

**A framework for enhancing information sharing in the North West
Department of Education, South Africa**

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ABSTRACT

One of the challenges facing the ministry of education is transition from mundane processes to electronic information sharing. This study focused on the North West Department of Education, which is responsible for delivering basic education in South Africa. Information sharing refers to the exchange of information between people and organisations. This study focuses on information sharing within the North West Department of Education, with a view to exploring the possibility of an aligned system of communication between schools and district offices. The researcher was concerned about the slow pace of adoption of Information and Communications Technology (ICT), which is largely due to the reliance on paper-based information sharing amidst the forces of the fourth industrial revolution impacting on almost every facet of lives.

The Department of Education does not take advantage of the obvious benefits of ICT. There is minimal use of such artefacts as the Internet and emails, among others. According to the report by National Education Collaboration Trust (NECT), published in 2016, the Department of Education in South Africa has not done enough to address challenges with regard to ICT. One of the major challenges identified by the NECT Report is shortage of ICT resources.

The Delone and Mclean Information Systems Success Model (ISSM) (2003) and Engestrom's Activity Theory (AT) (2003) (AT) were used in this study. ISSM is a model whose constructs determine whether or not Information Systems is implemented successfully or not and was used in the quantitative section of the study. AT is a theory developed to interpret activities that have seven constructs and was used in the qualitative section of the study. The first research instrument developed from ISSM was divided into constructs of quality of information, quality of system, quality of service, user satisfaction, intentions of usage and use. The second research instrument developed from AT focused on data categorised into ten areas of computers, personnel, policies, the Department as a whole and the organogram.

A mixed methods approach was used in the study, where quantitative and qualitative data collection techniques were used concurrently. The research onion as proposed by Saunders (2012) was employed in the study and pragmatism considered as the

main research philosophy that informed the study. Qualitative and quantitative questionnaires were administered for data collection.

The research questions sought to understand why the North West Department of Education could not leverage the obvious ICT benefits and to explore ways of enhancing information sharing. The conceptual framework used was a combination of Engestrom's Activity Theory and the Delone and Mclean model of Information Systems Success. The Activity Theory was used to interpret questions about why the Department was slow in the adoption of ICT tools while the second theory was used to interpret what was happening on the ground, a combination of objectivism and constructivism also referred to as pragmatism.

The study revealed various obvious ICT challenges prevalent in third world countries such as non-availability of ICT budgets, no ICT policies, no training of personnel on ICT and poor quality of service, among others. It was further revealed that policy adoption and budgets for ICT were non-existent and the service from the ICT Division of the Department was not right.

A framework to enhance information sharing is proposed in the study. The framework identifies key areas that need attention as follows: infrastructure; connectivity; people skills; quality of service; budgets; and policies. These key areas are considered to be an impediment towards information sharing and if addressed, information sharing could be enhanced.

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LIST OF ABBREVIATIONS AND ACRONYMS

AT	Activity Theory
DBE	Department of Basic Education
E-MAIL	Electronic Mail
GDE	Gauteng Department of Education
HCI	Human Computer Interaction
HoD	Head of Department
ICT	Information and Communications Technology
ISSM	Information Systems Success Model
MMR	Mixed Methods Research
NECT	National Education Collaboration Trust
NWDE	North West Department of Education
SMS	Short Message Service
SAMS	South African School Administration and Management Systems
Wi-Fi	Wireless Fidelity

CHAPTER 1- OVERVIEW OF THE STUDY

1.1 Introduction

Mesmer-Magnus and DeChurch (2009:1) consider information sharing as a collective method of making use of the resources of information by people belonging to one team, taking place in a centralised process. After the terrorist attacks of the United States Government (US) on 11 September 2001, information sharing became an important matter in the country to the extent that various departments were urged to create a way of sharing information. Thus, in the same breath, the researcher attempts a common, unified process of sharing information, for the North West Department of Education (NWDE).

The purpose of this study was to examine the flow of information between schools and districts in the North West Department of Education, which is mainly paper-based. Paper-based information sharing is generally considered outdated. There is a need for a framework for information sharing. Han (2014:1) supports web-based information sharing and maintains e-government is important to enhance government's capacity to perform administrative activities efficiently. The researcher believes the use of such artefacts as email, portals and cloud computing by the government of South Africa in general and the North West Department of Education, in particular, could leverage the benefits of Information Technology since it is generally believed that it brings a lot of benefits to organisations. The researcher also believes ITC is supposed to enhance information sharing.

Vahidov, (2012) states that it is important to take into account how information systems in the organisation is designed because it has a big impact on how the firm would ultimately perform according to expectations and deliver on its strategy, business systems, mission and vision. With this in mind, the researcher sought to investigate why there is no homogeneous information sharing system or framework for the North West Department of Education.

As stated earlier, schools have been provided with Notebook Microcomputers, commonly known as Laptops to improve the flow of information, but there is no uniform

system of communication between schools and district offices. As a result, administrators have to, on a regular basis, carry microcomputers to district offices for officials to extract information and carry out updates on the software. The system is so under-utilised because, for example, the textbook retrieval system was not captured on these Notebooks at the time of this study. Some schools submit manual paper-based records while others do so electronically.

Pasensie (2010) states that from 24 460 public education schools, a mere 5 714 had a functional computer centre. This is an indication that only about ten percent of public schools had computers because not all of them were stocked. Pasensie further maintains in a population of about forty-nine million, only about five percent were Internet users. The e-education policy states that every learner in the primary and secondary school sectors should be ICT capable by 2013. The aim of the said policy was to convert schools into e-schools where qualified and capable leaders use ICTs for planning, school management and school administration. These ideals were never achieved because according to Pasensie (2010), the situation in other provinces was so dire and there were no significant attempts to provide schools with ICT infrastructure or equipment.

Conradie and Roodt (2004) mention the following as the key impediments to the establishment of an information society: connectivity is cited as one of the impediments to provision of ICT as telecommunication costs are very high. The problem is exacerbated by the fact that in spite of the fifty percent subsidy provided for all public schools towards Internet provision, there is no proper coordination between the Department of Basic Education and the Department of Telecommunications, thus rendering the e-rate (Internet subsidy) unworkable. The second challenge is educator-ICT competencies. Pasensie (2010) argues that in order to achieve properly integrated into education, educators need to be comfortable with using ICT as a tool. The fact that correspondence is mainly paper-based could, therefore, be ascribed to the fact that educators are less equipped to work with technology. The third issue is the development and implementation of an appropriate environment for e-administration.

Pasensie (2010) states that in her reply to the national assembly, the former Minister of Education, Naledi Pandor, indicated that many public schools had not received any benefit from e-rate, except for one Further Education and Training Centre. E-Rate refers to a discount provided by government towards the use of Internet in schools. In his presentation to the Portfolio Committee on Education, in August 2013, the then Acting Deputy Director General for Curriculum, Matanzima Mveli, listed the following as challenges of ICT implementation in schools: lack of a dedicated ICT implementation budget; lack of provincial ICT implementation plans in some provinces; insufficient alignment of provincial plans and targets to the Action plan to 2014; and lack of competent human resources dedicated to ICT implementation at provincial and district levels, limited connectivity network coverage in rural areas where most schools are located; high cost of connectivity; and reluctance of Network Operators to implement the e-Rate. According to Dzanzi and Amedzo (2014), ICT is more prevalent in urban schools than in rural ones.

Using the Delone and Mclean's Information Systems Success Model (ISSM), as well as Engestrom's Activity Theory (AT), the researcher analyses challenges faced by the North West Department of Education in the sharing or distribution of information between schools and districts. The reasons for the non-use of a uniform electronic information sharing system are examined with a view to enhancing communication between schools and districts as well as how the absence of such a system hampers information sharing.

Table 1.1: Status of ICT infrastructure in South African schools, 2009/2010

Province	Number of schools	Number of schools with computers for admin	% of schools with computers for admin	Number of schools with computers for admin and learning	% of schools with computers for teaching and learning
Eastern Cape	5745	1427	25%	582	10%
Free State	1712	1191	70%	295	17%
Gauteng	2483	1796	72%	1571	63%
Kwazulu Natal	6008	2462	41%	992	17%
Mpumalanga	1927	977	51%	288	15%
Northern Cape	617	364	59%	297	48%
Limpopo	4084	1751	43%	427	10%
North West	1678	1349	80%	366	22%
Western Cape	1616	1350	84%	1280	79%
National	25870	11319	44%	6107	24%

In 2016, the National Education Collaboration Trust (NECT) provided its own findings on the status of ICT in schools. In this report, Meyer and Gent found that the Department of Education in South Africa was not doing enough to address ICT challenges. The criteria used to evaluate the status of ICT in South African schools were as follows: vision; policy; planning and implementation; curriculum and content assessment; pedagogy; change management and leadership; ICT management and administration; professional development; and research and innovative practices. The report found that there several policy gaps, slow implementation, overall ICT objectives at national level were not context-specific; and this is only in the area of policy. With regard to computers for teaching and learning, only 15% of schools had

access. In fact, with regard to the seven criteria, the Department of education was found wanting.

1.2 Problem statement

Despite the ever-present and pervasiveness of Information and Communications Technology (ICT) and its associated benefits, the North West Department of Education (NWED) has not implemented a homogeneous networked information sharing platform. The adoption and use of such a platform like all other technology-enabled artefacts, could be influenced by the organisation, people's attitudes, technology artefacts themselves or the environment.

In the broader scheme of things, it appears the information sharing, or distribution system used, does not sufficiently address all the needs of schools. It appears not to support the daily processes, decision-making as well as the competitive advantage of schools. Marakas and O'Brien (2013) maintain that business managers and professionals are faced with a key challenge of developing successful information systems solutions. This, therefore, suggests the need for a system that connects schools and districts in a more efficient manner.

The absence of a uniform computerised information sharing practice in the North West Department of Education is a major concern as this results in outdated paper-based communication, which according to the researcher, is inefficient and time wasting. Thus, a differentiated method of communication is considered improper by the researcher. The researcher is also of the view that certain manual tasks need to be automated using technology.

1.3 Objectives of the study

The study objectives refer to what a researcher hopes to achieve. They define the reason behind conducting research. In this study as stated below, the objectives are subdivided into the main objectives and the specific objectives.

1.3.1 The main objective of the study was to:

- Develop a framework enhance information sharing for the North West Department of Education that could be used as a basis for an easier and uniform system of communication between schools and district offices. Such framework is desired to end dependence on document-based communication.

1.3.2 The specific objectives of the study were to:

- Understand why the North West Department of Education is not taking advantage of the benefits of ICT; and
- Investigate what could be done to improve the use of ICT in the Province.

1.4 Literature review

The Longman Dictionary of Contemporary English defines a framework as “the main supporting parts of a building, vehicle, or object”. It is also considered as “a set of facts, ideas, etc. from which more complicated ideas are developed”. The purpose of this study is to develop a structure around which an information sharing platform can be established for the North West Department of Education. Studies on various frameworks as well as information sharing were consulted in order to establish a grounded knowledge on the subject.

The word theory refers to a set of constructs that are interrelated and propositions that are intended to interpret a certain phenomenon or behaviour within certain limitation conditions and assumptions Bhattacharjee, (2012). A theory might appear in a research study as an argument, a discussion, or a rationale, and it helps to explain (or predict) phenomena that occur in the world, Creswell, (2012: 51). According to DeLone and Mclean (2002), there are six distinct dimensions of information systems success as follows: quality of the system; quality of information; system use; user satisfaction; usage intentions; and net system benefits.

This is one of the theories considered by the researcher to understand challenges faced by the North West Department of Education in failing to implement a

homogeneous information sharing framework. Another way to think about theory in mixed methods research is to consider it as a theoretical lens or perspective to guide the study (Creswell, 2009: 66). Karuga and Richardson (2007) found that the ISSM model is the number one tool in information systems literature. This model was refined a decade later by the same authors and the six elements rearranged as follows: quality of information; quality of system; quality of service; intention to use/use; user satisfaction; and net benefits as illustrated in the figure below.

The Information Systems Success Model was used in this study to analyse the information systems situation in schools. This is a theory designed to present a comprehensive understanding of information systems success by identifying, describing and explaining the relationships among six of the most critical dimensions of success along which information systems are commonly evaluated.

Quality of information, as a measure of success in information systems, refers to the quality or value of the information as the name suggests. Urbach and Mueller (2012) maintain the success dimension of quality of information deals with the features of an information systems that preferred by users. They list the following as some of the exemplary measures of quality of information: accuracy; adequacy; availability; completeness; conciseness; consistency; format; precision; relevance; reliability; scope; timelines; understandability; uniqueness; usability; and usefulness. Since the structure of the model infers that the quality of information directly affects intentions of usage and user satisfaction, the following two hypotheses were stated:

H₁: Poor quality of information

According to Urbach and Mueller (2012), the quality of the **system** has to do with the usability of the system and its performance characteristic. In a business environment, there are three types of information systems as follows: executive support system; management information system; and decision support system. Executive support system is used by senior managers in their business planning, management information systems is used by middle managers in their control of business operations while employees at the operational level of a business use decision support system to carry out their daily duties. The quality of system referred to herein, encompasses all three types of information systems. Urbach and Mueller(2012) also

provide a list of measures of the quality of the system such as access, convenience, customisation, data accuracy, data currency, ease of learning, ease of use, efficiency, flexibility, integration, interactivity, navigation, reliability, response time, sophistication, system accuracy, system features, and turnaround time, among others. Since the research question focuses on the absence of a concise networked information sharing system, it was, therefore, hypothesised as follows:

H₂: The quality of the information system is poor

Quality of service is an additional dimension that was not part of the original model. It was included to address the support component of the system that users get from the Information Systems Department or Information Technology Department. Information technology department is that unit of an entity that services computers when they are broken or attends to every technical support issue within an organisation. Sometimes, it is referred to as a maintenance division. The support received by users get from the information technology personnel is referred to as quality of service (Urbach and Muller, 2012). It could be training programmes, telephonic helpline service and maintenance support, among others. Due to the internet challenges discussed earlier, with respect to rural areas and the fact that quality of service is supposed to be rendered by ICT personnel, like quality of information, and quality of the system, quality of service also directly impacts on the structure of the model and the positioning of constructs such as intentions of usage and user satisfaction directly. The hypothesis was then stated as follows:

H₃: The quality of service from technicians is poor.

