the purpose was to test learners' ideas on the development of a support programme that will provide learners with the right exposure and skills to pursue for career development. This section aims to answer the last research question on what strategies could be put in place for teachers and learners to develop support to prepare them in the use of ICT tools. The focus was on learners who struggle in the use of ICT web technologies in educational systems for academic purposes. The findings suggest that learners who struggle should be referred to the university's academic support programme. Another suggestion was that the introduction of an ICT module should be made compulsory for all students as they enrol at their precise universities. This would help them gain the required knowledge, skills and the ability to familiarize themselves with ICT tools and applications.

The results and findings represented in this chapter were derived from data gathered from the three selected universities by means of interviews and questionnaires. Chapter 8 provides a summary of the study, answers the research question and presents a comprehensive framework to be adopted in HES based on the findings.

CHAPTER 8

FINDINGS, CONCLUSION AND RECOMMENDATIONS

8.1 Introduction

The preceding chapters provided a detailed analysis and interpretation of results. This chapter provides a summary and conclusion based on the data analyses and interpretation of the qualitative and quantitative research.

8.2 Summary of the research findings

The overall purpose of this study is to develop a framework for social software adoption into HES. This chapter endeavours to offer an answer to the research question and to present a semantic web-based educational system framework. The chapter is arranged as follows: it starts of with a review of the research problem, followed by a review of the literature; a review of research objectives and questions; answers to the questions raised; a summary of the study; and a consolidation of both research approaches. This is followed with a discussion of the limitations of the study, a contribution to body of knowledge, and suggestion of possible future studies and draws conclusion.

8.2.1 Review of research problem

Nowadays, higher education institutions are faced with several challenges emerging from ICT web instructional technology usage. Jaffer *et al.* (2007) mention that the higher education system in South Africa is currently under pressure to meet the social transformation and skills needs of the new South Africa. The problem of preparing educators in the educational uses of SS/SW and ICT instructional web technologies seems to appear as the key factor in almost every development plan for education and educational reform efforts (Davis & Falba, 2002; Dawson *et al.*, 2003; International Society for Technology in Education, 2002; National Council for Accreditation of Teacher Education, 1997; Thompson *et al.*, 2003).

A national survey on ICT technology usage at universities shows that two-third of the educators are optimistic about the potential impact that ICT web instructional tools would bring to education. However, only a few of the educators use ICT technology in their teaching practices. This implies that in decades of training and preparing educators for the educational use ICT technologies, educators still lack the skills and knowledge required to administer lectures with educational web instructional technologies and applications successfully. This causes two problems:

- The problem of educators' inability to successfully integrate web instructional technologies (media distribution, blogs, wikis, and other SW technologies) in their teaching and learning practices remains.

- The lack of ICT confidence, technophobia and willingness to accept technology among and educators and learners remains a major challenge.

8.2.2 Review of research objectives

The objective of this study was to establish how the integration and adoption of SS/SW and ICT and web technologies in HES can improve learning enthusiasm, easy access, performance and the quality of education delivery. As such, the study explored the extent to which SS/SW and ICT web technologies will supplement the traditional approach to serve as a complementary tool for supporting teaching and learning. The research probed educators and students' ICT confidence, readiness and competence to ensure a systematic approach in supporting and sustaining technological innovation in HES. This helped to identify the challenges hindering educators' use and adoption of S/SW and ICT web technologies and its applications in HES and to develop strategies to support and prepare teachers and learners in ICT tools usage in education.

8.2.3 Review of research questions

South African higher education is under pressure to transform and to produce citizens who have the necessary skills for the information age (Wood, 2015). There is also the burden of improving on its strategic policy and academic performance. SS/SW and ICT web instructional technologies can serve as complementary tools for teaching and learning. The following questions arise from the above context:

- How will SS/SW and ICT web technologies help to improve learning enthusiasm and ease access to education once it has been adopted? How will it help universities break away from the highly traditional and centralized model of learning?

- What are educators and students' perceived views on the educational impact of SS/SW and ICT web technologies on learning and business processes?

- What are the extent of educators and students' ICT confidence, readiness, willingness to ensure a systematic approach in supporting and sustaining technological innovation in HES?

- What are the hindrances associated with the adoption of SS/SW and ICT web technologies and its applications in a teaching and learning environment?

- What support could be put in place for teachers and learners to prepare them for the use of SS/SW and ICT web technologies in HES?

8.3 Answers to the research questions

The study followed an MMR approach that consisted of a qualitative (interviews) and a quantitative (questionnaire) phase. The interview questions and sub-questions were directed at academic staff, while the questionnaire were directed at students. The aim of the questionnaire that was administered to students, was to draw responses from the students regarding SS/SW and ICT web instructional technologies for teaching purposes.

The literature review identified different themes, which were organized into a matrix. These themes were used to formulate the interview and questionnaire questions. The first literature matrix theme was ICT itself and was related to the first research question (see Section 8.2.4). Chapter 2 discussed the importance of ICT, describing its crucial principles, and uncovering its potential for HES. The first research question was also addressed in Chapter 6 and Chapter 7 (Sections 6.6.1–6.6.3.5 and 7.4.1–7.4.2).

The second, third and fourth literature matrix themes centred on SS/SW adoption in universities; defining SWBES; and SWOT analysis framework, with the objective of answering the second research question (see Section 8.2.4). Chapters 6 and 7 answered this research question by presenting the qualitative and quantitative research findings.

The fifth and the sixth literature matrix themes, namely the controversies associated with ICT and educators' challenges in the use of SS/SW and ICT web technologies in HES, addressed the third and the fourth research questions (see Section 8.2.4). These research questions were answered in Chapter 7 Chapter 6. Finally the seventh literature matrix theme is educator and learner development and support system. This theme addressed the fifth research question (see Section 8.2.4). This research question was answered in Chapter 6 and 7. The research questions are revisited and answered in short below.

8.3.1 How will SS/SW and ICT web technologies help to improve learning enthusiasm and ease access to education once it has been adopted? How will it help universities break away from the highly traditional and centralized model of learning?

The question sought to establish the usefulness of adopting SS/SW and ICT web instructional technologies for complementing teaching and learning in HES. To answer this question, educators and students were asked whether they are aware of and familiar with the concepts of SS/SW and ICT web tools, ODL and the adoption of SS/SW and ICT in HES. The findings showed that most of the educators across the selected universities were accustomed to, conversant in and comfortable with this concept SS/SW and web tools. Students also indicated a high level of familiarity about these SS/SW and ICT web technologies and its applications (Facebook, Twitter, Youtube, blogs, wikis, Digital Library, podcasts, myUnisa, eFundi, Google classroom, Blackboard). The result of the findings also signify that the concept of Web 2.0 and Web 3.0 is not new in the pedagogical environment (Hosein, 2013). In support of these findings, Noor Ul Amin (2013) assert that the notion of adopting SS/SW and ICT instruction tools into the pedagogical context for teaching purposes has been professed by many academics.

There is consensus among the educators and the students. They all supported the combined integration and adoption of SS/SW and ICT web instructional technologies and its applications in HES. Both the educators and students have basic computer skills, access and confidence. Students believed that these web technologies and applications offer them additional liberties such as choosing their learning space and the amount of time with other distance learners. It also encourages diverse approaches to learning and engaging with peers. This result is supported by Hosein (2013), who avers that SS/SW and ICT web instructional web tools open avenues for information and knowledge dissemination.

With the successful integration of ICT tools in educational systems, students can source and browse e-books, gain easy access to educational resources and personnel (mentors, experts, researchers, professionals, and peers all over the world) (Madhukar, 2013). The findings support claims that the use of ICT can improve performance, teaching, administration, and develop skills relevant to career pursuit. The findings also established that these tools can improve the quality of education by facilitating creative and integrative learning; reflective learning; collaborative learning; active learning and critical thinking. This is achieved through self-learning, problem solving, information seeking and analysis (Moges, 2013; Madhukar, 2013). Aghaei *et al.* (2012) sustain that ICT has the potential to improve easy access and the methods used to provide education in that learners are able to access information at any given point in time or place. It has a direct effect on the approach to teaching (Quadri & Olaojo, 2013; Sharma, 2008; Klamma *et al.*, 2007).

The findings clearly justify the adoption of SS/SW and ICT web technologies as instructional tools in HES. All participants were optimistic and certain that ICT in HES:

- can improve quality education and mode of delivery;
- improve learners' performance;
- can improve learners' enthusiasm;
- can increase educational opportunities; and
- can improve easy access to education.

Both groups agreed on the above findings. ICT web technologies are therefore capable of supporting collective active, collaborative, creative and integrative learning in educational systems (Lal, 2011; Badawood & Qureshi, 2013).

8.3.2 What are educators and students' perceived views on the educational impact of SS/SW and ICT web technologies in the facilitation of learning and business processes?

The responses of the educators suggested that they recognize SS/SW and ICT instructional technologies as useful for student management and blended learning. Educators' perception of SS/SW and ICT is that it is a channel for knowledge creation, that it increases educators' productivity and creates room for change (Angeli & Valanides, 2009). Some educators revealed that SS/SW and ICT enhances business processes, enables content personalization and integrated learning, as well as social presence. The educators were positive that Web 2.0 and Web 3.0 should be incorporated in HES to coordinate students' learning activities and assessments. The blended learning approach allows students to work independently and at their own pace (Sharma, 2010), while having face-to-face contact from the educators and accessing all the necessary educational resources and support that students require to pursue their career.

The students felt that educators were motivated to use ICTs. The research indicates that SW /SS can improve learners' management by offering the learner control and accountability for their own learning. This finding is affirmed when Hussain (2012) and Dixon (2012) sustain that cooperative tasks enable the students to associate, interrelate, ask questions, discuss answers, and assess learning topics. The impact on education divides into four categories, namely innovation or collaboration; content-drivenness; information quality and transformation or sustainability (Dotsika, 2012).

The educators gave examples of how SS/SW and ICT instructional web technologies incorporated into HES would benefit students in general. They contended that these web tools offer learners the ability to bring together new concepts and innovative learning that allows learners to assimilate new information with peers. This finding is confirmed Davies *et al.*, (2007) avers that there is a positive impact that these tools could afford to learners. Educators claimed that it encourages students to be reflective in their learning process and that it offers improved collaboration among students. The findings show that such applications and instructional web tools enable educators to monitor their students in online space interactions and for individual contributions (Wood, 2015). The educators and students believe that the benefit of using ICT web technologies and applications in HES is the ability of interoperability, personalization, virtualization, and intelligence h (Dotsika, 2012).

8.3.3 What are the extent of educators and students' ICT confidence, readiness, and willingness to ensure a systematic approach in supporting and sustaining technological innovation in HES?

The section that addressed this question was administered to both the educators and students with the aim of understanding the degree of educators' and students' ICT skill, confidence and willingness. The finding shows that educators and students from NWU, UNISA and UP do not lack ICT confidence. They were positive and are readily available to incorporate these tools for teaching. Educators from the NWU explained that they were exposed to web instructional technological tools at their previous institutions.

The findings revealed that the students do have basic computer skills and they have internet access to computer facilities at all the different universities. It was discovered that students spend a reasonable amount of time surfing the net. They all indicated that they use the internet mostly for educational purposes, research activities, information searches and for entertainment. Judging from these findings, the participants chosen were fit for this study, with widespread areas of academic specialization (educators, professors and head of department). They were chosen from different academic disciplines from information systems, computer sciences, school of computing and informatics simply due to their exposures and knowledgeable areas. Therefore, the participants did not lack ICT confidence (Ohei *et al.*, 2015; Ohei & Lubbe, 2013; Bingimlas, 2009).

Having established that educators and students have ICT skills and confidence, educators were asked to indicate which among these web instructional technologies they use on a daily basis for teach and learning purposes. Each university has adopted a LMS/VLEs for the facilitation of learning and business administration processes. All the respondents indicated that they use the given LMS of that university and that the universities use these tools for business administration.

The respondents were asked whether they use some of the social networking sites such as Facebook and YouTube during the facilitation of learning. The findings show that educators from UNISA and UP reveal that they frequently use YouTube to post video content and they use it in class as well. These educators disclosed that they use these web instructional technologies for educational purposes. At the NWU, the educators who participated do not make use of some of these web instructional technologies during the facilitation of learning.

There are slight differences in the responses from different universities because of the differences in their demographic. UNISA holds the highest population of distance learners of all South African universities, which makes the adoption and integration of SS/SW and ICT web technologies for instructional purpose crucially important. The same initiative has been supported at UP, although the impact of ODL at UP cannot be compared with UNISA. Just as the impact of ODL at UP cannot be compared with the NWU.

At UNISA and UP the university policy frameworks support web instructional technologies in their teaching and learning purposes. All participants from the NWU were positive that the university's policy framework restricts them. They also mentioned that they are confined to using what the university provides. Some of the participants believed that a lack of awareness also play a part to some extent. This limits their use of these tools.

The educators at the NWU indicated that they had some experience of these tools at their previous employers but that they don't use them so frequently for fear of being on the wrong side of policy. They also stated that technologies such as semantic blogging and discussion forums such as wikis are not incorporated in their LMS/VLEs (e-Fundi) (Kumar *et al.*, 2008; Crook, 2008; Wolak *et al.*, 2008). For that reason, educators are not able to integrate such applications during facilitation of learning. Moges, (2013), Dotsika (2012, 2010), and Zhu and Wang (2010) aver that regulations and policies may sometimes prevent educators from using various ICT technologies. Therefore, Moges (2013) emphasizes that such existing policies or regulation that govern the adoption of ICT tools into educational systems ought to be revisited and amended so that it permits the necessary participatory or collaborative platforms in HES.

8.3.4 What are the hindrances associated with the adoption of SS/SW and ICT web technologies and its applications in the teaching and learning environment respectively?