According to Delone and Mclean (2002), **user satisfaction**, as one of the measures of Information Systems Success within the model, proposes the extent of satisfaction that users derive from using the system and that will help determine user satisfaction. They use words such as adequacy, effectiveness, enjoyment, information satisfaction, overall satisfaction and system satisfaction to describe the model. As a result of the construct for user satisfaction, which influences usage intentions and Net System Benefits directly, it was, therefore, proposed as follows:

H4: Information system users are not satisfied with the system

Delone and Mclean (2002) argue that as users engage in using the system on a daily basis, or regularly, this forms what is represented as **intension to use** or use. It is about how they use it or how many times they use it and for what purposes they use it. The success dimension of (*intention to use*) represents the degree and manner in which an information system is utilised by its users (Urbach and Muller, 2012). The hypothesis for system use and intention to use was stated as follows:

H5: The system is under-utilised

Net system benefits is the final element of the model and is the overall value the information system adds to the organisation. It follows directly after system use/use and user satisfaction. Net benefit, therefore, influences and is influenced by user satisfaction and system use/use. The hypothesis about net system benefits was, therefore, stated as follows:

H6: The system has not benefitted schools sufficiently

1.5 Research hypotheses summarized

The hypothesis stated that information sharing system in the North West Department of Education is not as efficient as it should have been and there is need to improve it. The researcher believes that with the obvious benefits of technology and the Internet, the NWDE deserves to benefit more than what is actually taking place on the ground. There is need for an e-governance system where there will be limited paper work. For example, the Gauteng Department of Education (GDE), which is an agency responsible for public education in one of South Africa's provinces (Gauteng), registers new learners online only, but the North West Department of Education still uses manual records such as admission registers and class attendance registers, among others. Information sharing practices were gauged against the following variables to understand the nature of the relationships between them.

Summary of the hypotheses

Table 1.2: Summary of all the hypotheses

Hypothesis	Specific hypothesis
H ₁	The quality of information is poor
H ₂	The quality of the information system is poor
H ₃	The quality of service from technicians is poor
H ₄	Users are not satisfied with the system
H ₅	The system is under-utilised
H ₆	The system has not benefitted schools sufficiently

The second theory considered in this study is the Activity Theory. It is sometimes referred to as the Cultural Historical Activity Theory (CHAT). The Activity Theory can be used to explain and analyse the way people make use of mediating artefacts such as an online writing resource to reach objectives (Behrend, 2014). With this in mind, the researcher analysed the circumstances in the North West Department of Education which make it impossible to reap the benefits of technology artefacts.

Behrend (2014) argues that the theory highlights the role of mediating artefacts and provides a means to analyse tool-mediated goal-directed action in relation to the socio-cultural context of the activity. It was originally designed by Vygotsky and later modified by Leontiev and finally, Engestrom introduced the third generation Activity Theory in 1987. Hashim and Jones (2007) state that researchers can use the Activity Theory to do qualitative research or interpretive research and it is a useful method of discovery. The illustration below explains the functioning of an activity system.

Engestrom (2002) lists the following as elements of the Activity System: subject; instrument; object; rules; community; division of labour; and outcome. Engestrom (2002) argues that individuals or subjects in the Activity System, with a shared object, make use of artefacts or instruments, to achieve some objectives. Furthermore,

Activity is characterised by a division of labour, which shows how tasks are shared between members of the community according to their positions of responsibility in the organogram. Rules are inherently part of the activity system and relate to both clear and unclear ways and traditions (Solomon *et al.*, 2014). Kain and Wardle (2002) define an activity system as a group that shares one aim and motive in a period of time using tools to act on a certain object, to achieve some objectives. They see the theory as an efficient tool for the analysis of an activity system.

From the illustration above, an activity system in the context of the North West Department of Education is deduced as follows: Tools are represented by the information technology infrastructure available in the form of computers and other artefacts. Subject refers to individuals responsible for the use of technology in schools such as administration assistants sometimes referred to as school secretaries, school managers, deputy school managers, heads of departments and teachers. According to Kain and Wardle (2002), objects are the immediate goals or aims of the activity and are deduced to refer to the sharing of information in NWDE. The final outcome is intended to be a uniform system of information sharing, resulting from the effective use of technology and a departure from the traditional paper-based communication. Rules are laws governing the use of ICT in schools within the North West Department of Education and are available in the form of policies, regulations, procedures and systems, among others. The community in the theory refers to the ICT environment of the Department of Education and consists of schools, officials, learners and parents. Division of labour refers to how various units in the department are allocated responsibilities.

The Longman Dictionary of Contemporary English (2001) defines a theory in a number of ways. The first definition considers a theory as an explanation about something or about life and such explanation has not been found to be true. The example given is Darwin's theory of evolution. The second definition refers to a theory as general ideas or principles about a scientific phenomenon. Since this study is about the current state of information sharing in the North West Department of Education, thus Activity Theory was used to explain facts around the use of information systems within the Department. According to the Longman Dictionary of Contemporary English,

information refers to knowledge, details or facts that one gets about a thing or about a situation.

A District Office refers to the office responsible for the administration of schools in a particular area of a provincial Department of Education. In the North West Province, there are four district offices, each headed by a District Director as follows: Ngaka Modiri Molema District located towards the central parts of the Province; Kenneth Kaunda found in the South; Dr Ruth Segomotsi Mompati in the West; and Bojanala District in the East.

The rationale behind the use of the Activity Theory was because as the basic unit of analysis (Kain and Wardle, 2002), it could be used to understand why information sharing practices in the Department of Education are as they are while the Delone and Mclean Model fulfills the role of analysing the practical information sharing activities on the ground. It is used to gauge the extent of the success of information sharing practices.

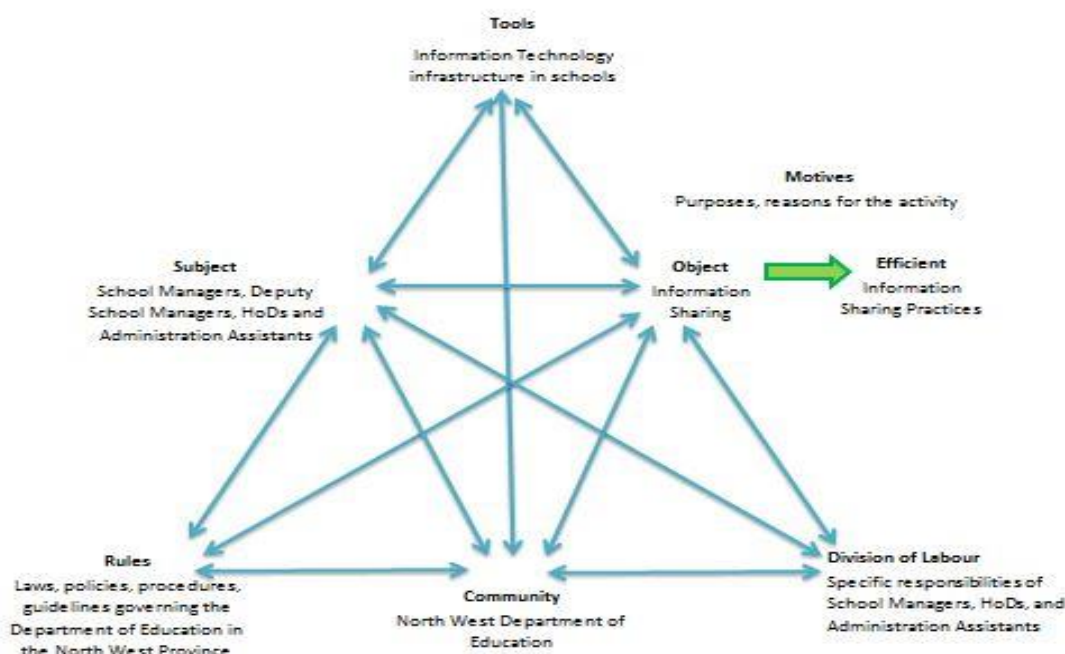


Figure 1.1: Activity theory within the context of NWED

The Activity Theory was used in this study to explain the situation on the ground and, thereafter, a comparison drawn with regard to the findings associated with the ISSM theory and the AT. In fact, AT explains the question why and how whereas, ISSM

explains what. The ISSM theory assisted in the analysis of the actual situation on the ground while AT guided the researcher in understanding the reasons for the situation within the Department.

1.6 Propositions

According to Bhattacharjee (2012: 22), propositions are rational conjectures which do not have to be true and can be tested directly. Hypotheses are propositions stated empirically. The premise of a hypothesis is that knowledge is based on experience whereas propositions are premised on the idea that the foundation for knowledge is based on reason and logic (Bhattacharjee, 2012: 22).

Tools versus object

Technology is not attractive to educators.

Subject versus object

Personnel are an obstruction to the diffusion of ICT.

Rules versus object

Policies in education do not enhance efficient information sharing.

Community versus object

The general community of the Department of Education is not receptive to ICT.

Division of labour versus object

Job descriptions do not encourage an improvement in ICT communication.

1.7 How the two theories complement each other

ISSM addresses the “what?” part of research while AT focuses on the “why?” and the “how?” parts. AT was used to measure fluid matters such as people’s attitudes and behaviours while ISSM measured the actual content of information sharing practices.

In short, ISSM addresses technology while AT addresses the attitudes, feelings and beliefs of people about technology. The analysis attempted to establish if the status is as a result of the technology itself or the people or both or otherwise. The information informed the recommendation that follows and how the two theories complemented each other.

1.8 Research questions

The aim of this study was to investigate what could be done to enhance information sharing within the North West Education Department by leveraging the benefits of ICT. Thus, the following research questions were asked as follows: why is the North West Department of Education not taking advantage of the benefits of ICT? and what could be done to enhance information sharing within the North West Department of Education? According to Roode (1993), process-based research should answer questions of what, why, how does and how should. With the “what is” questions, the researcher explores the fundamental nature of the research question. Roode (1993) argues that these questions further help the researcher to enquire radically and critically about the domain of the problem and its accompanying paradigms in order to describe the problem purely and without ambiguity. The “how does” research questions follow the “what does” questions. According to Roode (1993), such questions assist the researcher to observe the phenomenon or question directly. Roode (1993) provides the following examples of the how does questions: How do school managers use information systems? How do school information systems manifest themselves? and How are information systems developed in organisations? The third set of research questions is the “why is/are” questions. Roode (1993) further states that the purpose of such question(s) is to explain the real-life behaviour or characteristics of the phenomenon. He provides the following examples: Why do managers use information? Why do organisations use information systems? and Why are users involved? The last set of research questions are the how should questions. With these questions, the researcher evaluates the results arrived at during the research process. Roode (1993) clarifies this by stating that such questions focus on the conclusions, implications or normative aspects of the research results. In the final analysis, all the what questions should be answered in the problem statement, the why questions should be answered in the literature review, the how do/es questions should

be answered in the methodology chapter and lastly, the how should questions, should be answered in the results and conclusion section of the research. This is how Roode (1993) illustrates this process as shown in Table 1.3.

Table 1.3: Illustration of Roode's (1993) generic research questions

What is?		
How does?	Research problem	Why is?
	How should?	

1.8.1 The “what is” questions

With all or more of the “what is” questions, the researcher explores all that is about the nature of the problem under investigation. Roode (1993) states that the question aims at exposing the structure of the problem or meaning of the underlying concepts or ideas. Roode (1993) further maintains the purpose is to enquire radically and critically about the problem domain and its accompanying paradigms in order to be able to describe the problem precisely and unambiguously. Some of the “what is” questions should be answered in the first chapter of the research Roode (1993). In this case, the “What is” questions include the following: what is information sharing? what is a framework? what is the North West Department of Education? and what is enhanced information sharing?

1.8.2 The “how does” questions

All the how “does questions” are classified under the quantitative part of the enquiry. With the how does questions, the researcher observes the phenomenon directly as manifests itself and this speaks to the methodology area of the research. Answers to the “how does” questions are arrived at using the methods and techniques in research, this explains why the “how does” questions are presented in the third chapter of the study. The information sharing phenomenon in the North West Department of Education is explored in this study. For example, how does information sharing

happen between schools and district offices? and how does training of officials happen in ICT?

1.8.3 The “why is” questions

The “why is” questions explain the real-life manifestation of a phenomenon. They were answered qualitatively in this study using the Activity Theory. Roodt (1993) argues that “in doing so, the focus is on determining relationships between aspects of a/or variable(s) within the problem domain.” The “why is” questions should be answered in the second chapter of the research project. Roode (1993) provides some examples as follows: why do managers use information systems? why do schools use information systems in the way they do? and why are they still stuck with outdated paper-based administration?