The educators extensively talked about issues of security (Schroeder *et al.*, 2010b). The findings show that security, ethical and legal issues, human factors (culture, behavioural pattern, technophobia, attitude, belief) were recognized as the prevailing issues linked with ICT adoption in HES. ICT infrastructure and ICT investments (costs, risk and benefit) are on-going issue surrounding technology acceptance in educational environment. All of these issues influence ICT adoption one way or the other, either positively or negatively, and a few pose severe concerns (Siemens, 2014; Ozer, 2013; Schroeder *et al.*, 2010b; Mix, 2010; Bingimlas, 2009; Wolak *et al.*, 2008). Respondents also experience problems with human factors. The findings captured from the educators established that the challenges that may possibly prevent the adoption of SS/SW and ICT web instructional application and tools in HES are categorizes as:

- The issue of security (intellectual property ownership, patent violations, monetary function and trust)
- Ethical and legal issues (exploitation, misuse)
- Human factors (culture, behavioural patterns, technophobia, attitudes and beliefs).
- Lack of willingness and readiness
- ICT infrastructure (ICT teaching facilities)
- ICT investments (costs, risks and benefits).

It is important to note that not all of these issues can be eliminated. Some of these issues will interfere with the adoption process to some extent. Issues that come from human factors, ICT infrastructure, ICT investment (for instance, the cost implication and the risks) cannot be ignored (Haigh, 2010; Colburn *et al.*, 2008). The educators from the NWU, UNISA and UP believe that most of the controversies raised are unavoidable, but they view the impact of these issues as minimal compared to the benefits and impact of SS/SW and ICT tools in HES.

The educators suggested other possible challenges that may prevent ICT adoption, one of which is linked to students' lack of ICT exposure. The educators explained that many students come from disadvantaged homes. Their exposure to technology may be limited. This may pose challenges to their learning processes. Such a student's assimilation of content and use of ICT web technological applications of that particular student are limited (Ohei *et al.*, 2015; Jaffer *et al.*, 2007; Ohei & Lubbe, 2013; Lefever & Currant, 2010). Often, such a student is not able to cope as compared to those that are technologically advanced. For this reason, learners' lack of exposure to technology may pose a challenge.

The findings captured from students' responses suggest that educators experience several hindrances when using ICT web technologies in education. Quite of a number of those hindrances are caused by a lack of conformity between the technology usage and the educational requirements, in other words the policy framework for teaching and learning. The issues listed below affect the adoption process of SS/SW and ICT web instructional technologies in HES.

- Difficult to use
- Insufficient time on the side of the educators
- Heavy workloads
- Not enough simultaneous access
- Phobia to use web technologies
- Attitudes/perceptions
- Lack of proper knowledge, skills and capacity
- Lack of willingness to accept change
- Lack of resources (computer facilities)
- Technical assistance/training.

According to the educators' responses, they encounter very few of these challenges. This findings were confirmed in the preceding chapters.

8.3.5 What strategies could be put in place for teacher and learner development support to prepare them for the use of SS/SW and ICT web technologies tools in HES?

The purpose of this section was to test educators and learners' ideas about a development support programme that will afford the educators and the students the right exposure required or skills needed. Quadri and Olaojo (2013) and Hooker *et al.* (2011) highlight that educators ought to be able to integrate SS/SW and ICT during the learning process as this will provide the students with the ICT skills necessary to pursue their careers. The educators from these institutions affirmed that their respective universities offer ICT training, workshops and seminars to support educators and those who struggle. Some educators insisted that workshops, training and seminars are just not enough. They revealed that educators should change their attitudes towards and negative perceptions of ICT web tools. Some believe that practice makes perfect. Constant use of these web technologies in HES can actually improve educators' confidence.

From the students' perceptive, the findings suggest that learners who struggle should be referred to the university's academic support programme. Students suggested that an ICT module should be made compulsory for all students as they enrol at their perspective universities. This will help them gain the required knowledge, skills and the ability to familiarize themselves with ICT tools and application. Olakulehin (2007) considers there to be a need for HES to devise a framework for an educator development programme that redirects the training to lifelong professional preparedness and improvement of educators on new modalities of professional growth.

8.4 A consolidation of the qualitative and quantitative results

This section consolidates the results of the qualitative and quantitative research as a process of triangulation. The qualitative research entailed 20 interview questions for academic staff members and as well as the quantitative research comprised 71 questionnaire questions for students. These questions targeted academic staff and students across the selected universities, namely the NWU, UNISA and UP.

There were 15 interviewees and a total of 969 students who answered the questionnaires. Table 8.1 illustrates the contribution and components emerging from both research approaches and the findings presented in this section towards a framework development for SS in HES. These specific components were derived based on the degree of impact on the general completion of this study.

Table 8-1: Consolidation of the research approaches

Component	Qualitative approach	Quantitative approach	Mixed approach
Web instructional technology adoption			
• Quality education	X	X	X
• Improved learner performance, enthusiasm	X	X	X
• Increased educational opportunities	X	X	X
• Easy access to educational resources	X	X	X
• Improved learning theories		X	
Views of educators/students			
• Knowledge creation management		X	
• Administrative processes	X		
• Productivity as an educator	X		
• Student management	X	X	X
• Blended and integrated learning	X		
Benefits of Web 2.0/ 3.0			
Tutoring agent			
• LMS/VLEs	X	X	X
• Wikis, blogs, podcasts	X	X	X
• Innovation, collaboration	X	X	X
Controversies/Challenges			
Security concerns	X		
Ethical and legal issues	X		
Human factors			
• Not enough simultaneous access	X	X	X
• Phobia to use web technologies	X	X	X
• Attitudes/perceptions	X	X	X
• Lack of proper knowledge, skills and capacity		X	
• Lack of confidence	X	X	X

Component	Qualitative approach	Quantitative approach	Mixed approach
• Lack of willingness to accept change	X	X	X
• Lack of resources (computer facilities)	X	X	X
ICT infrastructure			
• ICT facilities	X	X	X
• ICT investment costs/risks and benefits	X		
Other possible concerns			
• Lack of student exposure	X		
• University policy	X		
Educator and student support	X	X	X

The foundation for the development of a framework for SS adoption in HES is derived from the findings from both research approaches.

8.5 The development of a comprehensive framework for SS adoption in HES

The comprehensive framework presented below is equivalent to that of a proposed diagrammatic framework developed in Chapter 3 and to the above components. This framework is based on the existing framework and the existing literature. Notably, the blending of qualitative and quantitative methods of data collection and analysis by means of MMR, makes research findings stronger, advances the accuracy of inferences, and enhances credibility.

Mavetera (2011a) avers that the development of a framework is founded on the systematic result. However, it is important to envisage that this comprehensive framework developed for SS adoption in HES cannot serve as "one-size-fits-all framework". Rather this framework directs the adoption of web instructional technologies tools and applications in HES and is fundamentally hypothetical in nature. It expands the body of knowledge. Therefore, the benefit of having to develop this framework is to assess the positive aspects of web 2.0 and 3.0 in HES. To successfully implement this framework in practice, the concerns raised in the framework ought to be addressed. Adopting this framework will assist several users (learners and educators/institution) in an administrative platform to reach their precise goals. It includes the new cohort of semantic web-based educational systems that enhance and improve business processes and the quality of services delivery with SS/SW and ICT web instructional technologies and applications. More specifically, the benefit of this framework is that it broadens the insight into the phenomena that are being studied.

In Chapter 3, a framework is defined as a conceptualization of an explicit complex research phenomenon, alongside with the relevant concepts and their associations. Furthermore, a framework enables researchers and practitioners to fully understand and exemplify IS studies. This framework is an indispensable extends the body of knowledge, allowing in-depth understanding and exposing the theoretical foundations of complex research phenomena through visual exposition.

Additionally, this framework is a system of unified objectives and ground rules that endorses the nature of SS/SW and ICT web instructional technologies and applications. Observing a framework allows attentive users to better comprehend the content provided in web technologies (Mavetera, 2011b). The framework is based on the findings presented in Chapter 5, Chapter 6 and Chapter 7. The themes were derived from Chapter 6 as follows: (1) SS/SW and ICT web technologies adoption in HES; (2) educators and students' perceptions of SS/SW and ICTs tools in HES; (3) educational impact and benefits of Web 2.0/3.0 and ICTs in HES; (4) controversies and challenges of adopting SS/SW in HES; and (5) educator and student development and support.

The researcher foresees that this comprehensive framework for SS adoption in HES will help these universities, IT departments and educators to completely integrate these web instructional tools for administration.

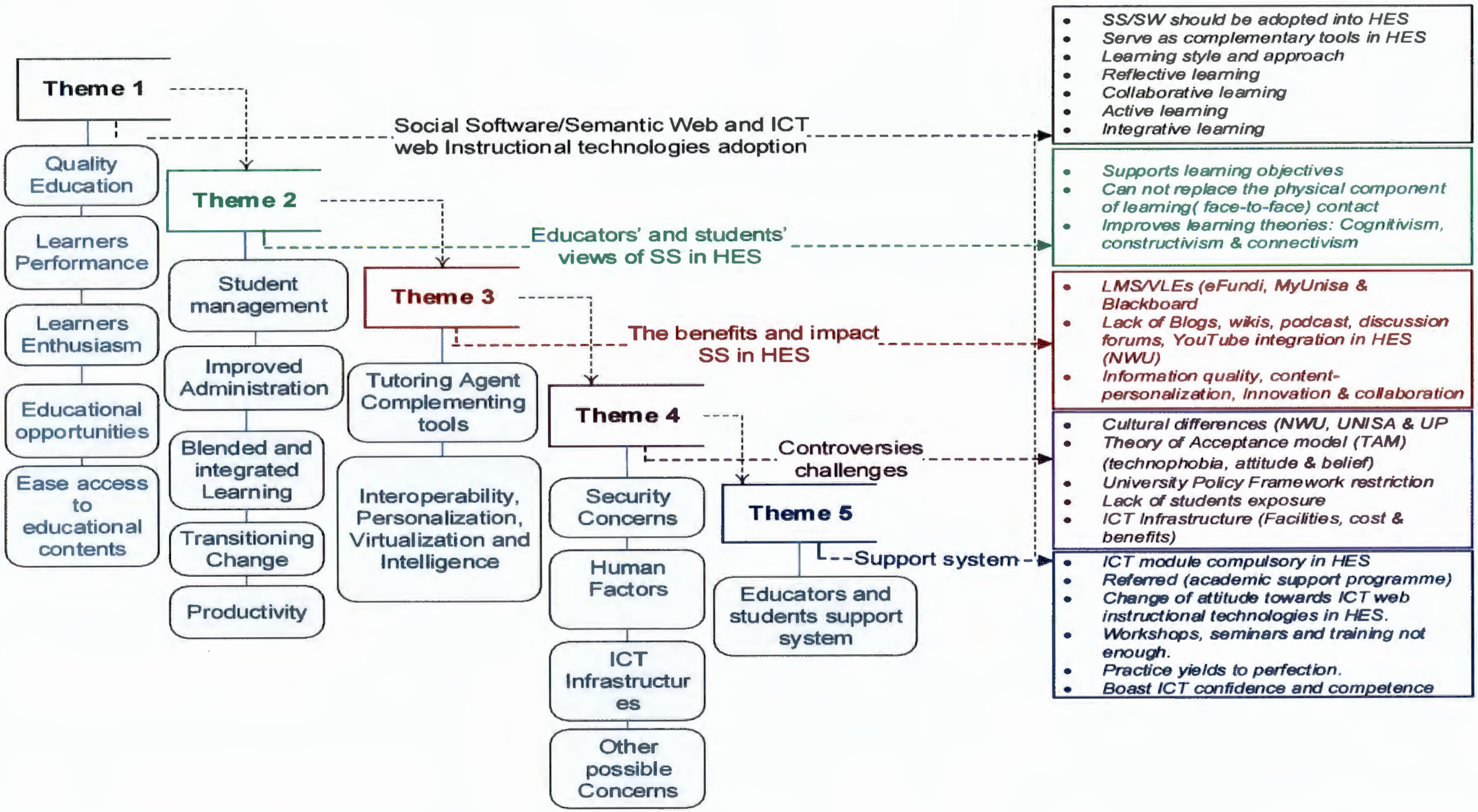


Figure 8.1: Comprehensive framework for SS adoption in HES

The diagrammatical framework depicted above consists of five themes. For each individual theme, the impacts and contributions are denoted with specific colour to differentiate them. The researcher starts by elaborating on the positive standpoint of Theme 1 of SS/SW and ICT adoption and the impact and the contributions that Web 2.0 and Web 3.0 will bring to the education system (Dotsika, 2012).

The framework depicts that the adoption of these web instructional technologies and its applications for academic purpose are fundamental. Theme 1 depicts that it can improve students easy access to educational content, quality education delivery, improved learning opportunities and leaners being motivated to learn. Therefore, it will improve students' learning styles (interactive, reflective, collaborative, active and integrative learning). The dotted line represents the link between the themes. Solid edged arrows with specific colours were assigned to each theme. The arrows present the contribution of each theme.

Theme 2 is green and it depicts the positive standpoint of educators and students' views of the use of web instructional technologies in HES as supported by the existing literature. The framework illustrates that the SS/SW and ICT web instructional technologies in HES support learning. While such platforms can be viewed as supportive, it is important to note that these web instructional technologies can only serve as complementary tools towards the facilitation of quality education and administration processes (Dotsika, 2012, 2010). It cannot serve as a replacement of traditional method learning (face-to-face) approach. The element of physical contact is vital, just as blended and integrated learning is essential for students' learning styles and development.

Theme 3 is denoted with red colour. This theme is somewhat directed at the educational impact and benefits of the use of LMS/VLEs. The framework incorporates the fact that NWU, UNISA and UP are using different kinds of LMS/VLEs, and as such, the integration and incorporation of web instructional technologies may differ due to their differences in business administrations. Only two universities (UNISA and UP) uses varied types of web instructional technologies and applications. The NWU is lacking in those areas. The use of blogs, discussion forums, wikis, and podcasts/vodcasts have not been incorporated into the NWU's LMS fully. Theme 3 also shows that the educational impact of Web 2.0 and 3.0 in HES is interoperability, personalization, virtualization and intelligence (Dotsika, 2012).

Figure 8.1 illustrates the negatives standpoint as well. There are challenging concerns that have to be addressed or issues that may hinder the adoption of this framework. This includes security and ethical concerns; human factors; ICT infrastructure, ICT investment (costs, risks, and benefits) and other possible concerns (lack of student exposure and university policy framework restrictions). Some of these concerns pose hindrances or prevents the adoption of web instructional tools in education. However, all the challenges are manageable if addressed.

Theme 5 addresses the concept of an educator and student development programme. Educators should have the opportunity to attend workshops, training and seminars to equip them to use of web instructional technologies. Educators should receive the necessary support. The students should not be trailing behind. It was recommended that the introduction of ICT module should be made compulsory to all students enrolled at any of these institutions. This will instil ICT confidence. Students who struggle should be referred to an academic development.

8.6 The study contribution to the body of knowledge

The MMR approach applied in this study contributes to the academic body of IS methodological inquiry in the sense of offering methodological insight that can direct future research work. No frameworks have been generated using a MMR approach and design. The mixture of qualitative and quantitative data acquisition and inquiry delivers the essential richness in IS research (Jogulu & Pansiri, 2011). It further advances wider and better consolidation of the research findings, enhances the exactness of inferences, and enhances trustworthiness. The MMR approach expands the boundaries of a single research approach, incorporates several epistemological assumptions, offered better validity or relevance to multifaceted educational settings. Therefore, the development of a comprehensive framework and methodologies employed in this study makes an original contribution to the academic body of knowledge by providing direction for SS/SW adoption in HES.

Dabbagh and Reo (2010) and Redecker (2009) reveal the impact and benefits that are associated with SS/SW and ICT web instructional technologies in HES. With the proliferation and emergence of SS/SW collaborative and participatory technologies, Web 2.0 and 3.0 present a dynamic shift in the higher educational environment that encourages better learning processes in the sense that SS/SW in HES will foster social communication and teamwork through various approaches. It enhances the capability for a student to express their uniqueness; increases responsiveness with the presence of peers; establishes social connections; and creates platforms for shared experiences and content publication (Dabbagh & Reo, 2011; McLoughlin & Lee, 2008, 2010; O'Reilly, 2005; Minocha, 2009).

Dabbagh and Reo (2010) add that SS/SW and ICT web technologies in HES will impact on student-centric learning styles or methods that encourage active engagement. Its user-centric nature presents several prospects of web instructional technologies for HES (Parmar & Siwach, 2010). Wheeler (2010) sustains that SS/SW and ICT web instructional technologies and its application in HES support openness and flexibility in learning. Finally, the study provides an enhanced approach to the adoption of SS in HES through the developed framework. SS/SW and ICT technologies has the potential to greatly influence HES in several ways. However, its potential has not been fully explored or utilized. The following section offers a general evaluation of the framework.

8.6.1 General evaluation of the framework

There are few questions that the researcher should pose to evaluate the presented framework. Mavetera (2011b); Mavetera and Kroeze, 2009 and Introna (1992) highlight that evaluation questions can be applied in an IS research study to make sure that all the necessary aspects have been addressed. The first question attempts to understand for whom this framework was developed. The second question was asks if the research problem has been solved or addressed. The remaining questions relate the requirements to the framework: How/can this comprehensive framework be utilized? What are the challenges involved? What are the factors that have to be considered when planning for the adoption of SS/SW and ICT web instruction technologies in HES? Finally, were the research methods deployed for this inquiry applicable, were the data techniques adopted during data analysis and interpretation aligned with method chosen? Did the comprehensive framework generated usual philosophical ideas?

8.6.1.1 Who are the consumers of the comprehensive framework?

The envisioned consumers/users of the developed comprehensive framework are learners/students, academic staff (educators), the IT department, and university management. These users of this framework have to ensure quality education delivery and advanced business administration processes. The framework offers the university management a better understanding of the potential benefits of the adoption of SS/SW and ICT web instructional technologies.

8.6.1.2 Was the research problem solved or addressed?

There are quite a number of research studies on the integration and adoption of ICT technologies. However, none have been conducted precisely on a framework for SS adoption in HES. Chapter 1 of the research study exposes the problem of the challenges higher education institutions are faced with when it comes to ICT web instructional technology use. It also highlighted that the South African higher education system is experiencing pressure to transform and to offer the skills needed in the new South Africa. Preparing educators to use SS/SW and ICT instructional web technologies seems to be the key factor in almost every development plan for education. The comprehensive framework developed addresses these issues.

8.6.1.3 What unique problems does the framework address?

The study considered the problem of educators' inability to integrate web instructional technologies (media distribution, blogs, wikis, and other SS technologies) successfully in their teaching and learning practices. It was discovered that the educators at these universities were well advanced concerning these tools. However, the NWU educators point a finger towards to the university policy framework as a factor that limits them from integrating these web tools. Some believe that such platforms are not incorporated in the NWU LMS/VLEs (eFundi).

The framework also addresses the problem of a lack of ICT confidence and technophobia. Neither educators nor students lacked ICT confidence or willingness. They were readily available to accept web instructional technologies in HES. The comprehensive framework addresses all the research problems.

8.6.1.4 What are the requirements of the framework?

The framework developed is intended for use in HES in conventional South African universities. It can work at any institution where knowledge is transferable to the society through ICT web instructional technologies enabled by Web 2.0 and 3.0 platform. However, there are no restrictions to the use of this framework as far as academic facilitation of learning and delivery is concerned. The framework should be adopted and integrated into the LMS/VLEs of these universities in order to be applicable and practical.

8.6.1.5 How/can this comprehensive framework be utilized?

This framework can be adopted or be integrated into the HES for facilitating and achieving educational goals. However, these web instructional technologies can be integrated as a complementary tool and cannot replace the traditional styles of teaching. The framework shows that both the physical component (face-to-face contact) and blended learning are essential for learner's development. The framework allows students and academic staff members to focus on interactive, collaborative learning, student management, information dissemination and improved educators' productivity and administration.

8.6.1.6 What are the challenges discovered?

- There are shortcomings with the use of interactive and collaborative platforms (semantic blogging; discussion forums; wikis; podcasting; vodcasts)
- Lack of RSS
- Minimal use of other conventional web instructional technologies to facilitate learning
- Minimal impact of ODL approach (at the NWU)
- Minimal ICT facilities, specifically at the NWU Mafikeng campus)

- There are cultural differences (learning approaches, curriculum formulation and design) across these universities.

8.6.1.7 *What are the factors that should be considered when planning for the adoption of SS/SW and ICT web instruction technologies in HES?*

This study probes a framework for SS adoption in HES to address the existing lack of ICT web technologies for facilitation and learning purposes. The framework suggested that there are factors that should be considered during ICT investment by any given institution. These factors are cost implications, the risks involved and the potential benefits that it will bring to the institution. This includes the university policy framework. The NWU policy framework limits educators. For this reason, it has to be repositioned and structured to allow the successful integration of these SS/SW and ICT web technologies in HES.

8.6.1.8 *Were the research methods used in this inquiry applicable?*

The basis for choosing the MMR methodological approach was that it suited the complexity of the problem investigated.

8.6.1.9 *Are the data techniques adopted in data analysis and interpretation aligned with method chosen?*

The steps followed during the stages of data analysis, presentation and interpretation are fundamental. The combined use of analytical statistical tools, software packages (ATLAS.ti, SPSS) enhanced the research processes. The study used interviews and questionnaires by means of online QuestionPro services. Each specific data technique was used to gather responses and data for the study. This served to triangulate the results.

8.6.1.10 *Has the comprehensive framework generated new philosophical ideas?*

No researcher has attempted to develop a framework for SS adoption in HES using MMR as this study has done. This study offers a comprehensive framework for SS adoption in HES and as such presents philosophical ideas different from many other researchers.

8.7 Validation and credibility of the study findings

The validity of research findings signifies that all procedural processes have been applied by following the right steps to provide solutions to the research questions. Reliability suggests consistency of measures, in other words the ability of a measurement instrument to measure the same thing each time it is used (Singh, 2007). Test-retest reliability is a measure of reliability obtained by administering the same test twice over a period of time to a group of individuals. In this study, the researcher checked for consistency in the responses. The Pearson's correlation coefficient was used to measure if the results reached the acceptable level of 0.5. The Internal consistency reliability employed in this study sought to evaluate whether the indicators that make up the scale or index were consistent. External validity is concerned with generalizations, the extent to which the results of a study can be generalized to populations, settings and measurement variables. All these constructs were considered and effected by including all of the items that probe the same theme.

Venkatesh *et al.* (2013) state that validity refers to the technical soundness of the study. The validation of MMR is sometimes multifaceted and difficult in the sense that the complexity of MMR is associated with representation and the legitimacy of the findings. When conducting MMR, validity should be emphasized. The concepts of trustworthiness, credibility and validity in MMR are important in any type of research as they strengthen the research findings (Venkatesh *et al.*, 2013). For this study, the justification of and the application of validity is to gain confidence that the nested research findings and practices were appropriate.

8.8 Limitations of the study

In academic research activities, all research is affected by a given set of limitations, and this study is no exception (Levy & Ellis, 2006). On the issue of bias, it is proper to emphasize that no form of research, in fact human activity generally, is without bias. Bias cannot be eliminated completely, but should be recognized. Sometimes personal bias is so subtle that the researcher is not even aware of it. In fact, many would argue that a researcher should not attempt to compensate for this bias, but should simply state clearly the possible biases involved and allow the readers to compensate for these themselves.

The following limitations affected this work:

- The study was only limited to three selected universities, namely the NWU, UNISA and UP.
- The interviews involved academic staff whose academic domains were information systems, computer sciences, school of computing and informatics. They were therefore quite knowledgeable and may not be representative of the broader population.
- The study was limited by the fact that researcher struggled to get hold of the interviewees. Only a few were able to schedule an appointment and availed themselves. There were constantly clashes with the interview appointments scheduled and the targeted participants due to the semester break. Some were on holiday and others were out of the country for conferences.

- In addition, the study was mainly founded on the views and knowledge of the respondents. These views could be subjective and cannot be generalized. This study was limited by resource constraints.

- Using a MMR approach where different data gathering techniques are used to collect data, can be overwhelming.

8.9 Delimitations of the study

8.9.1 What the study is not

It important to emphasize that there are two main approaches that guide the research in any IS research discipline. This approach entails the behavioural science and the design science (Peffers *et al.*, 2007). The behavioural aspect pursues to develop and verify philosophies or theories that seek to explain human or organizational behaviour. Behavioural research focuses on justification, development of theories and forecasting. The design science focuses on extending the landscape or boundaries of the organization or human capabilities in the sense that it seeks to create new and innovative artefacts (Peffers *et al.*, 2007).

Design science enhances artefact work, the standard as well as the performance. However, both approaches are involved in IS research. This thesis developed a framework for SS adoption in HES. Therefore, the study is theory-driven, with the aim to develop valid knowledge by describing, explaining and possibly predicting and producing shared understanding (Hanid, 2014). The study is, however, focused on theoretical problem solving, which entails narrative or solution-driven knowledge. The result emerging from this study through forecasting and explanation of phenomena may be employed in providing or designing solutions to the problem in question. The study developed new knowledge and ideas that may be used by professionals from the same fields to address similar research problems. The study based on the positivist approach and the connectivism learning theory (Denzin, 2012; Crnkovic, 2010).

The delimitations of the study are as follows:

- This study presents a framework for SS adoption in HES, not to develop a prototype for SS adoption in HES.

- This study does not entail the development of a university policy framework or curriculum.

- The study does not develop an e-learning system.

- Most significantly, the study does not test or measure the framework developed. The framework will serve as a guide on how to develop or to solve the existing problem.

- The study does not measure educators or students' mental or psychological capacity to use ICT web instructional technologies.
- The study does not cover any other institution apart from the selected universities mentioned in the study.

8.10 Recommendations for future research

The educators who participated in this study were all knowledgeable in the field of ICT. Educators in other disciplines may not be, and it could be valuable to investigate this in future research. In addition, the issues raised concerning the factors that may prevent the adoption of SS/SW and ICT in HES should not be ignored. Another recommendation is that the NWU university policy framework be revisited so that it can be aligned and repositioned to allow the incorporation and the use of interactive web instructional technologies.

Researchers should also investigate the matter of ICT adoption at more universities across South Africa. There used to be 36 universities in South Africa, which were reduced to 23 public HEIs after the merging process. Six of these were classified as comprehensive universities. These universities include the Nelson Mandela Metropolitan University; the University of South Africa; Walter Sisulu University; the University of Johannesburg; the University of Zululand and the University of Venda. Eleven were classified as traditional or conventional universities, namely the University of Pretoria; the University of Cape Town; the University of Fort Hare; the University of the Free State; the North-West University; the University of the Western Cape; the University of Witwatersrand; the University of Limpopo; the University of Stellenbosch; Rhodes University and the University of KwaZulu-Natal. Another six were classified as universities of technology, namely the Central University of Technology; the Cape Peninsula University of Technology; Durban University of Technology; Mangosuthu University of Technology; Tswane University of Technology and Vaal University of Technology. All the different types of universities should be studied in future. In addition, research should cover a wide range of academic domains and faculties. To add to this, there is a growing need for SS/SW and ICT web instructional technologies to be incorporated into teaching and learning platforms, offering another possible area of research.

8.11 Chapter summary

Chapter 1 laid the foundation for the study by presenting the background context, the research problem, identifying the research objectives and possible questions. Chapter 2 gave a historical overview of a framework for SS adoption in HES in the form of a descriptive literature review that detailed and unveiled the theoretical perspectives that are of relevance to the study based on previous scholars' experience of how similar research problems were solved.

Chapter 3 and 4 presented the proposed conceptual framework and the research methodologies, paradigms and instruments/techniques used during this study. It offered a clear discussion of research processes, approaches and theories deployed in the study. Chapter 5 and 6 of the chapter examined the results based on the objectives of the study. The results were presented using various techniques to help resolve many issues that were discussed in the problem statement. Chapter 7 handled the second research approach. The quantitative data analysis was presented based on the information gathered from the questionnaire across the selected universities.