1.8.4 The “how should” questions

These questions are answered according to Roode (1993) in the final stages of the research, focusing on conclusions and recommendations. It is at the end of the research product that the researcher would recommend answers to the research problem and in doing so, will be answering the how should questions. They could include answers to questions such as, how should schools share information with district offices? how should the quality of service be improved? and how should policies be applied?

1.9 Significance of the study

This study is intended to contribute to the existing body of knowledge in information sharing by way of developing a framework for enhancing information sharing. That framework, even if it could be available elsewhere, was not designed in the area of focus by the current researcher and furthermore, the researcher is of the view that no such research has been conducted before. The North West Department of Education is expected to benefit from the structured information sharing system. Furthermore, the new knowledge will be a novel idea for the North West Department of Education. Existing literature on information systems has not made use of the two theories together in one study, thus the knowledge gap filled by the current study. In other

words, the knowledge gap manifests itself in the sense that a combination of answers from the two theories (ISSM and AT) should provide a unique outcome for the research project and, therefore, address the gap.

1.10 Research design and methodology

The researcher used both descriptive (tests a theory) and exploratory (explains an observed phenomena) methods in the study. A summary of the model by Delone and Mclean (2003) is provided as it leads to the success of IS and thus, tested against what currently obtains in schools. Since the research questions imply that the creation of a platform would ease the sharing of information, the hypotheses were tested using a questionnaire. Both qualitative and quantitative methods were used in this study. Different paradigms, each focusing on different aspects of the situation, and multi-method research, are necessary in dealing effectively with the full richness of the real world (Mingers, 2001).

The mixed methods were considered in this study with a view to soliciting as much information as possible and to make sure a complete picture about information sharing was obtained (Venkatesh *et al.*, 2013). Venkatesh *et al.*, (2013) suggest that a mixed methods research (both qualitative and quantitative) enables the researcher to explore the topic and confirm or not confirm the hypothesis. Furthermore, Bradley (2013) states that qualitative research uses methods to assist researchers find out about the existence of opinions and attitudes. The views of those individuals using information systems software are very important and the qualitative angle of the research should be helpful. The two approaches were used concurrently.

Since a mixed methods approach was employed in this study, the Activity Theory was used for the qualitative part of this study in order to understand why people do certain things in certain ways. Hashim and Jones (2007) argue that AT is suitable for a qualitative research approach. The Delone and Mclean model was used in the quantitative part of the study. Quantitative research tests theories that are objective in nature by examining how variables are related, (Creswell, 2008: 5).

Adopting a particular paradigm is like viewing the world through a particular instrument such as a telescope, an X-ray machine, or an electron microscope (Mingers, 2001: 243). Each instrument reveals certain aspects, but each is blind to others (Mingers, 2001: 243). Although they may be pointing at the same place, each instrument produces a different, and sometimes, seemingly incompatible representation. In adopting only one method, one is often gaining only a limited view of a particular research situation (Mingers, 2001: 243). Thus, for the mixed methods approach to research, pragmatism helps by availing a combination of methods and varying world-views, and assumptions that are not similar, as well as different ways of collecting data and analysis (Creswell, 2009). Such is the approach to this study, and that is why Saunders *et al.* (2012) argue that a researcher, who is concerned with observable phenomena, such as the resources needed in a manufacturing process, is likely to have a very different view on the way research should be conducted from one concerned with understanding the subjective meanings of the feelings and attitudes of workers in that same manufacturing process. For researchers who adopt pragmatism, the importance of research is in the practical consequences of the findings (Saunders *et al.* (2012). Thus, this study is based on both the subjective meaning of feelings and attitudes of ICT users as well as the ICT infrastructure. In other words, what matters is the practical effects of the research outcome. Furthermore, Mkansi and Acheampong (2012: 134) concur with this view and maintain information systems is actually a pragmatic discipline which is mainly concerned with research that is practical.

1.11 Structure of the study

The study is divided into five chapters as follows:

- **Chapter 1**

This Chapter provides the executive summary of the study, the back-ground and context, the problem statement, objectives of the study, brief literature review, summary of the hypotheses and propositions, brief discussion of the two theories used in the study, the research questions, the significance of the study and the methodology.

- **Chapter 2**

This Chapter provides an in-depth survey of the literature on information sharing and was guided by Roode's (1993) structure for a process-based research. The guide employs four questions of what is, how does, why is and how should. Literature from was consulted from Africa, South Africa and other parts of the world.

- **Chapter 3**

This Chapter provides the research methodology (research philosophy, research approach, research strategies, choices, time horizons, techniques and procedures) used in conducting the study. All these procedures were followed in accordance with Saunders' theory of research illustrated in concentric circles as in an onion. The qualitative and quantitative methods were used concurrently.

- **Chapter 4**

The Chapter focuses on the discussion of the findings from both the qualitative and quantitative sections of the study. A reader orientation, a brief discussion of the conceptual framework and the actual results are presented using tables and figures.

- **Chapter 5**

This is the final chapter of the study and provides the conclusions and recommendations. It provides the interplay between the practices or culture of information sharing and the environment within the context of information sharing. This chapter presents the ultimate framework to enhance information sharing.

1.12 Validity and reliability

Bhattacharjee (2012: 59) posits that reliability estimates how consistent your measurement is, or more simply, the extent to which a measuring instrument will measure the same way each time it is used in under the same circumstances with the same subjects. Validity, on the other hand, deals with the accuracy of measurement. According to Bhattacharjee (2012: 59), validity, often called construct validity, refers

to that extent, to which a measure is satisfactorily representing the underlying construct which it is supposed to measure. The researcher ensured that all measures of validity and reliability were taken into account thus, providing credibility the study (face validity, convergent validity, content validity and predictive validity).

1.13 Confirmability and repeatability

According to Shenton (2003), the elements used to measure the extent of reliability of the research are as follows: credibility; transferability; dependability; and confirmability. All the steps, as prescribed to ascertain quality in research, were undertaken as outlined in Chapter Three.

1.14 Ethical considerations

O'Leary Z (2010) states that ethics deal with moral issues and obligations and that they are about what is right and what is not right. The researcher assured all respondents of the confidentiality of their responses. Furthermore, no respondent was forced to take part in the study. In addition, permission was sought and obtained from officials of the Department of Education to conduct the study. The research was subjected to the University's ethics requirements.

1.15 Representative sampling

Remler and Van Ryzin (2011) define a sample as the procedure followed by a researcher to choose participants or respondents in a research project. In this study, the sample consisted of school managers, deputy school managers, heads of departments, teachers and administrative assistants. Each school was represented by one person from the stated categories of administrative staff and management staff, thus two people per school. The sample was from the four education districts in the North West Province. Administrative assistants work directly with issues of information systems on a daily basis and are supposed to understand them better than all those considered in the sample. School managers, deputy school managers and administrative assistants understand school processes, make decisions for the school and develop competitive strategies for their schools.

Out of a total of about twenty-six thousand teachers (26 000) and about one thousand five hundred (1500) secretaries in the Province, the researcher sampled 250 participants, one from each of the stated categories of principal or deputy principal and an administrative assistant. One hundred and seventy-five (175) participants (70 percent) in the sample were from Ngaka Modiri Molema District, thirty eight (15 percent) were from Ruth Segomotsi Mompati District, twenty five (10 percent) were from Kenneth Kaunda District while thirteen (5 percent) were from Bojanala District. The reason for the spread of participants was largely due to the distances of the districts from the researcher's point of residence. The researcher is resident in Ngaka Modiri Molema and the other districts are further away.

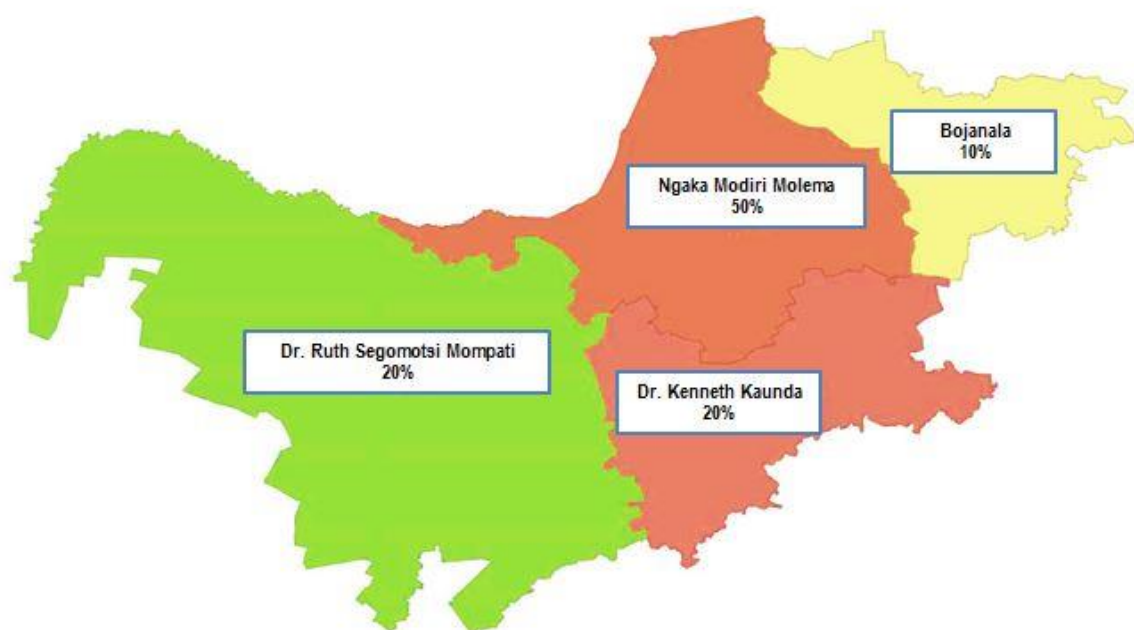


Figure 1.2: Map of the four districts of the North West Department of Education, Provincial profile: North West Census, 2011

1.16 Data analysis

Qualitative data was analysed using themes, sub-themes and codes and the results presented using figures and tables. Analysis means spotting something useful in what is seen (Bradley, 2013). It involves explaining what is noticed by a researcher (Bradley, 2013). The quantitative results were analysed using a computer aided statistical analysis method.

1.17 Limitations of the study

Bias refers to deviation from the truth in data collection, analysis, interpretation and publication and can happen intentionally or unintentionally (Simundic, 2017). The researcher (conducting research on the affairs of the Department of Education) is a teacher and, therefore, part of the item of the research. This, therefore, means he could be biased in certain instances and such is the nature of every research process. Thus, this study could somehow be biased. The findings of this study were limited to the Department of Education and cannot be generalised to the broader population. They were further limited to institutions using some form of computerised information systems.

1.18 Delimitations of the study

Delimitations refers to the features or qualities of a study that put a limit to the scope and determine the extent of how far researchers can go in their study, Simon (2011). This study is limited to information sharing in the ministry of education in the North West Province of the republic of South Africa. Any information sharing activity outside of the confines of the ministry of education is not included. Furthermore, the study is limited to information sharing only as defined in chapter two.

1.18.1 What the study is not about

According to Lian *et al.* (2003), the field of information systems is driven by design science issues and the other by human factors and system applications. This definition puts humans and computers as the main actors in the field and the concept is sometimes referred to as Human-Computer Interaction (HCI). This study is not about the design side of the research

in information systems but rather, about the human side of the interaction. The following is a list of what the study is not about:

- The study is not about developing a prototype software application for school administration;
- It is not about developing an ICT policy for the Department of Education;
- It is not about developing an information sharing policy;
- It is not about determining the advantages and disadvantages of electronic communication;
- It is not about the status of ICT in schools in general;
- It is not about ICT adoption in particular; and
- It is about improving information sharing or electronic communication.

1.19 Summary of Chapter

The aim of this was to create a framework for the purpose of improving the system of sharing information within the Department of Education. Use was made of the Delon and Maclean model of Information Systems success as well as the Activity theory to navigate through the research process. The researcher's view is that within this information sharing environment, there are people with certain attitudes and some knowledge. Is it their knowledge or lack thereof or attitudes that are impeding the creation of a platform for information sharing, or is it the environment itself that is standing in the way of leveraging the benefits of information technology? The next chapter is the review of the available literature.

CHAPTER 2 - LITERATURE REVIEW

2.1 Introduction

The previous Chapter provided the background to the study. Chapter Two focuses on the review and analysis of literature on information systems, zooming into computerised information sharing. Articles and academic writings on the topic under investigation were identified and summarised in order to provide a better understanding of the issues. The Chapter also focuses on the literature with regard to the Activity Theory, Delone and Mclean Model of Information Systems Success with a view to identifying the knowledge gap in information sharing. Studies of other researcher were consulted in order to position the current research in the broad knowledge base of information sharing as well as set the scene for future research. The whole exercise is about articulating what is already known in information sharing in general to help make explicit what is not known or the knowledge gap while at the same time, justifying the topic (a framework to enhance information sharing in the North West Department of Education). In order to do this, the review was guided by Roode's (1993) "what is, how does, why is, and how should" questions as stated in Chapter One.

According to Roode (1993), a complete IS research is an attempt to answer the four questions indicated above. Thus, the literature review followed these "road signs" in order to answer the research questions. It should, however, be noted that the Burrrel-Morgan model classifies knowledge into four quadrants that are mutually exclusive and antithetic in nature and refers to them as world views. Thus, a study that poses questions from the four quadrants, provides the researcher with views from different perspectives as follows: functionalism; constructivism; advocacy; and pragmatic (Van Zyl, 2015: 8). Literature that answers the "what is, how does, why is and how should questions" are cited in the review. The researcher, therefore, divided this Chapter into four sections or parts that address the questions mentioned above in addition to section that focus on the two lenses of analysis (the Activity Theory and Information Systems Success Model of Delone and Mclean). The last section of the Chapter focuses on e-governance, which is an important element of computerised information sharing. Roode's approach is intended to demonstrate that researchers can study a

phenomenon pragmatically from four different angles without attempting to achieve some synergy among them. Van Zyl (2015: 8) posits that it seems to be a pragmatic attempt at investigating a research problem from various perspectives.