The research problem identified in the study was addressed and the objectives have been reached. Solutions were proposed through the development of a comprehensive framework based on the MMR approach. The framework was evaluated to ascertain whether it has reached its aim by answering evaluation questions. The ideas, concepts and views of the respondents were accurately articulated and supported with existing academic literature studies.

The limitations of this study can serve as strengths and opportunities further studies, exposing the areas that require attentions. The contribution made in this study may be used to advance the adoption of SS/SW and ICT web instructional technologies in HES to serve as complementary technologies for teaching and learning purposes. It should not be used to replace the traditional approach of learning, but should support a blended and integrated learning process for achieving educational goals. The adoption of the comprehensive framework will be successful if the top management, IT departments and the educators apply the recommendations of this thesis when planning the adoption Web 2.0/3.0 in HES.

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ANNEXURES: A-K

ANNEXURE A: TERMINOLOGY AND CONCEPTS

This section, offers distinctive definitions of substantial terminology associated to this study which entails:

Table 1.1: Terms and concept definition

Affordance:	*The concept of affordance in this study is referred to as the act executed grounded on the intended purpose of an object or invention. This study used the term affordance to denote technological invention which offers users the avenue of perform a certain task or activity (Minocha, 2009/ McLoughlin & Lee, 2008).*
Blended and integrated learning:	*Blended and integrated learning may be also referred to as hybrid or mixed-mode courses. Blended and integrated learning approach in a pedagogical context is the combined use of traditional style of facilitating learning through face-to- face contact, jointly with online learning systems.In this instance, a class that is being conducted whereby a bit of the traditional face-to-face instructional is compliemtned with the web-based online learning (Tess, 2013/ McCarthy, 2010/* Sharma, 2010*).*
Framework:	*A framework is a conceptualisation of a specific complex research phenomenon, together with the salient constructs and their interconnection (Levy & Ellis, 2006) a framework can further be observed as road map that offers coherence to pragmatic inquiry in a research topic (Howard & Lubbe, 2012).*
Information and Communication Technology (ICT):	*Information and communication technology (ICT) in the context of education plays an integral part our society today. When it is considerably taken into account by the role it plays in the social, cultural and economic role it brings. Information and Communication Technology (ICT) is further denoted as wide-ranging of technologies namely, broadcast media, and audio and video processing and transmission for teaching and learing purpose (Tondeur et al., 2007).*

Innovation, Collaboration:	*In this context, innovation is viewed as an invention, indication, practice, or thing that is observed as actually new. While collaboration in this context relates to students communication between peers-to-peers, educators regardless of their location. (Voogt et al., 2013, 2013/ Moges, 2013/ Bonifacio, 2013/ Noor Ul Amin, 2013 & O'Reilly 2005).*
Mixed method research (MMR):	*The concept MMR, is the combined integration of qualitative data and quantitative data into a fused dataset with the initiative of producing or examining the research findings. In a MMR each of the method consolidates another, by improving data strengthen and reducing weaknesses from both data findings (Jokonya, 2016).*
Open Distance Learning (ODL):	*Open and Distance Learning (ODL) is usually the term used for ICT enabled communication employed to deliver education, contents as well as to improving learning globably. According to Ofoegbu (2009), who belives that ODL is progressively being realised as an educational delivery channel or model which is cost-effective without compromising the quality (Ofoegbu, 2009)*
Perception, Beliefs:	*In the context of this study, it simply means to view/perceive or be informed of certain object/concept in an environment to which they operate in. To develop beliefs regarding concepts/objects and actions" (Wood, 2011). On the other hand, beliefs in this instance, relates to human factor, and it is denoted on the standards that an individual have over something; an opinion; a verdict of a occurrence. (Pajares, 1996).*
Semantic or Web 3.0:	*The semantic web is commonly referred to Web 3.0. It is a newer of version of web 2.0 technologies. With present applications of supporting knowledge distribution and interoperability amongst incompatible information repositories depend on annotating data and preserving a syntactic reliability. Web 3.0 is as a form of web content where knowledge representation is standardised and relies on languages expressing information in a machine process-able form, by means of a framework based on RDF (Resource Description Framework) and ontologies (Tess, 2013/ Dotsika, 2012/ Lenhart et al., 2010)*

Social presence:	*The social presence in this study signifies the natural view of an environmen. Social presence refers to the extent of salience of the other person in the interaction and the consequent salience of the interpersonal relationships (Richardson & Swan, 2003/ Wood, 2011).*
Social Software or Web 2.0:	*The social software is also referred to as Web 2.0. The Web 2.0 provides the atmosphere where students can learning with varied typed of web instructional technologies and applications features. As opposed to the web 1.0. In other words, this signifies that users (students/educators) of web 2.0 have a wide-range of more interactive tools and a new version of web 1.0;. A more flexible design, more inspired, reuse, collaborative content, alteration, edification and modification. One distinctive affordance of web 2.0 is it fosters collaboration and assists to gather shared intelligence as compared to web 1.0 (Dotsika, 2012)*
Virtual learning environments (VLEs):	*Is ususal known to be an online teaching or learing platform/environment where the facilitation of learning is carried out n.d.*
Virtual world:	*A virtual world is a virtual evironment the combination of 2D/3D gaming technology, amplified reality, virtual environment power-driven with Internet technology where users relate through movable avatars. Learners can create their own avatars on the web & reside in these worlds. Virtual worlds can be seen as the creation of new era of e-learning as they offers learners to do role-play, 2D/3D demonstrating, simulations, creativeness and their active participations (Aghaei et al., 2012; Chisega-Negrila, 2012/ Rajiv & Manohar Lal, 2011 & Andriole, 2010).*

ANNEXURE B: CERTIFICATE OF PHD. RESEARCH FINDINGS PRESENTATION, COLLOQUIUM; APPROVED.

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
MAFIKENG CAMPUS

Faculty of Commerce and Administration
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South Africa, 2735
Tel: 018-3892064 Fax 018-3892090

FHDRC 5/2017

PHD COLLOQUIUM

The members of the colloquium appointed to attend the presentation of

Mr K Ohei

on 31/8/2017 find it satisfactory and recommend that it be approved.

Type of presentation: Approved – with recommendations.

Approval:

Prof I Choga
School of Economics and Decision Sciences

PP

Prof N Mavetera
Director: School of Economics and Decision Sciences
Member of FHDRC

Prof B Tchereni
Executive Dean of FCA
Member of FHDRC

Colloquium approval letter

ANNEXURE C: CERTIFICATE OF PHD. RESEARCH LITERATURE REVIEW AND METHODLOLOGY PRESENTATION COLLOQUIUM; APPROVED.

NORTH-WEST UNIVERSITY
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FHDRC 5/2016

PHD COLLOQUIUM

The members of the colloquium appointed to attend the presentation of

KENNETH OHEI

on 20 OCTOBER 2016 find it satisfactory and recommend that it be approved.

Type of presentation: METHODOLOGY

Approval: APPROVED WITH COMMENDATIONS

Prof N Moroke
School of Economics and Decision Sciences
Chairperson of the FHDRC(Acting)

Prof N Mavetera
Director: School of Economics and Decision Sciences
Member of FHDRC

DR Lekhanya, J.N

Prof S Swanepoel
Executive Dean of FCA
Member of FHDRC

Colloquium approval letter

ANNEXURE D: CERTIFICATE OF PHD. RESEARCH PROPOSAL PRESENTATION, COLLOQUIUM; APPROVED

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
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FHDRC 5/2015

PHD COLLOQUIUM

The members of the colloquium appointed to attend the presentation of Mr K N Ohei

on 20 October 2015 find it satisfactory and recommend that it be approved.

Type of presentation: Proposal

Approval: Approved

Prof N Mavetera
Director: School of Economics and Decision Sciences
Member of the FHDRC

PP.

Prof J B van Lill
Director: School of Management Sciences
Member of the FHDRC

PP

Prof J Meyer
Director: Graduate School of Business and Government Leadership
Member of the FHDRC

Colloquium approval letter

ANNEXURE E: CERTIFICTE OF LANGUAGE EDITING

cumlaude
languagepractitioners

Director: CME Terblanche - BA (Pol Sc), BA Hons (Eng), MA (Eng), TEFL
22 Strydom Street Tel 082 821 3083
Baillie Park, 2531 cumlaudelanguage@gmail.com

DECLARATION OF LANGUAGE EDITING

I, Christina Maria Etrecia Terblanche, hereby declare that I edited the research study with the title:

A framework for social software adoption in higher education systems

for Kenneth Ohei for the purpose of submission as a research study for examination. Changes were suggested in track changes and implementation was left up to the author.

Regards,

CME Terblanche

Cum Laude Language Practitioners (CC)

SATI accreditation nr: 1001066

Full member of PEG

ANNEXURE F: CERTIFICATE OF ETHICAL CLEARANCE OBTAINED

NORTH-WEST UNIVERSITY
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Institutional Research Ethics Regulatory Committee
Tel: +27 18 299 4849
Email: Ethics@nwu.ac.za

ETHICS APPROVAL CERTIFICATE OF PROJECT

Based on approval by the Human Sciences Research Ethics Committee (HSREC) on 23/08/2016, the North-West University Institutional Research Ethics Regulatory Committee (NWU-IRERC) hereby **approves** your project as indicated below. This implies that the NWU-IRERC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: A contextual framework for e-government implementation in the SADC region: A case of Zimbabwe.

Project Leader/Supervisor: Prof N Mavetera & Dr M Jantjies.
Student: T Chikerema

Ethics number: N W U - 0 0 4 0 5 - 1 6 - A 9

Application Type: PhD Application
Commencement date: 2016-08-18 **Expiry date:** 2019-08-18 **Risk:** N/A

Special conditions of the approval (if applicable):

- Translation of the informed consent document to the languages applicable to the study participants should be submitted to the HRREC (if applicable).
- Any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the HRREC. Ethics approval is required BEFORE approval can be obtained from these authorities.

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The project leader (principle investigator) must report in the prescribed format to the NWU-IRERC via HRREC:*
  - *annually (or as otherwise requested) on the progress of the project, and upon completion of the project*
  - *without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.*
  - *Annually a number of projects may be randomly selected for an external audit.*
- *The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the HRREC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-IRERC via HRREC and new approval received before or on the expiry date.*
- *In the interest of ethical responsibility the NWU-IRERC and HRREC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the project;*
  - *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process.*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the project are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the HRREC or that information has been false or misrepresented,*
    - *the required annual report and reporting of adverse events was not done timely and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*
- *HRREC can be contacted for further information via Estie.Emtoch@nwu.ac.za or 018 289 2873.*

The IRERC would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the IRERC or HRREC for any further enquiries or requests for assistance.

Yours sincerely

Prof LA Du Plessis
Digitally signed by Prof LA Du Plessis
Date: 2016.09.27 14:36:04 +02'00'

Prof Linda du Plessis
Chair NWU Institutional Research Ethics Regulatory Committee (IRERC)

ANNEXURE G: INTERVIEW: INFORMATION CONSENT

NORTH-WEST UNIVERSITY
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02 February 2017

RE: Information Letter and Consent Form for Invitation to be interviewed: A framework for Social software adoption in Higher Education systems

Dear XXXX

This letter serve as an invitation to participate in a study I am conducting as part of my Doctoral degree in the Department of Information Systems, School of Economic and Decision Sciences at the North West University (Mafikeng Campus), under the supervision of Prof Nehemiah Mavetera and Prof Sam Lubbe.

We request for your voluntary consent to participate in an interview we may learn more about the usefulness, importance and potential benefits of Social Software/Semantic Web and ICT tools in facilitating learning in Higher Educational Systems. Nowadays the Social Software /Semantic Web also known as the Web 2.0 & 3.0 and ICT tools applications play fundamental role in enhancing universities' business processes towards information management's performance, decision-making, integration of knowledge creation and use. Social software/Semantic Web & ICT tools offers learner the ability to access information at any given time and place as well as the option where, when and how to learn.

Main objectives of this research are to determine the educators' and students' profound confidence in their digital competence; to examine the extent of educator's and student's ICT profound confidence, readiness, willingness to adopt Social Software/Semantic Web technological innovation in teaching and learning and what are the main obstacles they encounter. It is anticipated that the information we gain from this study will help us to improve quality service delivery in education and for future research projects. Your participation is voluntary. It will involve an interview which take approximately (20-45minutes) and will take effect in a mutually agreed platform. In your response, please indicate from these possible options (telephone interview, skype interview, written interview and face-to-face interview) that is most convenient. You may decline to answer any of the interview questions if you so wish. Further, you may decide to withdrawal of your consent in the research study will not result in any penalty or loss of benefits.

With your consent, the interview will be tape-recorded to facilitate collection of information, and later transcribed for analysis. Shortly after the interview has been completed, I will send you a copy of the transcript to give you an opportunity to confirm the accuracy of our conversation and to add or clarify any points that you wish. All information you provide is considered completely confidential. Your name will not appear in any thesis or report resulting from this study, however, with your consent anonymous quotations may be used. The records will be kept for five years for audit purposes where after it will be permanently destroyed, hard copies will be shredded and electronic versions will be permanently deleted from the hard drive of the computer.

I would like to assure you that this study has been reviewed and approved by the North West University Institutional Research Ethics Regulatory Committee (NWU-IRERC) based on approval by Human Sciences Research Ethics Committee (HSREC). I am looking forward to speaking with you and thank you in advance for your assistance in this project. If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact the primary researcher, Kenneth Ohei, on 0730633904; email: kennethohei@gmail.com. The study leader, Prof Mavetera, during office hours at (018)3892143; email: Nehemiah.Mavetera@nwu.ac.za

Warm regards

ANNEXURE H: RESEARCH: INTERVIEW GUIDE

NB: I will only ask you about things that you should feel comfortable telling me about; if you do not feel comfortable answering any question, you are welcome not to answer it.

Background Information on Interviewee (Part A)

In the questions in Table below the researcher aimed to get to know the interviewee's professional life in relation to information required for the study.

Questions	Purpose
What is your title, job title, your job description and academic experience?	The question was meant for introductory purposes. It was meant for the researcher to familiarise with the interviewee thereby establish proper grounds to address them and start the conversation.

Main Interview Questions (Part B)

1. Social Software/Semantic Web and ICT web technologies adoption in Higher Educational Systems

   Social Software/Semantic Web also known as (Web 2.0/3.0) and ICTs tools has been perceived as driven force to improve learning enthusiasm and ease access to education.

   1.1. Are you familiar with any of the following social software (SS)/semantic web (SW) & ICT tools application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, Digital Library, Podcast, myUnisa, eFundi, clickUP, MyTUKS, Blackboard, WebCT, Overhead projector)?

   1.2. Does your institution offers open distant learning (ODL)?

   1.3. Do you think that by adopting these SS/SW & ICT tools application in Higher Education Systems (HES), do/can it assist in improving learning enthusiasm, performance, easy access and quality educational delivery, if so, how?

2. SS/SW adoption and its usefulness in universities (Part C)

   This section of the questions, attempts to access educators' views regarding SS/SW and to explore the flaws and effectiveness of Web 2.0 and Web 3.0 in education for facilitation of learning and business administration.

   2.1 What do you know about SS/SW and ICTs tools and application and its potentiality in supporting educational goal?

   2.2 Do you find SS/SW and ICTs tools useful for teaching and learning, if so, please explain?

2.3 The integration and adoption of SS/SW and ICTs tools can enable you to accomplish tasks more quickly, if so, explain how?

2.4 Using SS/SW and ICTs tools can increase your productivity as an educator, if so how?

2.5 Do you think by using these tools may pose serious issues regarding the aspects of (i.e unethical issues, privacy, intellectual property right and misuse and exploitation), please provide your view?

2.6 What other possible flaws may arise as a result of using SS/SW and ICT, explain comment your view?

3. Educators' confidence level of ICTs (Part D)

This area explores the extent of educators' ICT confidence, readiness, willingness, and their digital competence when using this tools to ensure a systematic approach to supporting and sustaining technological innovation in teaching and learning.

3.1 There are various types of SS/SW and ICTs and application that educators can use on a daily basis for teaching and learning (as highlighted in question 1.2). Which of these SS/SW tools do you often make use of on daily activities or most frequently?

3.2 Please give reason (s) what inspired you to use these tools and applications when facilitating learning and if you don't use these tools, why?

3.3 Why are you not using some of these SS/SW and ICTs tools that you didn't mention (Facebook, Twitter, YouTube, Skype, Blog, Wiki, Digital Library, Podcast, myUnisa, eFundi, clickUP, MyTUKS, Blackboard, WebCT, Overhead projector) if any?

3.4 Does your institution provide necessary resources to enable you use SS/SW and ICTs tools and application?

3.5 Does your institution provide you with the necessary training, workshops seminars to advance your knowledge to use SS/SW and ICTs tools and application?

4. Controversies and challenges (Part E)

There is a realization that the challenges and controversies associated with the adoption and use of SS/SW & ICTs tools application in teaching and learning are as follows. Please explain to what extent do you agree with the following statements?

4.1 Difficult to integrate and use for facilitation of learning, if so how?

4.2 Insufficient time, simultaneous access and massive workload, if so, how?

4.3 Lack of confidence and willingness to accept technology change, if so how?

4.4 Phobia, attitudes/perceptions to use web technologies, if so how?

4.5 Lack of resources (ICT Infrastructures/facilities; technical assistance training) and policy, if so how?

5. Educators and learners' development and support (Part F)

Strategies to recommend for educators' development support prepare them in the use of SS/SW and ICTs tools in HES.

5.1 Reflect your view

Kenneth Ohei

North West University (Mafikeng Campus)

Department of Information Systems

Faculty of Commerce and Administration; School of Economic and Decision Sciences

Contact Information (E-mail:kennethohei@gmail.com/ Mobile phone: +27 73 063 3904)

ANNEXURE I: RESEARCH: QUESTIONNAIRE GUIDE

PhD: RESEARCH QUESTIONNAIRE

FOR OFFICE USE ONLY: Respondent Code:.............

A framework for Social software adoption in Higher Education systems

Researcher: Kenneth Ohei

Note to the respondent

I need you to help me comprehend the usefulness of Social Software/Semantic Web and ICT tools in facilitating learning in Higher Educational Systems. Nowadays the Social Software /Semantic Web also known as the Web 2.0 & 3.0 and ICT tools applications play vital part in enhancing universities' business processes towards information management's performance, decision-making, integration of knowledge creation and use. SS/SW & ICT tools offers learner the ability to access information at any given time and place as well as the option where, when and how to learn.

Main objectives of this research are following:

- To determine the educators' and students' profound confidence in their digital competence.
- To examine the extent of educator's and student's ICT profound confidence, readiness, willingness to adopt SS/SW technological innovation in teaching and learning and what are the main obstacles they encounter.

Instruction to complete the questionnaire

- To complete this, questionnaire, it takes approximately 10 to 15 minutes, please answer the questions as truthfully as you can. There are seven sections (A-G), please ensure to read and follow the directions for each part. I would like to assure you that the results from this survey will not be misused in any way alongside with the information obtained will be considered as strictly confidential.
- If you decide to withdraw from continuing from this questionnaire at any given point in time, you may.
- Your advised to mark each response by making a tick or a cross, or encircling each appropriate response with a **PEN** (not a pencil), or by filling in the required words or numbers.

In case of any question, please, do not hesitate to contact me on the bellow mentioned contact information. Thank you for your cooperation and your valuable time in advance.

Kenneth Ohei
North West University (Mafikeng Campus)
Department of Information Systems
Faculty of Commerce and Administration; School of Economic and Decision Sciences
Contact Information (E-mail:kennethohei@gmail.com/ Mobile phone: +27 73 063 3904)

SECTION A

Demographic Variable

A1.

Gender	Male	1	Female	2

A2.

Age	18-25	1	25-31	2	31 and above	3

A3.

Name of University/institution	NWU MFK	1	NWU POTCH	2	NWU VAAL	3	UNISA	4	UNIVERSITY OF PRETORIA	5

A4.

Level of study	National Diploma (Undergraduate)	1
	Degree (Undergraduate)	2
	Post-graduate (Honours)	3
	Post-graduate (Masters)	4
	Post-graduate (PhD)	5

A5.

Academic Background		
In general term, how would you rank your average academic performance?	30% – 45%	1
	50% – 65%	2
	70% – 75%	3
	80% – 100%	4

SECTION B

Internet Awareness and Access

Please indicate to what extent you agree or disagree with the following statements below **1** = Completely agree **2** = Agree **3** = Disagree **4** = Completely disagree						
B1	Do you have basic computer skills (Ms Word, Excel, PowerPoint, Access, internet etc)?	1	2	3	4	
B2	Do you have access to the internet?	1	2	3	4	
Use the rating order below for your response in this section **1** = Every day **2** = 2-3 Days **3** = Once a week **4** = More than a week **5** = None						
B3	How/when do you often access the internet?	1	2	3	4	5
B4	Where do you basically have access to the internet?	Campus	Home	Both	Other	None
B4.1	If your answer other in (question B4) please specify..					
B5	Can you approximate the amount of hour (s) you spend using the internet in a day?	0-1 hour	1-2 hours	3-4 hours	5 and above	
In question B6, please tick as many that are applicable. Use the rating order below for your response **1** = Entertainment **2** = Educational use (i.e. assignment/ task activities) **3** = Information searching/filtering (i.e. Browsing) **4** = Research Activities **5** = All of the above……**6** = Other						
B6	When you access the internet, what purpose do you use the internet for?	1	2	3	4	5

SECTION C

Integrating ICT tools and application in HES

Please indicate to what extent you agree or disagree with the following statements.

1 = Completely agree 2 = Agree 3 = Disagree 4 = Completely disagree

C1	The adoption of social software and Information and Communication Technologies (ICTs) tools and application in teaching and learning can assist learners with their course module?	1	2	3	4
C2	The adoption of social software and Information and Communication Technologies (ICTs) tools and application can improve easy access to education at any given time and place?	1	2	3	4
C3	The adoption of social software and Information and Communication Technologies (ICTs) tools and application can improve quality education delivery?	1	2	3	4
C4	The adoption of social software and Information and Communication Technologies (ICTs) tools and application can improve learner's performance?	1	2	3	4
C5	The adoption of social software and Information and Communication Technologies (ICTs) tools and application can increase learning motivation, enthusiasm and collaboration?	1	2	3	4

SECTION D

Framework analysis of Semantic Web Based in educational Systems (SWBES)

D1	Would you agree that you are familiar with some of the following social software/semantic web & ICT tools application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, Digital Library, Podcast, myUnisa, eFundi, clickUP, MyTUKS, Blackboard/WebCT, Overhead projector)?	1 Completely Agree	2 Agree	3 Disagree	4 Completely disagree
D2	Based on your understanding of these tools, what is your view concerning these social software/semantic web & Information Communication Technology (ICTs) tools application in supporting teaching and learning in Higher Education? **Use the rating order below for your responses** **1** = Very supportive **2** = Supportive **3** = Not aware **4** = Not supportive				

D2.1. Overhead projectors	1	2	3	4
D2.2. Blackboard/WebCT	1	2	3	4
D2.3. Digital Library	1	2	3	4
D2.4. Learning with 3D Wiki	1	2	3	4
D2.5. Social Networking sites (Facebook, Twitter, YouTube, and Skype)	1	2	3	4
D2.6. Semantic blog/Micro Blogging	1	2	3	4
D2.7. Podcast/vodcast	1	2	3	4
D2.8. EFundi	1	2	3	4
D2.9. MyUnisa	1	2	3	4
D2.10. ClickUP	1	2	3	4
D2.11. MyTUKS	1	2	3	4

SECTION E

Students' digital competences and confidence level

Please indicate to what extent you agree or disagree with the following statements

1 = Completely agree **2** = Agree **3** = Disagree **4** = Completely disagree

E1	Do you have phobia towards ICTs and web technologies	1 Completely agree	2 Agree	3 Disagree	4 Completely disagree
E2	Do you have positive attitude when using or regarding any of the following social software/semantic web & ICT tools application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, Digital Library, Podcast, myUnisa, eFundi, clickUP, MyTUKS etc)?	1 Completely agree	2 Agree	3 Disagree	4 Completely disagree
E2.a	If you agreed in (question E2), which of these Information and Communication Technology tools do you frequently use on daily basis, please list as many as applicable …………………………………………………………………………………… ……………………………………………………………………………………				
E2.b	If you disagreed in (question E2), what do you think could be the problem? …………………………………………………………………………………… ……………………………………………………………………………………				
E3	Do you find any of these tools and applications as listed in **(question E2)** difficult to use?	1 Comp agree	2 Agree	3 Disagree	4 Com isagre

Use the rating order below for your response in question E4

1 = Outstanding **2** = Standard **3** = Average **4** = Basic **5** = Poor

E4	How is your confidence level when using any of Information and Communication Technologies (ICTs) tools and application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, Digital Library, Podcast, myUnisa, eFundi, clickUP, MyTUKS etc) in your learning?	Outstanding	Standard	Average	Basic	Poor

E5	How is your willingness/readiness to use Information and Communication Technologies (ICTs) tools and application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, Digital Library, Podcast, myUnisa, eFundi, clickUP, MyTUKS etc) in your learning?	Willing	Enthusiastic	Not willing	Not interested	Normal
E6	Would you agree that your educators/supervisors use this ICT tools application to facilitate learning?	Com. Agree	Agree	Disagree	Comdisagree	

E7 Which amongst these social software and Information Communication Technology (ICTs) tools does your educators/supervisors uses most frequently to facilitate teaching & learning?

1 = Most frequently **2** = Frequently **3** = Not in use **4** = Never in use

E7.1. Overhead projectors	1	2	3	4
E7.2. Blackboard/WebCT	1	2	3	4
E7.3. Digital Library	1	2	3	4
E7.4. Learning with 3D Wiki	1	2	3	4
E7.5. Social Networking sites (Facebook, Twitter, YouTube, and Skype)	1	2	3	4
E7.6. Semantic blog/Micro Blogging	1	2	3	4
E7.7. Podcast/vodcast	1	2	3	4
E7.8. EFundi	1	2	3	4
E7.9. MyUnisa	1	2	3	4
E7.10. ClickUP	1	2	3	4
E7.11. MyTUKS	1	2	3	4

E8

Please indicate to what extent you agree or disagree with the following statements.

What do you think inspired your educators/supervisors to use any of these Information Communication Technologies (ICTs) tools application to facilitate and support learning?

1 = Completely agree **2** = Agree **3** = Disagree **4** = Completely disagree

E8.1. Collaborative learning			3	
E8.2. Student's relationship management	1			
E8.3. Quality service delivery				
E8.4. Improved administration processes				4
E8.5. Transitioning/Change		2	3	
E8.6. Easy access and enthusiastic learning		2		4
E8.7. Improved learning theories (connectivism)	1	2		
E8.8. Knowledge creation management	1	2	3	
E8.9. Improved and integrated learning				
E8.10. Information quality				

SECTION F

Controversies/challenges

F	**Please indicate to what extent you agree or disagree with the following statements** What do you think are the challenges that limit educators/supervisors from not using these Information Communication Technologies (ICTs) tools during facilitation of learning? **1** = Completely agree **2** = Agree **3** = Disagree **4** = Completely disagree				
	F1. Difficult to integrate ICT into teaching	1	2	3	4
	F2. Difficult to use	1	2	3	4
	F3. Insufficient educator time	1	2	3	4
	F4. Too much of workloads	1	2	3	4
	F5. Not enough simultaneous access	1	2	3	4
	F6. Phobia to use web technologies	1	2	3	4
	F7. Attitudes/perceptions	1	2	3	4
	F8. Lack of proper knowledge, skills and capacity	1	2	3	4
	F9. Lack of confidence level	1	2	3	4
	F10. Lack of willingness to accept change	1	2	3	4
	F11. Lack of resources (Computer facilities)	1	2	3	4
	F12. Technical assistance/training	1	2	3	4

SECTION G

Student development and support programme

In this section of the question, please tick with an X as many that are applicable		
G	For learners that are not technologically advanced, what strategies do you suggest for learners development and support programme to prepare them in the use of ICT tools?	
G1	Be referred to academic development programme	
G2	Introduce ICT as compulsory module	
G3	Reflect you view …………………………………………………………………………………… ……………………………………………………………………………………	

Thank you for your time and participation!!!!!!