While Creswell (2013: 64) defines literature review as locating and summarising studies about a topic, Lewis-Beck *et al.* (2004: 577) state that literature review is a summary of what is currently known about some issue or field on the basis of research evidence, and/or what lines of argument there are in relation to that issue or field. The Chapter is divided into four major sections as follows: the first section is a discussion of the independent variables; the second section focuses on dependent variables; the third section provides a discussion of both dependent and independent variables; and the last section provides a conclusion. Among others, the following are some of the independent variables associated with the adoption of ICT in education in South Africa: infrastructure; costs of ICT; and leadership. Information sharing within the context of this study refers to a system of communication or the exchange of data or information between schools and district offices. The information is divided into two parts which are mandatory data needed as official record from every school in the Province and non-mandatory information such as letters and emails. Furthermore, for this study's purpose, information is limited to only computerised information such as the one captured in the School Administration and Management Software (SAMS).

2.2 Definition of terms

The Cambridge Advanced Learner's Dictionary defines the term “**enhance**” as to improve the quality of something. Thus, the rationale behind the envisaged framework is to better communication between schools and district offices with the development of a communication framework guiding, channelling and tailoring all correspondence and storage of information. Within the context of this study, the researcher confines the definition of information sharing only to the context of correspondence between schools and district offices.

North West Department of Education as defined in the earlier Chapter, refers to that sector of government bestowed with the responsibility of ensuring that children receive education in South African schools and the setting is the North West Province, Republic of South Africa (headquartered in the capital town Mmabatho, about three

hundred kilometres from the national capital city, Pretoria). According to the global positioning system, the Province is situated on 26.6639 degrees south and 25.2838 degrees east. The total surface area of the Province is about 104 000 square kilometres and is home to some 1500 public schools, running from Grades zero to 12.

Framework in the context of this particular research project, refers to a structured and uniformed way of passing important information from schools to district offices, from districts to provincial offices up to the national Department with minimal hassles.

Information sharing refers to the flow of information between schools and district offices. Information could be electronic or paper-based. The aim of this was to construct an electronic communication framework for the government where paper correspondence is insignificant. The researcher believes in the final analysis, the Department of Education will be able to issue electronic learner report cards to parents, electronic reports to district offices, store all school information electronically using cloud services, and finally, taking the whole school administration systems to the cloud.

2.3 The “what is” questions

As stated in the first chapter, the purpose of the “what is questions” is to enquire radically and critically about the problem domain and its accompanying paradigms in order to be able to describe the problem precisely and unambiguously (Roode, 1993). Literature that explores the nature of the problem as it plays itself out is explored in this section as it is a critical enquiry about a phenomenon.

An important factor in the equation of information systems is called the **Digital Divide**. The digital divide refers to a disparity in the availability of ICT resources between urban and rural schools or poor and affluent schools. Dzansi *et al.* (2014:342) point out that many, if not all urban schools in South Africa, are fully equipped with ICT equipment and the same cannot be said for rural schools. This disparity, therefore, makes it difficult for authorities to leverage the benefits of ICT. This could be the reason for the slow pace of adopting cloud computing services, which could assist many organisations. Thus, the digital divide is influenced by the socio-economic status of organisations. The digital divide is directly proportional to the socio-economic position

of entities as articulated by Dzansi (2014). Kroukamp (2005) states that the differences between communities or people that bar them from accessing and using information technology services such as the internet and its related benefits is called the digital divide. These differences often result in people being unable to participate in the economy. The digital divide is a phenomenon linked not only to access to the internet, but also to usage and usage benefit (Fuchs and Horak, 2008 :99). There are, in the world of ICT, digital natives and digital immigrants. Digital natives are people who have access to ICT services and use them regularly and digital immigrants are those with limited access to ICT services (Prensky, 2001). Those with limited access to ICT services are said to be on the wrong side of the digital divide. Therefore, a digital divide can be referred to as an imaginary line or wall that sits between digital immigrants and digital natives. Chen and Wellman (2004) clarify this by maintaining the digital divide involves the gap between individuals (and societies) that have the resources to participate in the information era and those that do not.

First world countries have more access to ICT services than third world countries and it is for this reason that Chen and Wellman (2004) argue that in spite of the rapid diffusion of the Internet, a disproportionate number of users are concentrated in more **developed countries**, especially the United States of America. These authors further state four factors that affect the use of the Internet as follows: socio-economic status; gender; life stage; and region. They maintain Internet users are more likely to be well off individuals who may be better educated than non-users. Secondly, they argue that except for the United States of America, men are more likely to use the Internet than women. Thirdly, they observed that older people are less likely to be attracted to the Internet than younger people. The last aspect is the region and the authors observe that a geographic location has an effect on the use of the Internet. Thus, first world countries would be better placed to leverage the benefits of ICT than third world countries like South Africa and it is common knowledge that first and third world countries are located differently on the globe.

Therefore, it is the researcher's assumption that the digital divide could be put paid to the creation of a framework for information sharing in the North West Department of Education, since the Province is part of the Republic of South Africa and a third world country. It seems the digital divide is in the way of creating ICT services that can

enhance the flow of information because as Sikhakhane *et al.* (2005) state, poorer communities find it difficult to choose a computer and leave food. For example, in Brunei, Sayel (2012) observed that the movement towards e-education was slowed down because the Ministry had little knowledge of what e-education was as they had lesser knowledge about ICT. This created problems when proposals had to be made as they were to be evaluated and approved by people with little or no knowledge of ICT (Sayel, 2012). The digital divide is said to be wider in third world countries than first world nations. This phenomenon shows that the divide is not only seen between countries but within countries as well. Furthermore, the region cannot be immune to the other three factors impeding or encouraging access to ICT, which are socio-economic factors, gender and life stage. In South Africa, there are people living in affluent areas such as suburbs in Cape Town, Johannesburg as well as people in deep rural areas like Qunu in the Eastern Cape where education is difficult to access. There are people of various ages and there are men and women in this part of the world too and we need not lose sight of the fact that. Chen *et al.* (2004) argue that gender is a factor in the digital divide. In their article, Fuchs *et al.* (2008) found that capital investment in internet technology benefited more white males than black men and females. Zooming into the white community in the statement above, one finds a bias in gender, hence the argument that the digital divide manifests itself in terms of gender as well.

The **digital divide** is certainly put paid to the unavailability of a systematic approach to information sharing, which has led to the prevalence of paper-based reporting witnessed in the North West Department of Education. For example, the practice on the ground is such that school managers capture educator leave records online. After capturing them and uploading online, they have to duplicate the exercise by submitting leave forms written by hand to the District Office every week. Such is a typical behaviour of digital natives as explained by Prensky (2001). According to Neumann *et al.* (2014:2), information technology can reduce transaction and coordination costs drastically, often leading to significant changes in the way companies run their businesses. The researcher is of the opinion that the availability of a uniform information sharing framework should ease communication challenges in the system. Some authors such as Neumann *et al.* (2014:3) refer to ICT as tools for inventing

organisations. Thus, ICT should be used by education managers to reinvent their communication systems with other government officials. It is for this reason that Oboegbulem (2013: 1) argue that ICT has contracted the world into a global village and, as such, has been recognised to be a vital tool for solving communication problem the world over. Oboegbulem *et al.* (2013:1) further state that an uninformed school administrator cannot provide and update information. With regard to the demands placed on school administrators due to changes in ICT, Oboegbelum *et al.* (2013:1) posit that school administrators need to equip themselves with ICT skills so that they can be in a position to handle the demands of their jobs.

Lastly, the digital divide may persist for as long as there is inequality among the people, and is not necessarily the result of poor governance in the case of Africa but a product of decades of exclusion and exploitation. This divide expresses the unequal status of the world population or can be said to be an important element of the many characteristics or determinants of poverty in nations of the world. In fact, Fuchs *et al.* (2008) state that the digital divide does not result from corruption in African governments but from dependency of the third world, exclusion and colonialism. Thus, African governments alone, cannot be blamed for the slow adoption of technology in their administrations. According to data released in by Fuchs *et al.* (2008), there were only 3,6 million South Africans using the internet in 2008 representing seven percent of the total population. The data puts South Africa as the one hundred and twentieth country according to the United Nations ranking of countries using the Internet.

Infrastructure challenges are such that many schools do not have access to electricity and telecommunication infrastructure. Dzansi *et al.* (2014: 342) states that electricity and telecommunications infrastructure, plus inadequate storage facilities, are a challenge to many rural South African schools. The authors further argue that although significant strides have been made, since democratisation in 1994, it is evident that it will take some time before rural areas of South Africa too will have access to sufficient infrastructure needed to make ICT integration into rural schools much easier. The North West Department of Education is, therefore, faced with a huge impediment towards providing ICT services to these areas that are without electricity or Internet connectivity. According to Pelgram (2000), infrastructure was cited by

seventy percent of respondents from a worldwide study as the number one factor impeding the adoption and use of ICT in schools. Infrastructure was followed by teacher's skills on the list and accounted for sixty six percent of respondents.

ICT improves **access** to education (Bata *et al.*, 2012). According to a study conducted in India, it was found that India was able to compete with other internationally recognised schools due to massive computerisation. Khan *et al.* (2012) point out that the adoption of ICT ensures the provision of an education that is of a good quality. Bata *et al.* (2012) state that studies in educational technology reveal that it was through ICT that educational institutions were able to better **monitor academic standards**. This demonstrates the value of ICT in schools. ICT improves school curriculum, organisation and administration in that schools can monitor even the individual performance of each learner, each teacher and even subjects themselves. Ngwangwu *et al.* (2013) moot that the design of management information is such that ICT should help school managers do their work in an orderly and efficient manner as they collect information, process it, store it and even during retrieval. Ngwangwu *et al.* (2013) argue that this is possible because the modern ICT is a network of computers with the capability of processing information quickly and efficiently. Shah (2014) cites teaching, learning and administration of schools as areas of schools that can be improved by taking advantage of ICT. Another factor of importance, according to Shah (2014), is the fact that ICT brings about efficiency and effectiveness and the examples include staff allocation, resource allocation and time tabling.

According to a study conducted in Kenya in 2013, it was confirmed that ICT improves efficiency and reinforces good communication channels within the school. Sethunya (2015) states that ICT improves **government efficiency** by doing away with paper work, replacing it with the speedy online service. In this way, jobs normally performed by a number of individuals, can be done by a lesser number (Mundy *et al.*, 2010).

Connectivity is another factor in the provision of ICT in that many areas in South Africa lack telephone lines. This makes it impossible to connect such areas to the internet. Dzansi *et al.* (2014:345) state that connectivity is about the installation of working computers in schools and making sure they are connected to the internet. The authors, however, suggest that with the advent of wireless telecommunication, schools

in such areas as stated above, where there are inadequate fixed telephone lines, can opt for wireless connection but unfortunately, it does not come cheap.

Kiposi *et al.* (2012) argue that **sub-Saharan Africa uses less of ICT** compared to first world countries. This is so because of slow adoption of ICT in this region and because of the fact that ICT is not emphasised, Kiposi *et al.*, (2012). It is interesting to note that literature always points to the advantages associated with the integration of ICT in school administration and management, but authorities are slow in the promotion of ICT. Becta (2003) states that ICT plays a prominent role in enhancing management in education in that information or data can be availed efficiently and timeously at any time without wasting time through the use of data centres and the internet. Kiposi *et al.* (2012) report that in Kenya, which is a sub-Saharan country like South Africa, the level of literacy among principals is generally very low and this is more so in deep rural villages of the country.

In their 2012 article, Kiposi *et al.* argue that the Southern African Development Community (SADEC) region, a region in Africa comprising countries in the Southernmost part of the continent, is still lagging in the adoption of ICT and, therefore, the people in that region are missing out on better education as well as well managed education systems. They argued in 2010 that eighty percent of the world's internet users belong to the developed world. Furthermore, Campbell *et al.* (2002) state that the total bandwidth for all of Africa is less than that of the city of Sao Paolo in Brazil. Arguably, all or more of the above can be ascribed to the not so active use of technology in schools in South Africa and the North West Province in particular.

2.4 The “how does questions”

The how does questions are reality-based and enquire about a phenomenon by observing it directly as it manifests itself. Dzansi *et al.* (2014:342) argue that **ICT skills** should be able to give a country, citizens that are able to adapt to the demands of a global economy. He further states that if a country is to be internationally competitive, it is essential that its labour force is able to utilise and harness the advantages of ICT. Dzansi *et al.* (2014:342) maintain in the face of ICT skills shortage in South Africa, it will be unreasonable to expect rural schools not to face ICT support problems. Therefore, the researcher is of the view that skills shortage is also attributable to the

slow adoption of ICT in South African schools since the personnel cannot motivate for new technologies such as, for example, cloud services, when they understand very little about them, and this includes some senior departmental officials of NWDE. In the same way as electricity is an impediment, skills shortage is as well a barrier to ICT diffusion in the education sector. For example, in 2011, only twenty two percent of schools in the Province had available computers for use in teaching and learning as highlighted by the then Acting Deputy Director General, Mr Matanzima Mwel, during his presentation to the portfolio committee on Education in Parliament in 2011.