The End of Questionnaire!

ANNEXURE J: THE EXAMPLES OF UNIVERSITIES THAT HAS INTEGRATED SS IN TEACHING AND LEARNING

Ref/author	University	Narration of technological tools used	Engagement
Read (2005)	Drexel University, USA	Read research evidence stated that students record their study-group sessions as well as maintaining audio blogs to connect with peers during the work experience activities.	Peer-to-peer learning, shared intelligence approach
Lee, Chan & McLoughlin (2006)	Charles Sturt University, Australia	At the Australia University, students took charge of creating talkback radio-style podcasts to assist other students	Learner-centred instruction; student-generated content
Evans (2006)	Swathmore College, USA	Literature students were engaged to read short passages and record them as podcasts, as well as creating individual podcasts	Development of digital and social competencies
Miller (2006; 2007)	University of Connecticut, USA	Three forms of podcasts were used to support a General Psychology course: • iCube podcasts – Informal discussions with students following each week's lectures; • Precasts – Short improved podcasts previewing resources prior to each lecture; • Postcasts – Short post-lecture podcasts containing re-explanations of selected concepts.	Blending of formal and informal learning; mobile, ubiquitous learning

Ref/author	University	Narration of technological tools used	Engagement
Edirisingha, Salmon & Fothergill (2006)	University of Leicester UK	Students make use of "profcasts", i.e. material designed to support learning distinct from that which is facilitated through structured on-campus or e-learning processes alone. E.g., weekly profcasts to supplement online teaching through updated information and guidance.	Extended learning, enrichment and extension activities, personalisation of learning content
Sener (2007)	University of North Carolina at Pembroke, USA	A wiki-based encyclopaedia was produced by students, the goal being to create entries on a variety of subjects related to law, criminal justice, sociology and criminology.	Student-generated content, collaborative writing, organising and editing content
Wenzloff (2005); Richardson (2006)	Macomb Independent School District, Michigan, USA	Social bookmarking was adopted to compile and distribute resources with educators training participants. The instructor also subscribes to the RSS feeds of the students' Furl sites, to see what they are reading as well as their comments about the sites.	Resource-based and collaborative learning
Yew, Gibson & Teasley (2006)	University of Michigan, USA	Students initialled and present blog posts and bookmarks, with keywords or tags, openly and in a collaboratively manner. This allows all stakeholders to use social software to organise, share and coordinate knowledge	Community of learning
Boulos, Maramba & Wheeler (2006)	University of Plymouth, UK	Blogs, wikis and podcasts were incorporated for virtual collaborative clinical practice in health and paramedical education, to foster sharing and reflection.	Anytime, anyplace, peer-to peer learning community, self-regulated learning

Adopted by (McLoughlin & Lee, 2008)

ANNEXURE K: CROSS-TABULATIONS AND CORRELATION SECTIONS

Cross-tabulation Section B

A3. Name of University/Institution * B1. Do you have basic computer skills (Ms Word, Excel, PowerPoint, Access, Internet etc)? Crosstabulation

			B1. Do you have basic computer skills (Ms Word, Excel, PowerPoint, Access, Internet etc)?				
			Completely agree	Agree	Disagree	Completely disagree	Total
A3. Name of University/Institution	NWU (MFK)	Count	139	122	31	12	304
		% within A3. Name of University/Institution	45.7%	40.1%	10.2%	3.9%	100.0%
	NWU (POTCH)	Count	71	61	24	10	166
		% within A3. Name of University/Institution	42.8%	36.7%	14.5%	6.0%	100.0%
	NWU (VAAL)	Count	66	64	22	11	163
		% within A3. Name of University/Institution	40.5%	39.3%	13.5%	6.7%	100.0%
	UNISA	Count	61	85	21	15	182
		% within A3. Name of University/Institution	33.5%	46.7%	11.5%	8.2%	100.0%
	UNIVERSITY OF PRETORIA (UP)	Count	59	62	22	11	154
		% within A3. Name of University/Institution	38.3%	40.3%	14.3%	7.1%	100.0%
Total		Count	396	394	120	59	969
		% within A3. Name of University/Institution	40.9%	40.7%	12.4%	6.1%	100.0%

A3. Name of University/Institution * B2. Do you have access to the Internet? Crosstabulation

			B2. Do you have access to the Internet?				Total
			Completely agree	Agree	Disagree	Completely disagree	
A3. Name of University/Institution	NWU (MFK)	Count	155	126	14	9	304
		% within A3. Name of University/Institution	51.0%	41.4%	4.6%	3.0%	100.0%
	NWU (POTCH)	Count	83	65	10	8	166
		% within A3. Name of University/Institution	50.0%	39.2%	6.0%	4.8%	100.0%
	NWU (VAAL)	Count	67	78	12	6	163
		% within A3. Name of University/Institution	41.1%	47.9%	7.4%	3.7%	100.0%
	UNISA	Count	77	67	21	17	182
		% within A3. Name of University/Institution	42.3%	36.8%	11.5%	9.3%	100.0%
	UNIVERSITY OF PRETORIA (UP)	Count	70	68	10	6	154
		% within A3. Name of University/Institution	45.5%	44.2%	6.5%	3.9%	100.0%
Total		Count	452	404	67	46	969
		% within A3. Name of University/Institution	46.6%	41.7%	6.9%	4.7%	100.0%

A3. Name of University/Institution * B3. How/when do you often access the Internet? Crosstabulation

			B3. How/when do you often access the Internet?				Total
			Every day	2-3 Days	Once a week	More than a week	
A3. Name of University/Institution	NWU (MFK)	Count	198	62	30	14	304
		% within A3. Name of University/Institution	65.1%	20.4%	9.9%	4.6%	100.0%
	NWU (POTCH)	Count	103	36	19	8	166
		% within A3. Name of University/Institution	62.0%	21.7%	11.4%	4.8%	100.0%
	NWU (VAAL)	Count	98	37	24	4	163
		% within A3. Name of University/Institution	60.1%	22.7%	14.7%	2.5%	100.0%
	UNISA	Count	70	76	28	8	182
		% within A3. Name of University/Institution	38.5%	41.8%	15.4%	4.4%	100.0%
	UNIVERSITY OF PRETORIA (UP)	Count	89	35	21	9	154
		% within A3. Name of University/Institution	57.8%	22.7%	13.6%	5.8%	100.0%
Total		Count	558	246	122	43	969
		% within A3. Name of University/Institution	57.6%	25.4%	12.6%	4.4%	100.0%

A3. Name of University/Institution * B4. Where do you basically have access to the Internet? Crosstabulation

			B4. Where do you basically have access to the Internet?				
			Campus	Home	Both (Campus & Home)	Other (Work place)	Total
A3. Name of University/Institution	NWU (MFK)	Count	141	34	129	0	304
		% within A3. Name of University/Institution	46.4%	11.2%	42.4%	0.0%	100.0%
	NWU (POTCH)	Count	56	26	84	0	166
		% within A3. Name of University/Institution	33.7%	15.7%	50.6%	0.0%	100.0%
	NWU (VAAL)	Count	64	24	75	0	163
		% within A3. Name of University/Institution	39.3%	14.7%	46.0%	0.0%	100.0%
	UNISA	Count	57	46	58	21	182
		% within A3. Name of University/Institution	31.3%	25.3%	31.9%	11.5%	100.0%
	UNIVERSITY OF PRETORIA (UP)	Count	80	16	58	0	154
		% within A3. Name of University/Institution	51.9%	10.4%	37.7%	0.0%	100.0%
Total		Count	398	146	404	21	969
		% within A3. Name of University/Institution	41.1%	15.1%	41.7%	2.2%	100.0%

A3. Name of University/Institution * B5. Can you approximate the amount of hour (s) you spend using the Internet in a day? Crosstabulation

			B5. Can you approximate the amount of hour (s) you spend using the Internet in a day?				
			0-1 hour	1-2 hours	3-4 hours	5 and above	Total
A3. Name of University/Institution	NWU (MFK)	Count	27	116	133	28	304
		% within A3. Name of University/Institution	8.9%	38.2%	43.8%	9.2%	100.0%
	NWU (POTCH)	Count	13	54	79	20	166
		% within A3. Name of University/Institution	7.8%	32.5%	47.6%	12.0%	100.0%
	NWU (VAAL)	Count	16	71	54	22	163
		% within A3. Name of University/Institution	9.8%	43.6%	33.1%	13.5%	100.0%
	UNISA	Count	40	73	47	22	182
		% within A3. Name of University/Institution	22.0%	40.1%	25.8%	12.1%	100.0%
	UNIVERSITY OF PRETORIA (UP)	Count	24	53	68	9	154
		% within A3. Name of University/Institution	15.6%	34.4%	44.2%	5.8%	100.0%
Total		Count	120	367	381	101	969
		% within A3. Name of University/Institution	12.4%	37.9%	39.3%	10.4%	100.0%

A3. Name of University/Institution * B6. When you access the Internet, what purpose do you use the Internet for? Crosstabulation

			B6. When you access the Internet, what purpose do you use the Internet for?					
			Entertainment	Educational use	Information searching/filtering	Research Activities	All of the above	Total
A3. Name of University/Institution	NWU (MFK)	Count	26	78	66	38	96	304
		% within A3. Name of University/Institution	8.6%	25.7%	21.7%	12.5%	31.6%	100.0%
	NWU (POTCH)	Count	19	42	26	35	44	166
		% within A3. Name of University/Institution	11.4%	25.3%	15.7%	21.1%	26.5%	100.0%
	NWU (VAAL)	Count	18	39	36	26	44	163
		% within A3. Name of University/Institution	11.0%	23.9%	22.1%	16.0%	27.0%	100.0%
	UNISA	Count	29	40	34	18	61	182
		% within A3. Name of University/Institution	15.9%	22.0%	18.7%	9.9%	33.5%	100.0%
	UNIVERSITY OF PRETORIA (UP)	Count	14	32	29	30	49	154
		% within A3. Name of University/Institution	9.1%	20.8%	18.8%	19.5%	31.8%	100.0%
Total		Count	106	231	191	147	294	969
		% within A3. Name of University/Institution	10.9%	23.8%	19.7%	15.2%	30.3%	100.0%

Cross-tabulation Section D2

Table 6.8: D2- Respondents from NWU (MFK) perceived views of SS/SW and ICT tools in supporting teaching and learning in HES

Items	V, Supportive	Supportive	Not aware	Not supportive
D2.1. Overhead projectors	40.1%	26.6%	28.3%	4.9%
D2.2. Blackboard/WebCT	18.1%	33.2%	34.9%	13.8%
D2.3. Digital Library	26.6%	44.4%	24%	4.9%
D2.4. Learning with 3D Wiki	28.6%	42.8%	27%	2.3%
D2.5. Social Networking sites (Facebook, Twitter, YouTube, and Skype)	32.2%	39.8%	23.7%	4.3%
D2.6. Semantic blog/Micro Blogging	28.3%	43.4%	25%	3.3%
D2.7. Podcast/vodcast	30.6%	34.9%	30.9%	3.6%
D2.8. eFundi	66.8%	20.1%	10.9%	2.3%
D2.9. MyUnisa	0%	0%	45.7%	54.3%
D2.10. ClickUP	0%	0%	71.1%	28.9%
D2.11. MyTUKS	0%	0%	32.6%	67.4%

Table 6.8: D2- Respondents from NWU (POTCH) perceived views of SS/SW and ICT tools in supporting teaching and learning in HES

Items	V, Supportive	Supportive	Not aware	Not supportive
D2.1. Overhead projectors	39.8%	30.7%	21.1%	8.4%
D2.2. Blackboard/WebCT	15.7%	29.5%	38.6%	16.6%
D2.3. Digital Library	18.7%	50%	25.3%	6%
D2.4. Learning with 3D Wiki	25.9%	41.6%	28.9%	3.6%
D2.5. Social Networking sites (Facebook, Twitter, YouTube, and Skype)	31.3%	39.2%	24.1%	5.4%
D2.6. Semantic blog/Micro Blogging	21.7%	50%	25.3%	3%
D2.7. Podcast/vodcast	27.1%	31.9%	34.9%	6%
D2.8. eFundi	68.1%	23.5%	7.2%	1.2%
D2.9. MyUnisa	0%	0%	50%	50%
D2.10. ClickUP	0%	0%	71.1%	28.9%
D2.11. MyTUKS	0%	0%	39.2%	60.8%

Table 6.8: D2- Respondents from NWU (VAAL) perceived views of SS/SW and ICT tools in supporting teaching and learning in HES

Items	V, Supportive	Supportive	Not aware	Not supportive
D2.1. Overhead projectors	41.1%	35%	15.3%	8.6%
D2.2. Blackboard/WebCT	16.6%	29.4%	39.3%	14.7%
D2.3. Digital Library	24.5%	46.6%	22.1%	6.7%
D2.4. Learning with 3D Wiki	25.2%	44.2%	28.2%	2.5%
D2.5. Social Networking sites (Facebook, Twitter, YouTube, and Skype)	42.9%	31.9%	19.6%	5.5%
D2.6. Semantic blog/Micro Blogging	23.9%	40.5%	29.4%	6.1%
D2.7. Podcast/vodcast	27.6%	32.5%	34.4%	5.5%
D2.8. eFundi	68.1%	23.5%	5.5%	3.1%
D2.9. MyUnisa	0%	0%	46%	54%
D2.10. ClickUP	0%	0%	64.4%	35.6%
D2.11. MyTUKS	0%	0%	24.5%	75.5%