Budgetary constraints are making it tough for the government to cater for every school on an equal basis. This is evident by the recent provision of tablets to learners in Gauteng Province to the exclusion of the other eight provinces in South Africa. Dzansi *et al.* (2014:14) maintain that while ICT installation is never a cheap business, **the cost of installing ICT** in rural areas can be expected to be even higher mainly due to transportation and other logistical costs. Gauteng Province is the richest Province in South Africa. It is the central point of major economic activities of the country. It is the researcher's assumption that it is the wealth of that Province that has made it possible to introduce e-learning ahead of other provinces by way of providing learners with tablets. No other province has been able to do the same on a similar scale. According to Statistics South Africa's (Statssa) quarterly bulletin of the 3rd quarter of 2014 on Gross Domestic Product (GDP), Gauteng Province's contribution to the GDP for the period 2004 to 2013, averaged around 33.9% while the other eight provinces ranged from 2.1 percent to 16.7 percent.

The other challenge in connection with the adoption of ICT in schools is **school managers**. According to Oboegbulem *et al.* (2013), if a school administrator is not trained in ICT, he/she may find it difficult to lead the process towards its integration into the school administration since the challenges and demands of the job of school leadership have changed with the times. According to Sadegul (2006), when a principal lacks technical skills or ICT skills, he or she may not support the course of ICT integration into the school system. It is school principals who should see to it that computers are safely stored and are not vulnerable to burglary. But because of their apparent apathy, computers become susceptible to burglary. Furthermore, principals who lack ICT skills are not confident enough to promote it as argued by Sadegul

(2006). The British Office for Standards in Education (Ofsted) (2000) maintains attempts towards the improvement of schools are bound to fail if principals do not provide bold and courageous leadership because principals are supposed to be agents of change. Seyal (2012: 32) points out that accordingly, lack of leadership capacity is often attributed to failure of schools to systematically integrate ICT into the curriculum and school's teaching and learning practices. Seyal (2012) concludes that researchers have found that school leadership is central to successful technology diffusion in the school.

The **leadership styles** of school managers affect either positively or negatively the adoption of ICT in schools. With regard to autocratic leaders, research shows that their leadership styles have a negative impact on ICT practices and that is why their schools are less likely to adopt ICT compared to charismatic democratic leaders (Ghamrawi, 2013). Autocratic leaders/principals do not consider ICT an important component to advance education although they have positive attitudes towards it (Ghamrawi, 2013). This, therefore, shows a positive correlation between autocratic leadership styles and low level use or adoption of ICT by schools. This further shows that autocratic leadership styles correspond with negative attitudes towards ICT by teachers in their schools. Thus, the attitudes of principals play an important role in that staff members get discouraged to use ICT when principals display negative attitudes towards it. Ghamrawi (2013) further suggests that before ICT reforms are promoted in schools, leadership development for principals should be the starting point. Weng *et al.* (2014) state that technology strategies need to be part of the training programmes of principals so that their administrative capabilities could be enhanced.

2.5 The “why is” questions

These are questions that are exploratory in nature and explore the causal relationships between constructs of a reality (Van Zyl, 2015:8). Fuchs *et al.* (2008) state that an assumption that capital investment in ICT will automatically grow the use of ICT among citizens is not true. In other words, the availability of fixed telephone lines or wireless networks will never guarantee a proportional growth of ICT usage because there could be other pressing needs. Fuchs *et al.* (2008) further maintain some analysts think that maybe there is minimal need for ICT in third world countries because of poverty, health

issues and illiteracy. Thus, the region cannot escape the effects of the digital divide phenomenon. It should (the digital divide), by assumption, find its way into the information sharing practices of the North West Department of Education, which is the focus area of this study. Furthermore, Prensky (2001) argues that there is a big difference between digital immigrants and digital natives, in that natives understand the language of computers and the internet while immigrants do not. The Department of Education in South Africa is certainly headed by digital immigrants (people who use less technology), who should make decisions about digital issues, which are better understood by digital natives. Prensky (2001) states that digital natives were born between 1980 and 2000 and are native speakers of the digital language where computers, video games and the internet are used.

One study that was conducted by Oboegbulem *et al.* (2013:1) revealed that among others, the use of ICT in school administration is a necessity and worthwhile venture, especially in this era of globalisation, but the extent of their application in secondary schools is very slow as school administrators are incompetent in handling ICT facilities for effective administration of schools. This statement attests to the fact that the skills of school administrators can be an impediment towards effective use of technology in schools. Therefore, there is a positive relationship between **the skills level of administrators** and the optimal use of ICT in schools. This means that the better the level of knowledge, the better are the chances that ICT can be optimised in schools and the lower the skills level, the bigger are the chances that ICT may not be optimised. Thus, it is critical that school administrators be equipped with ICT skills so that the chances of leveraging the benefits of ICT can be taken advantage of. Tayo *et al.* (2013:1) found that school administrators are aware of the importance of ICT in school administration, but the major challenge is lack of the required skill and knowledge to use these facilities.

Negative attitudes of school administrators towards ICT lead to poor adoption of ICT in schools. As stated by Laaria (2013: 1), when a school manager has the attitude towards the adoption and internalisation of ICT capabilities, then the school will be better placed to adopt ICT quicker and better than otherwise because he or she will lead and encourage fellow team members to integrate ICT in their daily work. Laaria (2013:1) further reports that the interest of school leaders, their commitment and

championing implementation of ICT programmes in schools positively influences the whole process.

2.6 The “how should” questions

The how should questions belong to the domain of objectivism with regard to enquiry and are supposed to be positivistic in nature, according to the extended version of Roode’s model (Van Zyl, 2015: 110). Radu *et al.* (2014) state that there is no way electronic administration can be ignored if entities wish to enhance their administrative ability as they are faced with growth in ICT everywhere. In the same way, ICT has made businesses more efficient and cost-effective, and, should, therefore, benefit schools (Kiposi *et al.*, 2012). Radu *et al.*, (2014) predict that future administration due to globalisation, will rely more on technology. The change from paper-based office information processing to a computer-based one is termed e-administration (Radu, 2014). Bata *et al.* (2012) argue that e-governance has the ability to take organisations out of a chaotic environment into one of order and cites an example where India moved from manual voting to electronic voting. The authors consider e-governance as a set of processes that are mediated through technology and are used to deliver services to the public. The authors further state that public administration activities can be delivered using electronic media in a more efficient and quicker way. Shah (2014: 2800) maintains management information systems are being used by schools to support a range of administrative activities, including attendance monitoring, assessment records, reporting and resource staff allocation.

According to the researcher, the North West Department of Education needs an information system that is so efficient in order to address such needs as cloud capability so that information can be relatively secured compared to storing it in the ‘strong rooms’ of schools. Burglary or fire can happen at any time and if data is stored on paper, it could be lost. With cloud storage, information would be secure from such ills as burglary or the current scourge of the burning of social amenities by rioting crowds. It is for this reason that Neumann *et al.* (2014: 3) state the challenge of evolutionary business information systems is to provide a socio-technical information system infrastructure that is capable of meeting changing business requirements

incrementally, where (anticipated) changes can be incorporated incrementally (without service interruptions) directly by stakeholders.

The challenge of evolutionary business information systems is to provide a socio-technical information system infrastructure that is capable of meeting changing business requirements incrementally, where (anticipated) changes can be incorporated incrementally (without service interruptions) directly by stakeholders (Neumann *et al.*, 2014:3). Neumann *et al.* consider evolutionary business information systems as information systems developed with a view to enhancing the performance of organisations or businesses. This is why they argue that information technology has the ability to minimise the costs of transactions as well as those of coordination significantly. The authors further argue that information systems are, forever, developing in order to be relevant to new business modalities. Now that information systems are forever evolving, this study is an attempt to justify the need for a computerised information sharing framework that could change the current culture of information sharing for the better.

Principals should possess **knowledge** and **skills** and display a **positive attitude** towards ICT (Afshari *et al.*, 2008). The expectation is such that they should take a leading role in making sure technology is embraced in their schools. Principals are expected to understand ICT and make use of it in their administrative functions at schools. Schiller (2003) states that without the support of school leaders, particularly the principal, the educational potential of information and communications technology may not be realised. Some examples cited include knowing word processing, spreadsheets for financial reporting and creating reports, among others. Schiller (2003) concurs with this and maintains principals should understand word processing, spreadsheets, power point presentation as well as composing, sending and retrieving emails. Principals should also know how to create and maintain files on discs as well as know how to use hardware. According to Thomas (2001), there is a way according to which principals can be able to better their professional practices as well as increase their output. Such ways include an understanding of long-range planning such that current and emerging technologies are accommodated in their work. They should have the ability to understand issues relating to technology such as concepts and proposals. Principals are supposed to have a big-picture-vision of ICT in education.

As and when they communicate with parents, colleagues and other stakeholders, principals should take advantage of the benefits of technology. Thomas (2008) states that principals should make use of technology to collect and analyse data as it will improve even their decision-making. Principals should understand how technology can be integrated into the daily processes of teaching and learning. It is important that they (principals) keep abreast with issues of ethics and law in the use of technology. Thomas (2008) further argues that school managers should use technology appropriately when communicating about school activities. Makewa *et al.* (2013) moot that even though there could be challenges around technology diffusion, exacerbated by school leaders' attitude and perception of ICT, it is very important that they change their mind set in order to be in a position to support ICT endeavours in their duties.

With such approach, it is hoped that once they are confident about their ICT skills, then they may be better equipped to encourage and motivate their followers to integrate ICT in their daily teaching activities. According to Kiposi *et al.* (2012), problems of adoption are exacerbated by the fact that those who want to introduce change, ignore the values, attitudes and behaviour of their subjects and this implementation formula is said to be flawed. It is for this reason that Ghamrawi (2013) motivates for the training of principals first, before any ICT campaign is entered into and this is so because they are supposed to be agents of change in their schools.

According to the British Educational Communications and Technology Agency (BECTA) Report of 2003, good ICT leadership reflected good ICT learning opportunities in that schools that showed signs of good ICT leadership, increased in number with an increase in ICT opportunities. There was a positive relationship between good ICT leadership and ICT learning opportunities. In the study, there was unsatisfactory ICT leadership for example, as only one percent of schools provided good learning opportunities and in instances where ICT leadership improved, it did improve with high quality learning opportunities as shown in Figure 2.1.

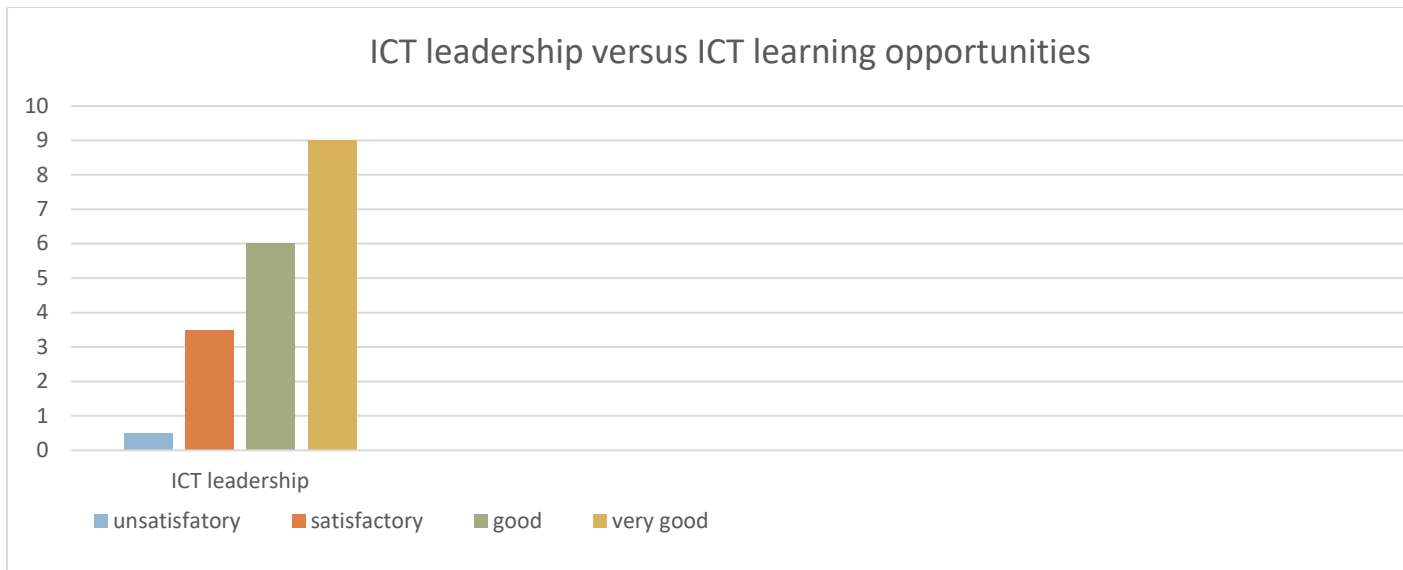


Figure 2.1: ICT leadership and ICT learning opportunities as adapted from BECTA, 2003

The other important comparison was one of general school leadership and ICT learning opportunities (Figure 2.2). The result also showed a positive relationship between general school leadership and good ICT learning opportunities.

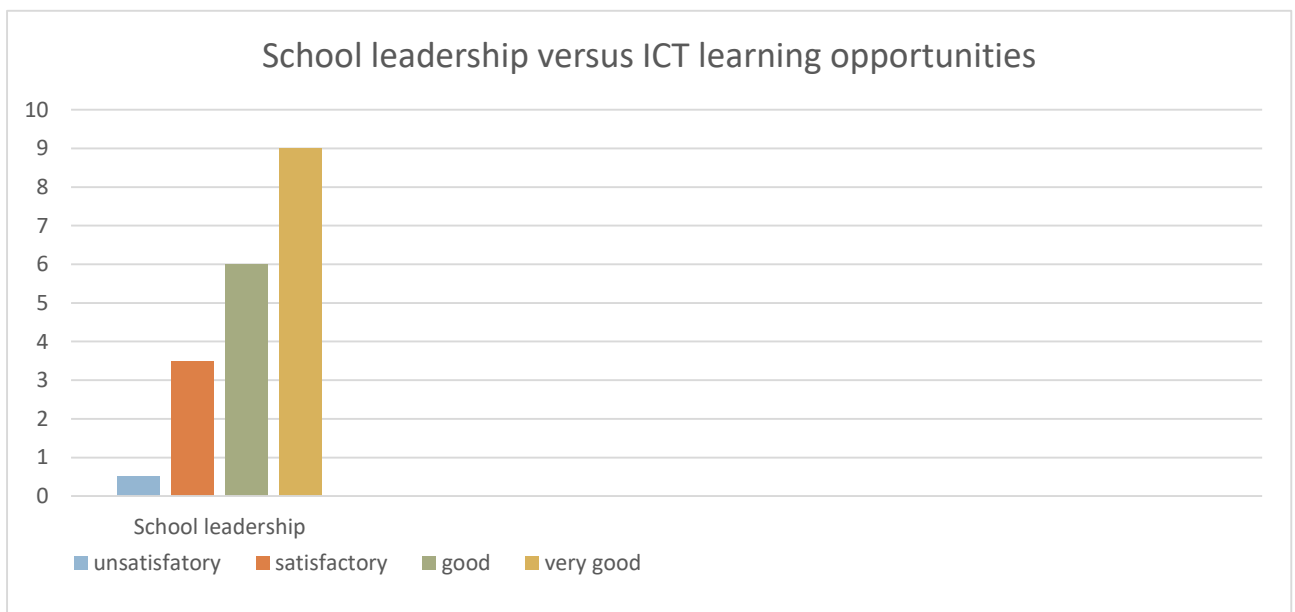


Figure 2.2: School leadership and learning opportunities

On the other hand, research shows that **flexible** and **adaptive** school leaders are effective in changing environments such as that of ICT (Bass *et al.*, 2003). Transformational leaders play an important role in the adoption of innovations because

they work with their followers to generate solutions to complex problems compared to waiting for problems to arise and respond to them. These are leaders who use their charisma to motivate, influence and enthuse their followers. They inspire confidence and team work. According to Dexter (2000), who conducted research on eight hundred schools in the United States of America, technology infrastructure is important but what is even more important is technology leadership because this will encourage effective use of technology in schools. Makewa *et al.* (2013) maintain when a school principal's attitude is not positive towards ICT adoption and integration into school activities, he or she will not support activities that promote such endeavours. The authors further maintain the principal is the main actor in all the processes at school level.

Stuart *et al.* (2009) argue that school managers need to exhibit characteristics of **champions** in that they should be proactive in promoting and supporting the adoption and implementation of new technologies and, in so doing, make use of others to help them do this. This, therefore, justifies the argument that even though school principals may not be that knowledgeable about ICT, they can still enthuse and encourage their followers by being open-minded on issues relating to new technology. However, this does not suggest that they do not need the minimum technology skills to enhance their leadership. Stuart *et al.* (2009) further state that poor technology integration in schools could be attributed to a lack of ICT competence in the leadership and, therefore, suggest that before principals can attain the status of technology leaders, they need to have some level of ICT competence. In this way, they can champion what they lead with some confidence. In the final analysis, the advent of ICT in education requires a new type of leadership that is akin to the promotion of technology use in the daily activities of the school (Seyal, 2012).

Stuart *et al.* (2009) observe that school managers need to exert a **hands-on** approach to dealing with ICT in order to hone their own skills. A hands-on approach provides them with an opportunity to be role models to their followers. Not only does a hands-on approach provide for role modelling, it does as well improve their competence. Principals need to provide ICT leadership in their schools so that technology can be fully integrated into their administrative activities at schools. Ngwangwu *et al.* (2013: 195) state that for an effective management information system to produce information

that is accurate, timely and complete, yet concise, it must be supported by a manager that is skilful in information management as well as necessary funds that make the information management system effective. As Makewa *et al.* (2013) note, principals are supposed to be professional communicators and should take advantage of such virtues as e-mail and websites as they engage with other stakeholders such as teachers, students and parents since they should possess sufficient ICT know-how.

School managers remain central to a successful adoption of ICT in schools. Cho *et al.* (2011) argue that there is a need for them to adopt transformational leadership approach. The authors further argue that transformational leaders are able to give inspiration about values and ideals that propel organisations forward, especially when subordinates are made to give output that is beyond their prescribed jobs. These authors define transformational leadership as a leadership method that puts emphasis on inspiring the values and ideals of the organisation. They further observe that there is a positive relationship between organisational commitments, justice perception and organisational citizenship behaviours, follower motivation, organisation performance and leader effectiveness (Cho *et al.*, 2011). The authors arrived at a conclusion that in the context of ICT, transformational leadership is very important. They state their major findings reflected that transformational leaders have the ability to make followers have their support and can assist them to create self confidence in their jobs and, therefore, recommend that ICT managers adopt a transformational leadership approach in their workplace. They should further come up with programmes to encourage transformational leadership development programmes. In this way, employees will feel valued and thus, add value to the overall organisational output. Ngwangwu *et al.* (2013) observe that ICT has to be properly **implemented** in schools in order to benefit the institution, teachers, students and the community. Bata *et al.* (2012) further state that the adoption and implementation of ICT should go beyond mere computerisation of records.

2.7 Activity theory

The Activity theory, as stated in the previous Chapter, is one of the two lenses used by the researcher to study the situation with regard to the diffusion of ITC in schools. The theory was initiated by Russian scholars in the 1920s, thus the reason why many

scholars depended on the translated versions of the theory as it was originally written in Russian. The fact that the work was originally in Russian, therefore, means different authors may come with slightly different interpretations of the same work as a result of the obvious difficulties associated with interpreting a text from one language to the other. The multiple versions indicate that there have been several attempts to translate the original work (Yagamata-Lynch, 2010:14). Vygotsky L, Léntiev A.N. and Lúria A.N. in the 1920s, are the original authors of this theory. However, Vygotsky died in 1934 aged 37. It was during this period that Pavlov, also a Russian scholar, popularised his theory of classical conditioning, which will be given attention later in the study. Vygotsky referred to the theory as belonging to a class of associationist theories and was very opposed to such theories because he believed they disregarded the association between the organism and the environment. Vygotsky did not agree with the mainstream movement towards transforming psychology into a scientific field by separating the organism and the environment (Yagamata-Lynch, 2010: 15). Vygotsky and his team of researchers developed a triangular shaped representation of mediated action consisting of mediating artefacts, subject and the object. Yagamata-Lynch (2010: 16) state that the individual or individuals in the activity are called the subject and the artefacts or tools or social orders knowledge that help in doing the activity are at the top part of the graphic whereas the object is defined as the goal of the activity. In this way, a new theory combining the individual or group plus the environment was coined and thus, bringing an end to the hitherto divisive stances between the individual and the environment.

Ditsa *et al.* (2000: 243) state that the Activity Theory is a powerful and clarifying descriptive tool rather than a strongly predictive theory.

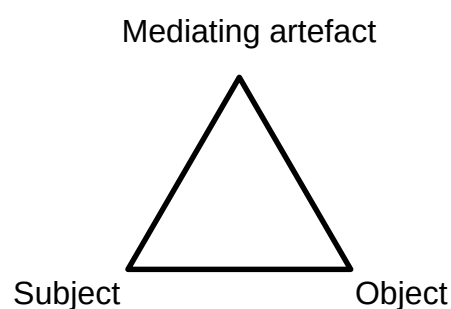


Figure 2.3: Vygotsky's first-generation Activity Theory, a basic mediated action triangle, Hardman *et al.*, 2015

Ditsa *et al.*, (2000: 241) posit that the Activity theory is a cultural-historical theory of activity initiated by a group of revolutionary Russian psychologists in the 1920s and 1930s, who were determined to turn the spirit of Karl Marx's (1845) Feuerbach theses into a new approach of understanding and transforming human life. The theory is useful in qualitative research. Ditsa *et al.* (2000: 243) argue that the Activity Theory is a powerful and clarifying descriptive tool rather than a strong predictive theory. It is a research framework in an interpretive mould that presents a framework within which to analyse the actions of people as they interact with each other in an attempt to achieve a desired outcome (Ditsa *et al.*, 2000: 243).

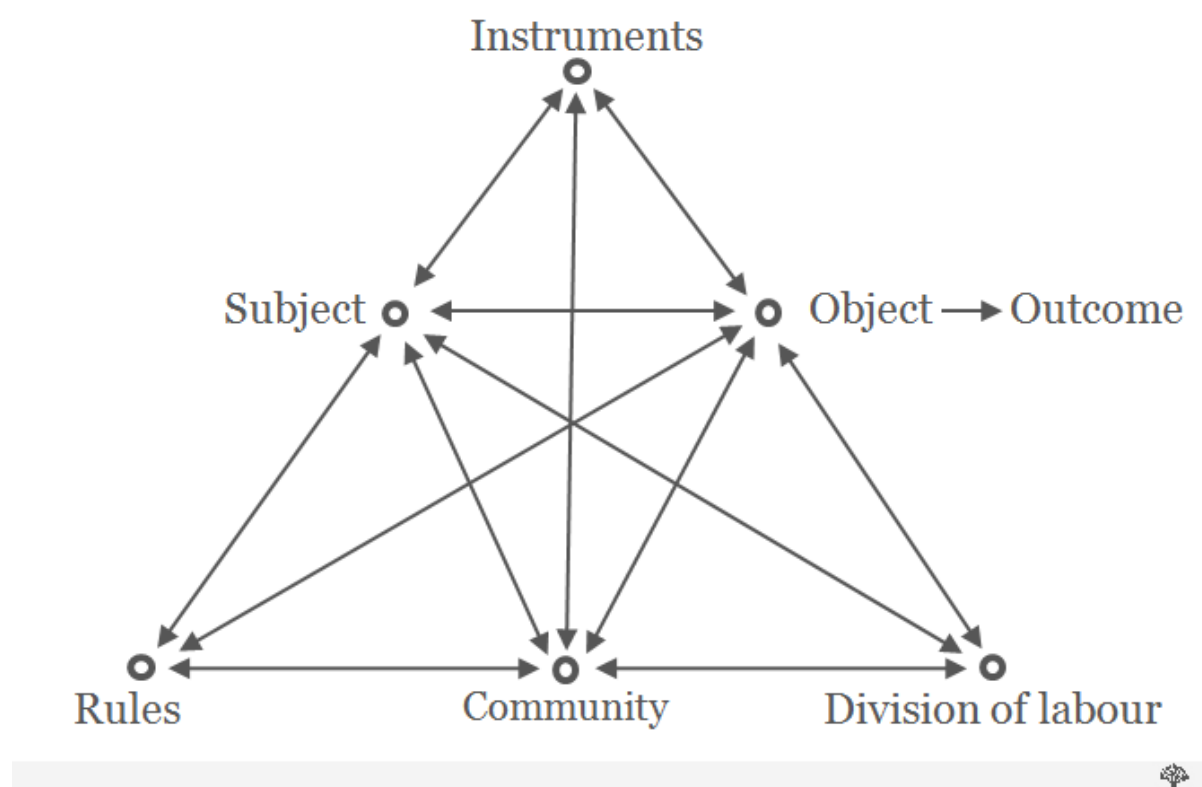


Figure 2.4: Engeström's second generation Activity Theory, Engeström, 1987

The second generation of the Activity Theory was promulgated by Engeström. Engeström (1990) views human activity as an interdependent system involving the individual (subject), tools, a problem space (object), the community of people who are

similarly concerned with the problem, the division of labour between community members aimed at the object and the outcome and the conventions (rules) regarding actions. The following is an illustration of the theory in Figure 2.5.

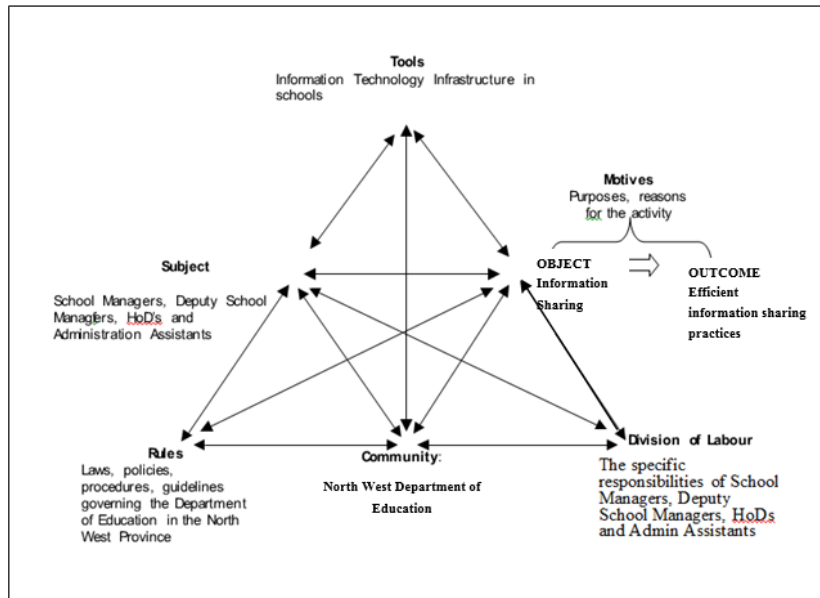


Figure 2.5: Engeström's second generation Activity Theory as adapted for the current study

As shown in Figure 2.5, Engeström extended the base of the triangle and included rules, community and division of labour. This is the third generation of Activity Theory. Hashim *et al.* (2007) clarify that tools referred to in the theory, refer to mediating artefact such as a telephone, a computer or a pen. The Activity Theory considers the integration of technology as tools which mediate social action. The subject in Figure 2.5 is about the person being studied and, in this case, it refers to school managers, deputy school managers, heads of departments and administrative assistants. The object refers to the intended activity.