Table 6.8: D2- Respondents from UNISA perceived views of SS/SW and ICT tools in supporting teaching and learning in HES

Items	V, Supportive	Supportive	Not aware	Not supportive
D2.1. Overhead projectors	41.1%	34.1%	16.5%	8.2%
D2.2. Blackboard/WebCT	20.3%	25.8%	36.3%	17.6%
D2.3. Digital Library	9.3%	26.9%	42.3%	21.4%
D2.4. Learning with 3D Wiki	17.6%	47.8%	31.9%	2.7%
D2.5. Social Networking sites (Facebook, Twitter, YouTube, and Skype)	23.6%	36.3%	19.2%	20.9%
D2.6. Semantic blog/Micro Blogging	39%	42.3%	16.5%	2.2%
D2.7. Podcast/vodcast	30.2%	32.4%	22.5%	14.8%
D2.8. eFundi	0%	0%	53.3%	46.7%
D2.9. MyUnisa	34.6%	32.4%	15.3%	17.6%
D2.10. ClickUP	0%	0%	66.5%	33.5%
D2.11. MyTUKS	0%	0%	49.5%	50.5%

Table 6.8: D2- Respondents from UP perceived views of SS/SW and ICT tools in supporting teaching and learning in HES

Items	V, Supportive	Supportive	Not aware	Not supportive
D2.1. Overhead projectors	51.3%	37.7%	7.8%	3.2%
D2.2. Blackboard/WebCT	22.7%	39.6%	30.5%	7.1%
D2.3. Digital Library	14.3%	27.3%	35.1%	23.4%
D2.4. Learning with 3D Wiki	20.1%	47.4%	31.2%	1.3%
D2.5. Social Networking sites (Facebook, Twitter, YouTube, and Skype)	39.6%	37.7%	18.8%	3.9%
D2.6. Semantic blog/Micro Blogging	17.5%	52.6%	26%	3.9%
D2.7. Podcast/vodcast	28.6%	33.1%	33.1%	5.2%
D2.8. eFundi	0%	0%	59.7%	40.3%
D2.9. MyUnisa	0%	0%	40.3%	59.7%
D2.10. ClickUP	41.6%	42.5%	10.4%	5.2%
D2.11. MyTUKS	48.1%	42.9%	5.2%	3.9%

Section B: The correlation table for Internet awareness and access

Correlations

			B1. Do you have basic computer skills (Ms Word, Excel, PowerPoint, Access, Internet etc)?	B2. Do you have access to the Internet?	B3. How/when do you often access the Internet?	B4. Where do you basically have access to the Internet?	B4.1. If your answer other in (question B4) please specify	B5. Can you approximate the amount of hour (s) you spend using the Internet in a day?	B6. When you access the Internet, what purpose do you use the Internet for?
Spearman's rho	B1. Do you have basic computer skills (Ms Word, Excel, PowerPoint, Access, Internet etc)?	Correlation Coefficient	1.000	.469**	.277**	-.141**	-.051	-.127**	-.159**
		Sig. (2-tailed)	.	.000	.000	.000	.109	.000	.000
		N	969	969	969	969	969	969	969
	B2. Do you have access to the Internet?	Correlation Coefficient	.469**	1.000	.293**	-.252**	.025	-.117**	-.045
		Sig. (2-tailed)	.000	.	.000	.000	.441	.000	.162
		N	969	969	969	969	969	969	969
	B3. How/when do you often access the Internet?	Correlation Coefficient	.277**	.293**	1.000	-.219**	-.025	-.057	-.065*
		Sig. (2-tailed)	.000	.000	.	.000	.444	.075	.044
		N	969	969	969	969	969	969	969
	B4. Where do you basically have access to the Internet?	Correlation Coefficient	-.141**	-.252**	-.219**	1.000	-.039	.035	.034
		Sig. (2-tailed)	.000	.000	.000	.	.220	.277	.292
		N	969	969	969	969	969	969	969
	B4.1. If your answer other in (question B4) please specify	Correlation Coefficient	-.051	.025	-.025	-.039	1.000	-.005	.043
		Sig. (2-tailed)	.109	.441	.444	.220	.	.871	.182
		N	969	969	969	969	969	969	969

			B1. Do you have basic computer skills (Ms Word, Excel, PowerPoint, Access, Internet etc)?	B2. Do you have access to the Internet?	B3. How/when do you often access the Internet?	B4. Where do you basically have access to the Internet?	B4.1. If your answer other in (question B4) please specify	B5. Can you approximate the amount of hour (s) you spend using the Internet in a day?	B6. When you access the Internet, what purpose do you use the Internet for?
	B5. Can you approximate the amount of hour (s) you spend using the Internet in a day?	Correlation Coefficient	-.127**	-.117**	-.057	.035	-.005	1.000	.099**
		Sig. (2-tailed)	.000	.000	.075	.277	.871	.	.002
		N	969	969	969	969	969	969	969
	B6. When you access the Internet, what purpose do you use the Internet for?	Correlation Coefficient	-.159**	-.045	-.065*	.034	.043	.099**	1.000
		Sig. (2-tailed)	.000	.162	.044	.292	.182	.002	.
		N	969	969	969	969	969	969	969

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Section C: The Integrating ICT tools and application in HES

Correlations

			C1. The adoption of social software and Information and Communication Technologies (ICTs) tools and application in teaching and learning can assist learners with their course module?	C2. Can improve easy access to education at any given time and place?	C3.Can improve quality education delivery?	C4. Can improve learner's performance?	C5. Can increase learning motivation, enthusiasm and collaboration?
Spearman's rho	C1. The adoption of social software and Information and Communication Technologies (ICTs) tools and application in teaching and learning can assist learners with their course module?	Correlation Coefficient	1.000	.043	.118**	.135**	.119**
		Sig. (2-tailed)	.	.180	.000	.000	.000
		N	969	969	969	969	969
	C2. Can improve easy access to education at any given time and place?	Correlation Coefficient	.043	1.000	.213**	.248**	.132**
		Sig. (2-tailed)	.180	.	.000	.000	.000
		N	969	969	969	969	969
	C3.Can improve quality education delivery?	Correlation Coefficient	.118**	.213**	1.000	.233**	.106**
		Sig. (2-tailed)	.000	.000	.	.000	.001
		N	969	969	969	969	969
	C4. Can improve leamer's performance?	Correlation Coefficient	.135**	.248**	.233**	1.000	.195**
		Sig. (2-tailed)	.000	.000	.000	.	.000
		N	969	969	969	969	969
	C5. Can increase learning motivation, enthusiasm and collaboration?	Correlation Coefficient	.119**	.132**	.106**	.195**	1.000
		Sig. (2-tailed)	.000	.000	.001	.000	.
		N	969	969	969	969	969

**. Correlation is significant at the 0.01 level (2-tailed).

Section D: Framework analysis of Semantic Web Based in educational Systems (SWBES)

Correlations

			E7.1. Which amongst these social software and Information Communication Technology (ICTs) tools does your educators/ supervisors uses most frequently to facilitate teaching & learning; Overhead projectors?	E7.2. Blackboard/ WebCT?	E7.3. Digital Library?	E7.4. Learning with 3D Wiki?	E7.5. Social Networking sites (Facebook, Twitter, YouTube and Skype)?	E7.6. Semantic blog/Micro Blogging?	E7.7. Podcast/vodcast?	E7.8. eFundi?	E7.9. myUnisa?	E7.10 clickUP?	E7.11. MyTUKS?
Spearman's rho	E7.1. Which amongst these social software and Information Communication Technology (ICTs) tools does your educators/supervisors uses most frequently to facilitate teaching & learning; Overhead projectors?	Correlation Coefficient	1.000	.165**	.025	-.168**	-.072*	-.038	-.115**	.057	-.054	.017	-.006
		Sig. (2-tailed)	.	.000	.439	.000	.025	.242	.000	.076	.091	.600	.842
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.2. Blackboard/ WebCT?	Correlation Coefficient	.165**	1.000	.339**	.064*	.056	.063	.071*	-.089**	-.028	.145**	.138**
		Sig. (2-tailed)	.000	.	.000	.047	.079	.051	.027	.006	.392	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.3. Digital Library?	Correlation Coefficient	.025	.339**	1.000	.184**	.164**	.096**	.172**	.087**	-.011	-.018	-.075*
		Sig. (2-tailed)	.439	.000	.	.000	.000	.003	.000	.007	.726	.568	.020
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.4. Learning with 3D Wiki?	Correlation Coefficient	-.168**	.064*	.184**	1.000	.513**	.492**	.395**	-.133**	.145**	.118**	.193**
		Sig. (2-tailed)	.000	.047	.000	.	.000	.000	.000	.000	.000	.000	.000

		N	969	969	969	969	969	969	969	969	969	969	969
	E7.5. Social Networking sites (Facebook, Twitter, YouTube and Skype)?	Correlation Coefficient	-.072*	.056	.164**	.513**	1.000	.520**	.418**	-.074*	.044	.202**	.180**
		Sig. (2-tailed)	.025	.079	.000	.000	.	.000	.000	.021	.174	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.6. Semantic blog/Micro Blogging?	Correlation Coefficient	-.038	.063	.096**	.492**	.520**	1.000	.621**	-.240**	.188**	.235**	.238**
		Sig. (2-tailed)	.242	.051	.003	.000	.000	.	.000	.000	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.7. Podcast/vodcast?	Correlation Coefficient	-.115**	.071*	.172**	.395**	.418**	.621**	1.000	-.230**	.188**	.199**	.188**
		Sig. (2-tailed)	.000	.027	.000	.000	.000	.000	.	.000	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.8. eFundi?	Correlation Coefficient	.057	-.089**	.087**	-.133**	-.074*	-.240**	-.230**	1.000	-.349**	-.246**	-.301**
		Sig. (2-tailed)	.076	.006	.007	.000	.021	.000	.000	.	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.9. myUnisa?	Correlation Coefficient	-.054	-.028	-.011	.145**	.044	.188**	.188**	-.349**	1.000	-.127**	.008
		Sig. (2-tailed)	.091	.392	.726	.000	.174	.000	.000	.000	.	.000	.793
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.10 clickUP?	Correlation Coefficient	.017	.145**	-.018	.118**	.202**	.235**	.199**	-.246**	-.127**	1.000	.366**
		Sig. (2-tailed)	.600	.000	.568	.000	.000	.000	.000	.000	.000	.	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.11. MyTUKS?	Correlation Coefficient	-.006	.138**	-.075*	.193**	.180**	.238**	.188**	-.301**	.008	.366**	1.000
		Sig. (2-tailed)	.842	.000	.020	.000	.000	.000	.000	.000	.793	.000	.
		N	969	969	969	969	969	969	969	969	969	969	969

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Section E: Students' digital competences and confidence level

Correlations

			E1. Do you have phobia towards ICTs and web technologies?	E2. Do you have positive attitude when using or regarding any of the following social software/semantic web & ICT tools application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, myUnisa, eFundi, clickUP, MyTUKS etc)?	E2.a. If you agreed in (question E2), which of these Information and Communication Technology tools do you frequently use on daily basis, please list as many as applicable	E2.b. If you disagreed in (question E2), what do you think could be the problem ?	E3. Do you find any of these tools and applications as listed in (question E2) difficult to use?	E4. How is your confidence level when using Information and Communication Technologies (ICTs) tools and application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, Podcast, myUnisa, eFundi, clickUP, MyTUKS etc) in your learning?	E5. How is your willingness/readiness to use Information and Communication Technologies (ICTs) tools and application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, myUnisa, eFundi, clickUP, MyTUKS etc) in your learning?	E6. Would you agree that your educators/supervisors use this ICT tools application to facilitate learning ?
Spearman's rho	E1. Do you have phobia towards ICTs and web technologies?	Correlation Coefficient	1.000	-.118**	.146**	-.033	.009	-.077*	-.037	.018
		Sig. (2-tailed)	.	.000	.000	.301	.770	.016	.251	.578
		N	969	969	969	969	969	969	969	969
	E2. Do you have positive attitude when using or regarding any of the following social software/semantic web & ICT tools application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, myUnisa, eFundi, clickUP, MyTUKS etc)?	Correlation Coefficient	-.118**	1.000	.020	.043	.225**	.188**	.114**	.224**
		Sig. (2-tailed)	.000	.	.541	.181	.000	.000	.000	.000
		N	969	969	969	969	969	969	969	969

	E2.a. If you agreed in (question E2), which of these Information and Communication Technology tools do you frequently use on daily basis, please list as many as applicable	Correlation Coefficient	.146**	.020	1.000	.057	.169**	-.115**	-.071*	.018
		Sig. (2-tailed)	.000	.541	.	.076	.000	.000	.028	.570
		N	969	969	969	969	969	969	969	969
	E2.b. If you disagreed in (question E2), what do you think could be the problem?	Correlation Coefficient	-.033	.043	.057	1.000	-.158**	-.004	.032	.159**
		Sig. (2-tailed)	.301	.181	.076	.	.000	.909	.318	.000
		N	969	969	969	969	969	969	969	969
	E3. Do you find any of these tools and applications as listed in (question E2) difficult to use?	Correlation Coefficient	.009	.225**	.169**	-.158**	1.000	.016	.019	.078*
		Sig. (2-tailed)	.770	.000	.000	.000	.	.621	.547	.015
		N	969	969	969	969	969	969	969	969
	E4. How is your confidence level when using Information and Communication Technologies (ICTs) tools and application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, Podcast, myUnisa, eFundi, clickUP, MyTUKS etc) in your learning?	Correlation Coefficient	-.077*	.188**	-.115**	-.004	.016	1.000	.234**	.281**
		Sig. (2-tailed)	.016	.000	.000	.909	.621	.	.000	.000
		N	969	969	969	969	969	969	969	969
	E5. How is your willingness/readiness to use Information and Communication	Correlation Coefficient	-.037	.114**	-.071*	.032	.019	.234**	1.000	.183**
		Sig. (2-tailed)	.251	.000	.028	.318	.547	.000	.	.000

	Technologies (ICTs) tools and application such as (Facebook, Twitter, YouTube, Skype, Blog, Wiki, myUnisa, eFundi, clickUP, MyTUKS etc) in your learning?	N	969	969	969	969	969	969	969	969
	E6. Would you agree that your educators/supervisors use this ICT tools application to facilitate learning?	Correlation Coefficient	.018	.224**	.018	.159**	.078*	.281**	.183**	1.000
		Sig. (2-tailed)	.578	.000	.570	.000	.015	.000	.000	.
		N	969	969	969	969	969	969	969	969

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Section E: Continues

Correlations

			E7.1. Which amongst these social software and Information Communication Technology (ICTs) tools does your educators/supervisors uses most frequently to facilitate teaching & learning; Overhead projectors?	E7.2. Blackboard/ WebCT?	E7.3. Digital Library?	E7.4. Learning with 3D Wiki?	E7.5. Social Networking sites (Facebook, Twitter, YouTube and Skype)?	E7.6. Semantic blog/Micro Blogging?	E7.7. Podcast/vodcast?	E7.8. eFundi?	E7.9. myUnisa?	E7.10 clickUP?	E7.11. MyTUKS?
Spearman's rho	E7.1. Which amongst these social software and Information Communication Technology (ICTs) tools does your educators/supervisors uses most frequently to facilitate teaching & learning; Overhead projectors?	Correlation Coefficient	1.000	.165**	.025	-.168**	-.072*	-.038	-.115**	.057	-.054	.017	-.006
		Sig. (2-tailed)	.	.000	.439	.000	.025	.242	.000	.076	.091	.600	.842
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.2. Blackboard/ WebCT?	Correlation Coefficient	.165**	1.000	.339**	.064*	.056	.063	.071*	-.089**	-.028	.145**	.138**
		Sig. (2-tailed)	.000	.	.000	.047	.079	.051	.027	.006	.392	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.3. Digital Library?	Correlation Coefficient	.025	.339**	1.000	.184**	.164**	.096**	.172**	.087**	-.011	-.018	-.075*
		Sig. (2-tailed)	.439	.000	.	.000	.000	.003	.000	.007	.726	.568	.020

		N	969	969	969	969	969	969	969	969	969	969	969
	E7.4. Learning with 3D Wiki?	Correlation Coefficient	-.168**	.064*	.184**	1.000	.513**	.492**	.395**	-.133**	.145**	.118**	.193**
		Sig. (2-tailed)	.000	.047	.000	.	.000	.000	.000	.000	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.5. Social Networking sites (Facebook, Twitter, YouTube and Skype)?	Correlation Coefficient	-.072*	.056	.164**	.513**	1.000	.520**	.418**	-.074*	.044	.202**	.180**
		Sig. (2-tailed)	.025	.079	.000	.000	.	.000	.000	.021	.174	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.6. Semantic blog/Micro Blogging?	Correlation Coefficient	-.038	.063	.096**	.492**	.520**	1.000	.621**	-.240**	.188**	.235**	.238**
		Sig. (2-tailed)	.242	.051	.003	.000	.000	.	.000	.000	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.7. Podcast/vodcast?	Correlation Coefficient	-.115**	.071*	.172**	.395**	.418**	.621**	1.000	-.230**	.188**	.199**	.188**
		Sig. (2-tailed)	.000	.027	.000	.000	.000	.000	.	.000	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.8. eFundi?	Correlation Coefficient	.057	-.089**	.087**	-.133**	-.074*	-.240**	-.230**	1.000	-.349**	-.246**	-.301**
		Sig. (2-tailed)	.076	.006	.007	.000	.021	.000	.000	.	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.9. myUnisa?	Correlation Coefficient	-.054	-.028	-.011	.145**	.044	.188**	.188**	-.349**	1.000	-.127**	.008
		Sig. (2-tailed)	.091	.392	.726	.000	.174	.000	.000	.000	.	.000	.793
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.10 clickUP?	Correlation Coefficient	.017	.145**	-.018	.118**	.202**	.235**	.199**	-.246**	-.127**	1.000	.366**
		Sig. (2-tailed)	.600	.000	.568	.000	.000	.000	.000	.000	.000	.	.000
		N	969	969	969	969	969	969	969	969	969	969	969
	E7.11. MyTUKS?	Correlation Coefficient	-.006	.138**	-.075*	.193**	.180**	.238**	.188**	-.301**	.008	.366**	1.000
		Sig. (2-tailed)	.842	.000	.020	.000	.000	.000	.000	.000	.793	.000	.
		N	969	969	969	969	969	969	969	969	969	969	969

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Section E: Continues

Correlations

			E8.1. Collaborative learning	E8.2. Student's relationship management	E8.3. Quality service delivery	E8.4. Improved administration processes	E8.5. Transitioning/Change	E8.6. Easy access and enthusiastic learning	E8.7. Improved learning theories (connectivism)	E8.8. Knowledge creation management	E8.9. Improved and integrated learning	E8.10. Information quality
Spearman's rho	E8.1. Collaborative learning	Correlation Coefficient	1.000	.120**	.213**	.134**	.050	.182**	.107**	.155**	.088**	.147**
		Sig. (2-tailed)	.	.000	.000	.000	.122	.000	.001	.000	.006	.000
		N	969	969	969	969	969	969	969	969	969	969
	E8.2. Student's relationship management	Correlation Coefficient	.120**	1.000	.221**	.173**	.078*	.090**	.098**	.155**	.185**	.030
		Sig. (2-tailed)	.000	.	.000	.000	.015	.005	.002	.000	.000	.348
		N	969	969	969	969	969	969	969	969	969	969
	E8.3. Quality service delivery	Correlation Coefficient	.213**	.221**	1.000	.118**	.013	.047	.074*	.206**	.254**	.157**
		Sig. (2-tailed)	.000	.000	.	.000	.695	.142	.022	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969

			E8.1. Collaborative learning	E8.2. Student's relationship management	E8.3. Quality service delivery	E8.4. Improved administration processes	E8.5. Transitioning/Change	E8.6. Easy access and enthusiastic learning	E8.7. Improved learning theories (connectivism)	E8.8. Knowledge creation management	E8.9. Improved and integrated learning	E8.10. Information quality
	E8.4. Improved administration processes	Correlation Coefficient	.134**	.173**	.118**	1.000	.274**	.170**	.210**	.079*	.242**	.064*
		Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000	.014	.000	.045
		N	969	969	969	969	969	969	969	969	969	969
	E8.5. Transitioning/ Change	Correlation Coefficient	.050	.078*	.013	.274**	1.000	.183**	.191**	.212**	.223**	.205**
		Sig. (2-tailed)	.122	.015	.695	.000	.	.000	.000	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969
	E8.6. Easy access and enthusiastic learning	Correlation Coefficient	.182**	.090**	.047	.170**	.183**	1.000	.255**	.224**	.120**	.161**
		Sig. (2-tailed)	.000	.005	.142	.000	.000	.	.000	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969
	E8.7. Improved learning theories (connectivism)	Correlation Coefficient	.107**	.098**	.074*	.210**	.191**	.255**	1.000	.115**	.178**	.131**
		Sig. (2-tailed)	.001	.002	.022	.000	.000	.000	.	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969

			E8.1. Collaborative learning	E8.2. Student's relationship management	E8.3. Quality service delivery	E8.4. Improved administration processes	E8.5. Transitioning/Change	E8.6. Easy access and enthusiastic learning	E8.7. Improved learning theories (connectivism)	E8.8. Knowledge creation management	E8.9. Improved and integrated learning	E8.10. Information quality
	E8.8. Knowledge creation management	Correlation Coefficient	.155**	.155**	.206**	.079*	.212**	.224**	.115**	1.000	.276**	.215**
		Sig. (2-tailed)	.000	.000	.000	.014	.000	.000	.000	.	.000	.000
		N	969	969	969	969	969	969	969	969	969	969
	E8.9. Improved and integrated learning	Correlation Coefficient	.088**	.185**	.254**	.242**	.223**	.120**	.178**	.276**	1.000	.200**
		Sig. (2-tailed)	.006	.000	.000	.000	.000	.000	.000	.000	.	.000
		N	969	969	969	969	969	969	969	969	969	969
	E8.10. Information quality	Correlation Coefficient	.147**	.030	.157**	.064*	.205**	.161**	.131**	.215**	.200**	1.000
		Sig. (2-tailed)	.000	.348	.000	.045	.000	.000	.000	.000	.000	.
		N	969	969	969	969	969	969	969	969	969	969

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Section F: Controversies/challenges

Correlations

			F1. Difficult to integrate ICT to teaching	F2. Difficult to use	F3. Insufficient educator	F4. Too much of workloads	F5. Not enough simultaneou	F6. Phobia to use web	F7. Attitudes/pe	F8. Lack of proper knowledge, skills and	F9. Lack of confidence	F10. Lack of willingness to accept	F11. Lack of resources (Computer	F12. Technical assistance/training	G. Reflect your view
Spearman's rho	F1. Difficult to integrate ICT to teaching	Correlation Coefficient	1.000	.364**	.120**	.120**	.362**	.356**	.158**	.427**	.280**	.188**	.198**	.206**	-.055
		Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.089
		N	969	969	969	969	969	969	969	969	969	969	969	969	969
	F2. Difficult to use	Correlation Coefficient	.364**	1.000	.462**	.362**	.339**	.329**	.358**	.325**	.332**	.271**	.277**	.150**	.016
		Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.620
		N	969	969	969	969	969	969	969	969	969	969	969	969	969
	F3. Insufficient educator time	Correlation Coefficient	.120**	.462**	1.000	.573**	.229**	.277**	.296**	.154**	.201**	.230**	.258**	.130**	-.004
		Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000	.000	.000	.000	.000	.900
		N	969	969	969	969	969	969	969	969	969	969	969	969	969
	F4. Too much of workloads	Correlation Coefficient	.120**	.362**	.573**	1.000	.418**	.295**	.316**	.126**	.152**	.027	.116**	.155**	.014
		Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000	.000	.000	.406	.000	.000	.653
		N	969	969	969	969	969	969	969	969	969	969	969	969	969
	F5. Not enough simultaneous access	Correlation Coefficient	.362**	.339**	.229**	.418**	1.000	.482**	.364**	.357**	.268**	.147**	.234**	.302**	-.088**
		Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000	.000	.000	.000	.000	.000	.006
		N	969	969	969	969	969	969	969	969	969	969	969	969	969

			F1. Difficult to integrate ICT to teaching	F2. Difficult to use	F3. Insufficient educator	F4. Too much of workloads	F5. Not enough simultaneou	F6. Phobia to use web	F7. Attitudes/pe	F8. Lack of proper knowledge, skills and	F9. Lack of confidence	F10. Lack of willingness to accept	F11. Lack of resources (Computer	F12. Technical assistance/training	G. Reflect your view
	F6. Phobia to use web technologies	Correlation Coefficient	.356**	.329**	.277**	.295**	.482**	1.000	.374**	.402**	.468**	.355**	.239**	.243**	-.132**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000	.000	.000	.000	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969	969	969
	F7. Attitudes/ perceptions	Correlation Coefficient	.158**	.358**	.296**	.316**	.364**	.374**	1.000	.355**	.380**	.314**	.184**	.240**	.137**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.	.000	.000	.000	.000	.000	.000
		N	969	969	969	969	969	969	969	969	969	969	969	969	969
	F8. Lack of proper knowledge, skills and capacity	Correlation Coefficient	.427**	.325**	.154**	.126**	.357**	.402**	.355**	1.000	.567**	.393**	.243**	.272**	-.013
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.	.000	.000	.000	.000	.683
		N	969	969	969	969	969	969	969	969	969	969	969	969	969
	F9. Lack of confidence level	Correlation Coefficient	.280**	.332**	.201**	.152**	.268**	.468**	.380**	.567**	1.000	.587**	.289**	.222**	.054
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.	.000	.000	.000	.093
		N	969	969	969	969	969	969	969	969	969	969	969	969	969
	F10. Lack of willingness to accept change	Correlation Coefficient	.188**	.271**	.230**	.027	.147**	.355**	.314**	.393**	.587**	1.000	.366**	.187**	.032
		Sig. (2-tailed)	.000	.000	.000	.406	.000	.000	.000	.000	.000	.	.000	.000	.327
		N	969	969	969	969	969	969	969	969	969	969	969	969	969
	F11. Lack of resources (Computer facilities)	Correlation Coefficient	.198**	.277**	.258**	.116**	.234**	.239**	.184**	.243**	.289**	.366**	1.000	.299**	-.084**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.	.000	.009
		N	969	969	969	969	969	969	969	969	969	969	969	969	969

			F1. Difficult to integrate ICT to teaching	F2. Difficult to use	F3. Insufficient educator	F4. Too much of workloads	F5. Not enough simultaneou	F6. Phobia to use web	F7. Attitudes/pe	F8. Lack of proper knowledge, skills and	F9. Lack of confidence	F10. Lack of willingness to accept	F11. Lack of resources (Computer	F12. Technical assistance/t	G. Reflect your view
	F12. Technical assistance/ training	Correlation Coefficient	.206**	.150**	.130**	.155**	.302**	.243**	.240**	.272**	.222**	.187**	.299**	1.000	.156**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.	.000
		N	969	969	969	969	969	969	969	969	969	969	969	969	969
	G. Reflect your view	Correlation Coefficient	-.055	.016	-.004	.014	-.088**	-.132**	.137**	-.013	.054	.032	-.084**	.156**	1.000
		Sig. (2-tailed)	.089	.620	.900	.653	.006	.000	.000	.683	.093	.327	.009	.000	.
		N	969	969	969	969	969	969	969	969	969	969	969	969	969

**. Correlation is significant at the 0.01 level (2-tailed).