The lower part of the triangle comprises three units of analysis (rules, community and division of labour). In the context of this study, rules refer to policies that govern ICT in the Department of Education, the community refers to individuals working with ICT in the Department and division of labour talks to the hierarchy or job descriptions in the Department. Thus, the intention of the researcher is to understand the contribution of each unit of analysis or components of the Department of Education to the situation

around ICT in the Province. This theory proved useful to the researcher as Hashim *et al.* (2007) put it, many researchers in education, information systems and humanities have found that the Activity theory provides a worthwhile framework for understanding their field of study. The Activity theory is useful because it describes activities as hierarchical in nature and provides a model for decomposing activities into actions and operations (Hashim *et al.*, 2007).

According to Ditsa *et al.* (2000), **the evolution** of the Activity theory can be divided into two generations as follows: the beginning; and the second generation. The Activity theory evolved in the Soviet Union and is a theory according to which personality traits are formed from social forces and not autonomous (Ditsa *et al.*, 2000). It is said to have evolved as a result of the work of a group of revolutionary Russian psychologists, who wanted to turn Karl Marx's ideas into an approach to understanding life (Ditsa *et al.*, 2000). The third generation Activity theory denotes an interaction between activity systems. Researchers have used it to analyse phenomena like learning technologies.

This theory emphasises the importance of the interaction between agents and their environment. It also explains the very central idea of the principle of mediation. Tools, according to Kaptelinin *et al.* (1995), shape the manner in which people interact with reality. For example, tools such as computers, have shaped the way teachers and school secretaries deal with information and this way is different from the way they dealt with information during the era of typewriters in schools. The other thing about the Activity Theory is that tools show other people's experiences who had experienced being confronted with the same problem before and had invented them (tools) with the aim of trying to solve it. The structure of the tool as well as how the tool is used, all accumulate into the experience of the inventors of the tool and the users thereof. There are two types of tools as follows: technical; and psychological. Technical tools refer to items such as computers, knives and cameras, among others and psychological tools refer to drawings, advertisements and pictures. Kaptelinin (1995) states that the object of the Activity theory determines a fundamental redefinition of what must be the object of research. It states that it is not fruitful to study "interfaces" as isolated entities, but they have to be embedded in purposeful actions, where both the object of those actions, the purpose of them, and the larger context in which they are taking place are significant. This alone differentiates the Activity theory from other social theories since

the Activity theory takes into account the environment in which an activity is happening. For example, in a school setting, as shown in figure 2.7, the capturing of learners' marks in a computer should be seen in the context of a computation of mark schedules, which too is in the context with preparing report cards

The theory is relevant for the analysis of how human beings relate and interact with their environment, using tools to attend to their daily activities and can be used in both the qualitative and the quantitative research for a holistic approach (Hashim *et al.*, 2007). It is for this and other reasons that the researcher opted to use this theory in this study. The authors further state that it is relevant for environments that are experiencing constant change. The information systems environment is supposed to be one such environment because software development and overall continuous improvement of hardware is an ongoing process.

The activity system in the Department of Education could be illustrated as shown in Figure 2.7. This illustration shows that when a school secretary captures marks, he or she is operating at the operation level of the activity system, which is at the base of the illustrative diagram. When they are involved in the exercise of authenticating, moderating and other quality control mechanisms, then they are at the second level of the activity system referred to as the action level. The operation and the action levels actually inform the higher-level activity, which is the preparation of report cards for the term.

Table 2.1: An illustration of the hierarchy of activities in an activity system at school level

<u>Levels in an activity system</u>	<u>Practical examples of activities</u>
Activity level	Preparing report cards for students at the end of a school term
Action level	Preparation and computation of marks on schedules
Operation level	Actual capturing of marks into a computer

Other researchers have used the Activity theory to study various phenomena. In information systems, the theory has been used to interpret the interaction between people and computers. Computers are tools used in the mediated action. Tools can be primary, secondary or tertiary. Primary tools are physical and tangible. Secondary tools are internal or mental whereas, tertiary tools are schematic in that the mind and culture act together in an activity. Hashim *et al.* (2007) state that the human side of information systems is commonly referred to as Human Computer Interaction (HCI). HCI interaction puts the computer and all its supporting suite of tools such as Power point, Internet, e-mails and other applications on one side and humans on the other. Other researchers have used the theory to interpret activities of software developers and the activities of users of the software.

There are five principles which help explain this Activity Theory and are said to be the **manifesto of the current state of the theory**. The first principle is that a **collective, artefact-mediated and object-oriented activity** system which should always be seen in the context of its relation with other activity systems and should be taken as an important unit of analysis. Activities, in this case, are directed towards a certain goal by either individuals or groups and can be understood in the context of an entire activity system. Operations and actions result in a bigger activity system, such as the use of ICT in schools.

The second principle is that **activity systems are multi-voiced** in that a system is always a community of a number of viewpoints, traditions and interests. Division of

labour in an activity, is such that participants have various roles to play using artefacts that have been shaped by participants' experiences. When more than one activity is studied, the system becomes multi-voiced. The motivation for the use of ICT in schools is different from that at district level, although there is one aim of engaging in e-governance.

The third principle is one of **historicity**. During the passage of time, there are changes that happen in activity systems. Thus, in understanding the history behind the activity system, one gets to comprehend the activity system better. In interpreting medical work, cognisance needs to be taken of the local organisation's history, against the global history of medical concepts, procedures and tools used and gathered in the local activity (Engestrom, 1999). This explains why the history of an activity is important in analysing an activity. Hence, the era of typewriters is so important when using AT to study educational administration.

The fourth principle is the fact that **contradictions are a source of change and development**. These contradictions are not conflicts or problems. Engestrom (1999) states that contradictions are historically accumulating structural tensions within and between activity systems. They are found in all activity systems. As new element such as new technology enter an activity system, secondary contradictions occur because they may be in conflict with the old ways. When this happens, an activity system gets disturbed and gets galvanised into innovations to change the activity. This is an important element of this study; the observation of contradictions in an activity system. The contradiction under observation here is of paper-based administration when the world is galvanised into virtualisation of administration.

The fifth principle is about the possibility of **expansive transformations** in activity systems. In activity systems, there are always changes and changes are seen when contradictions are aggravated and individuals deviate from the usual norms. As per this principle, it is expected that players in an activity system, where ICT is prevalent, would be more responsive to challenges presented by ICT itself. In the same way, the researcher expects players in NWDE to be responsive to the push of ICT towards cloud services.

Table 2.2: A summary of the activity system in the Department of Education

Category	Information	Comments
Subject	School managers, deputy school managers, heads of departments, teachers, learners and secretaries	School management teams have the responsibility to create an ITC environment. They make ITC available in schools.
Object	Information sharing, usage of ICT	The object of ICT is efficient information sharing practices
Tools	ICT infrastructure in schools in the form of computers, e-mails, Facebook, whatsapp, twitter, hardware, software, etc.	Computers, as tools used for communication by sending e-mails, uploading staff, downloading staff, capturing of data, storage and retrieval of data
Rules	Conventions, policies practices, culture and guidelines and everything that governs ICT usage in a school	Do school rules encourage ICT adoption? Do officials use ICT? ICT governance. Security of the infrastructure
Community	The North West Province's Department of Education consists of geographical districts, municipalities, towns, villages, schools, etc.	Many community members are ICT illiterate. Such gadgets as smartphones are not available for everyone. Minimal access to ICT for learners
Division of labour	The organogram, roles as played by various units, people's responsibilities with regard to ICT, etc.	What is the possibility that older teachers can be left out of ICT training programmes?

For the purpose of this study, conducted within the limits of space and time, the researcher only focused on contradictions expressed between the two activity systems of an ICT environment as well as those between the elements of an activity. Thus, a total of six contradictions were under observation, central to which were the subject in the activity, which are subject/object contradiction, subject/tools contradiction, subject/rules contradiction, subject/community contradiction, subject/division of labour contradiction and contradiction between two community systems. This refers to schools versus district offices as one activity system as well as the elements/constructs in the system as shown in Figure 2.9.

2.8 The Delone and Mclean Model of information system success

The second tool of analysis is the Delone and Mclean model of information systems success. This model was developed by William H. Delone and Ephraim R. Maclean and seeks to provide an explanation to information systems success. It identifies and explains the relationships between the seven variables in the model. These variables are information quality, system quality, service quality, usage intentions, system use, user satisfactions and net system benefits. The model was developed in 1992 and ten years later (in 2002), it was refined to include e-commerce because of the massive use of the internet. This study makes use of the latest model refined in 2002. Delone and Mclean (2002) state that ICT and particularly the Internet, is having a big impact in the world of business operations.

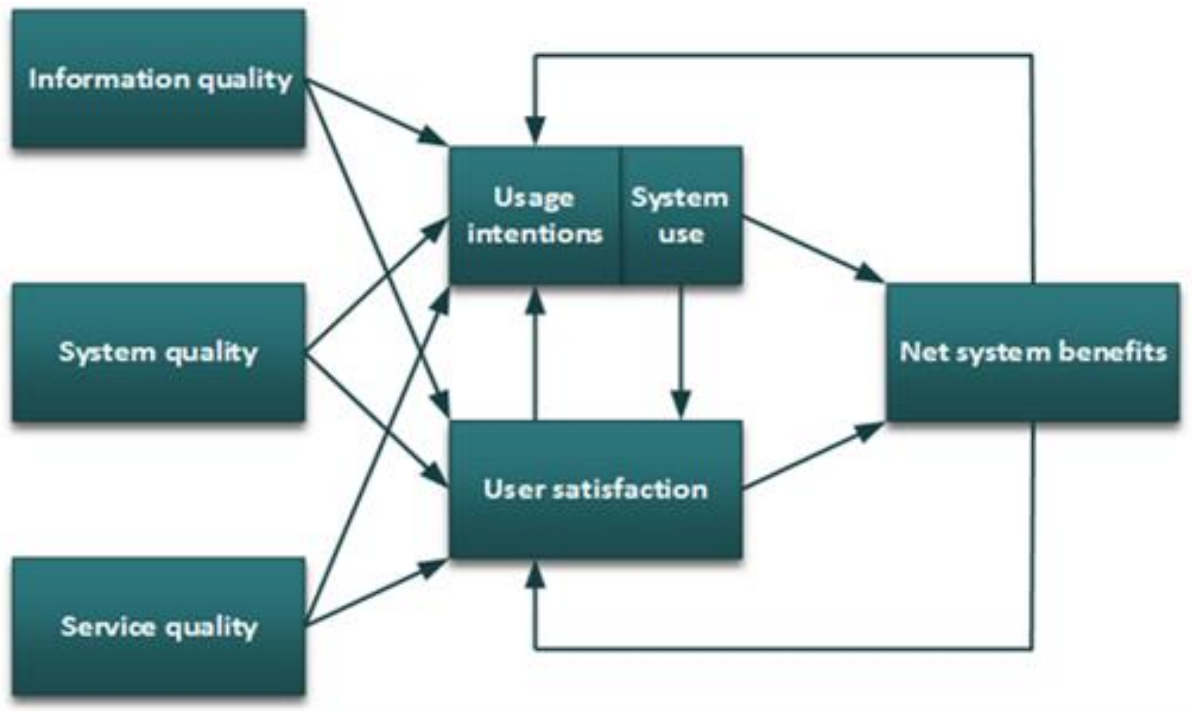


Figure 2.6: The Delone and Maclean Model of Information Systems Success (2003)

Information systems stores, delivers or produces information. According to *Petter et al.* (2008), **system quality** refers to the desirable characteristics of an information system. *Petter et al.* (2008) further maintain that users would prefer a system that is flexible enough to adapt to local needs. They mention such characteristics as reliability, ease of learning plus features of intuitiveness, sophistication, among others. All these are classified under one element referred to as system quality. The elements of an e-commerce model are adaptability, availability, reliability, response time and usability.

Information quality refers to the characteristics of a system outputs that make it desirable. Are the outputs relevant to the organisation or to the people? Are they understandable? Are the outputs complete and usable? When an information systems information quality satisfies most of the variables stated above, then it would be considered to be of quality. Under information quality, one can find the following constructs for e-commerce: completeness; ease of understanding; personalisation; relevance; and security.

The third element of the system is **service quality**. Organisations need support from information technology sections and the type of service organisations get from this section is evaluated under the heading service quality in the Delone and Maclean model of information systems success. Petter *et al.* (2008) argue that service quality is that quality of the support that system users get from the IS department and IT personnel. Assurance, empathy and responsiveness are constructs for service quality with regard to e-commerce. In the district office, there are personnel employed specifically to assist schools with all ITC-related queries.

Fourthly, **system use**, which is the extent to which system users make use of the system, is another important construct in the model. Petter *et al.* (2008) discuss the extent to which and manner in which personnel and customers use the capabilities of an information system. In this case, use is made of such measurement variables as nature of use, frequency of use, extent of use, appropriateness of use, and purpose of use. Still in connection with the e-commerce part of the model, one finds the following constructs: nature of use, navigation patterns, number of site visits, and number of transactions executed.

User satisfaction refers to users' level of satisfaction with reports, web sites and support services (Petter *et al.*, 2008). Repeat purchases, repeat visits, user surveys are constructs for the e-commerce version of the model constitute the last element in the model (**net system** benefits). This refers to the overall contribution of the system to the organisation, groups, individuals, industries or even nations. As for the e-commerce version, one finds cost savings, expanded markets, incremental additional sales, reduced search costs and time savings as constructs. The net system benefits are, therefore, seen in the context of school improvement in administration.

The field of information systems has been around since the 1960s when it was commonly referred to as Management Information Systems and has been evolving ever since (Hirschheim *et al.*, 2012). The modification of the model to accommodate e-commerce is surely as a result of the continuous evolution of ICT from the sixties as stated in the quotation above.

2.9 E-governance

In as much as business processes are informed by business functions, which are a product of business strategy, e-processes are as well-informed by e-functions, which are a product of e-strategy. The preceding paragraphs addressed ICT issues in general while this section on e-governance, zooms into the part of ICT which is about virtual administration systems or electronic governance, where administration is cloud-based or electronic. Although different authors use the terms e-governance, e-government and e-administration interchangeably, they seem to refer to the same thing, which is, using electronic means to run administrations. Nayak *et al.* (2016) argue that e-governance, which is a paradigm shift over the traditional approaches in Public Administration, means rendering of government services and information to the public using electronic means, whereas Batta *et al.* (2012) state that e-governance refers to processes of governance or administration that are based on the use of technology and, in a way, transform a traditional paper-based office or administration into an electronic one. In the Department of Education, the application software is called **SA-SAMS**; an acronym for South African School and Administration Management System. It is designed to help schools with computerised administration. SA-SAMS has modules such as human resources information, learner and parent information, standard letters and forms, physical resources module and library modules, among others. It is generally accepted that services provided electronically are time saving and, as such, beneficial to customers or whoever they are meant to serve. It is for this reason that Batta *et al.* (2012) remind us that e-administration is actually a tool in ICT that enhances an organisation's productivity and performance.

The objective of e-governance is to empower citizens by providing in a transparent way of services to the public. In fact, according to Batta *et al.* (2012), the power and quality of technology will continuously increase to a point where it could be possible to deliver practically anything that people can imagine. With this statement in mind, it is the view of the researcher that ICT should be able to deliver efficient communication services between schools and district offices digitally. There is of late, evidence of digital migration in that a project called Data Driven Districts is currently under way. Through it, government officials outside of schools can log into their computers and view schools' information in virtual form. Batta *et al.* (2012) further state that the quality

and quantity of output from a system of education can only be bettered when authorities do not ignore the importance of e-governance.

Thus, it becomes obvious that with ICT, and especially a focus towards digital administration, there are chances that there could be significant improvements in education. However, the focus of this study is not the overall administration system of the Department of Education, but only information sharing practices. In general, the total structure of a typical educational administration can be divided into five dimensions as follows: human resources; curriculum management and delivery; financial resources; and physical resources as well as all of which can according to Batta *et al.* (2012) can be transformed into digital forms. In order to transform the administrative systems of government from paper-based offices to e-administration, there will always be a need to construct an e-government information resource sharing system and cloud computing is central to all this (Han, 2014). Finally, e-governance changes completely, the traditional business operations of a sector thereby, providing a complete paradigm shift, hence the need for a change in the system of communication between schools and district offices. Martinez *et al.* (2008) state that electronic administration is so advantageous to organisations as it simplifies procedures of administrations and takes administration offices from where they are into the houses of people, thus making it a very useful service.

2.10 How does E-Governance work?

The establishment of e-government service or e-administration relies on the availability of the internet and can reduce costs significantly (Han, 2014). However, the construction of an e-government information resource sharing services often has the challenge where people do not have knowledge thereof (Han, 2014). This then, ultimately renders the construction of the service somewhat futile because people cannot take advantage of it. This becomes worse when different government departments use different criteria and thus, fragment the system with differing platforms. This stalls interoperability between government agencies or departments.

Through e-Government, public service operations are improved and information and communication technology optimises service delivery (Nayak *et al.*, 2016). These authors further state that it is the growth of ICT that has enabled the emergence of e-

governance and has again brought about big improvements in business value chain by lowering costs significantly. According to Nayak *et al.* (2016), research conducted in India shows that the transformation of public service from a traditional one to e-governance, brought about benefits such as time saving, accuracy in record-keeping, reduction in corruption, improved attitude and behaviour in handling personnel, among others.

Another interesting fact about e-governance is that its scope is spread throughout three major distinct areas as follows: government to government (G to G); government to citizens; and government to business (Nayak *et al.*, 2016). Government to government refers to the sharing of information between government departments or units such as a school sharing information with a district office. A government to citizens (G to C) transaction can be represented by a school sharing information with parents by way of e-newsletters, e-report cards for learners or e-financial statements. In the North West Department of Education, the following services are still manual and not electronic: learner enrolment; infrastructure and asset management; application for employment; and evaluation of foreign qualifications. Evidence of this was gathered through personal experience since the researcher is an educator. Furthermore, in the National e-Government Strategy Roadmap of April 2017, one of the challenges facing e-governance is that research recognises that ICT infrastructure is one of the main challenges of e-Government. A government to business (G to B) transaction involves the procurement of services from business by government entities. The following is an illustration of how government services have evolved from traditional administration systems to value-based e-governance system.

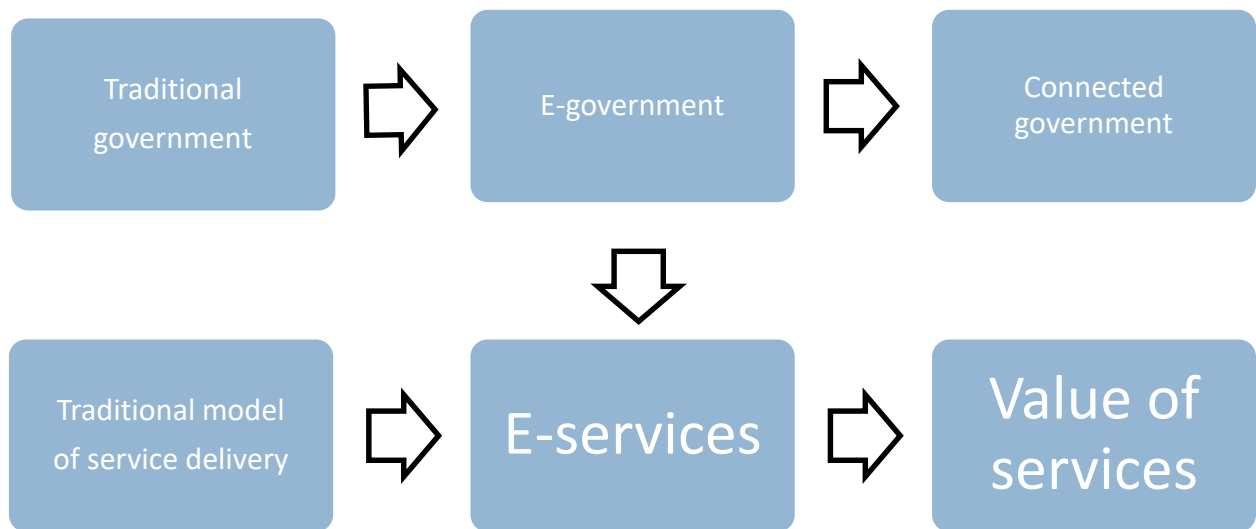


Figure 2.7: Recommendations for e-administration, evolving approach to public service

2.11 Objectives of E-Governance

As a communication channel between administrations and the people they serve, e-governance aims to reach out to people any time any day, irrespective of where they are (Martinez *et al.*, 2008). For example, in Spain, the government introduced what they referred to as the Network 060 Project, whose objective was to respond to the demands of citizens where any service they wanted and, at any time it was needed, was made available. Through this project, citizens are able to make transactions and pay for them using electronic signatures. People are informed of the status of their request and if there is a delay in the request, the system is able to pick where the delay is and all this is possible throughout the day, irrespective of whether or not it is office hours. The whole service was automated.

Although e-governance is so beneficial to people and organisations, there are always challenges that come with it and one of them is the level of education of citizens. In South Africa, the levels of **literacy** are low and, therefore, it is imperative that designers of e-governance services should always bear in mind this fact. E-services should be user-friendly to the intended users and, where possible, they should be in the language users can understand (Nayak *et al.*, 2016).

2.12 The transformation stages of E-Government

In the same way as businesses derive a lot of benefits from ICT, and governments and especially NWDE, should as well leverage the benefits thereof. The application of information technology enabled processes and system is called e-governance (Nayak *et al.*, 2016). Radu *et al.* (2014) argue that e-governance is divided into three levels. The first level is **information**, which is made available online through the internet. An example of this could be a website for a company, a public office or a school or education district office. The second level of the interaction is **communication**, where the ability to access and exchange information is done interactively. Examples of this interaction are e-mail messages or any electronic application used to send or receive electronic messages or circulars from the head office or district offices. The last level is **transaction**, where services are consumed electronically. Users are, today, able to sign documents electronically and such documents possess the same legal status as paper documents. The appointment of teachers can be done electronically without having to submit any forms to the district office. Another example is electronic voting systems used in some countries. Different authors offer different stages for the transformation of e-governance. For example, Accenture (2002) suggests that there are four stages as follows: **information** as the first stage; **interaction** as the second stage; **transaction** as the third stages; and **transformation**. Alternatively, Islam (2007) suggests **institutionalisation** as the fifth stage of e-governance transformation.

Information refers to the availability of information on the internet and this improves transparency, democracy and service. The Department of Education, in this case, has websites and portals that offer static information about the Department. Interaction refers to various applications that necessitate communication between governments and citizens as well as government and business through e-mails and other applications. There is no interactive e-service for the Department of Education. The third stage of transaction refers to a system where users or consumers can complete a transaction wholly online without having to visit the physical office. At this stage, the system is more complex but provides a much better service to the user. Examples of a transaction stage of transformation are online voting, completing income taxes, electronic signatures, online examinations or online learner registrations as in Gauteng

Province. Furthermore, this virtual service is not available in the North West Department of Education. For example, learner registrations happen manually at school. The fourth stage entails a complete change of culture as well as processes for organisations in that virtual offices are the in-thing. At this level of the transformation, efficiency is the name of the game, customer satisfaction is improved and costs are reduced significantly. In the last stage as proposed by Islam *et al.* (2007), the stage of interactive democracy is where governance moves beyond mere service delivery but to a system wide political transformation where users can personalise websites, provide inputs and get feedback. This is the last stage of digitisation and there is no way this stage can be reached without firstly, complying with the first stages. An important illustration to the lagging in e-governance is quoted in the South African National e-Governance Strategic Roadmap, where it is stated that a big impediment to e-governance is the fact that there is no **dedicated budget allocation** for the specific implementation of e- Government in South Africa and a number of initiatives are still run under separate budgets. The other important challenge to e-governance is that (as stated in the same gazette quoted above) at least 75% of South Africans do not have access to ICT infrastructure.

2.13 Important considerations around E-Governance

Connectivity, as stated earlier, is very important for e-governance because this is electronic communication and can only happen through the internet. It shows that ICT infrastructure is very important for the actualisation of an e-governance system of administration. In addition to connectivity, there are important elements such as cyber laws, infrastructure, privacy and security, political will power, reusability, economic issues, maintenance, portability, acceptance as listed by Nayak *et al.* (2016). There are both positive and negative aspects to all items in the list and depending on how they manifest themselves, they will either positively or negatively affect adoption of e-governance. For example, in the case of a negative political will power, organisations in that administration will experience a slow process of migration towards electronic services whereas, if the political will power is positive, then people will experience the opposite of slow migration.

2.14 Examples of e-administration systems/services in general

E-signatures are as authentic as any paper document and are equally binding (Radu *et al.*, (2014). They are used for electronic public administration procedures, signing of contracts, internet banking and e-invoicing, among others. The other use of e-administration could be e-identification, where the system ensures that online services are secure. This prevents fraud because citizens require assurance that data is treated with the necessary caution and respect. Other uses are e-passports, e-voting, e-courts, e-taxes and e-customs.

2.15 Summary of Chapter

There are several challenges to the adoption of ICT than there are strides to adopt ITC, especially in poorer communities. The major factor in this equation is the digital divide, which the literature reveals has more impact in third world countries. The Activity theory has been used by researchers to analyse various settings of ICT, including adoption thereof in schools and other organisations. It has proved to be a useful analytic tool. With regard to the Delone and Mclean model of Information Systems Success, it appears many authors have focused not on the entire model when using it in their research. This model helps in analysing what is practically happening on the ground. Finally, e-governance appears to be the new phenomenon, which may bring about a new definition to business management. The research again hopes to establish the extent of evolution into e-governance. The next chapter is the research methodology.

CHAPTER 3 - RESEARCH METHODOLOGY

3.1 Introduction

Chapter two focused on the literature review on ICT adoption in general with a bias towards schools as well as how the Activity theory has been used to analyse various settings by other researchers as well as an analysis of the literature on the Delone and Mclean model of information systems. This chapter focuses on the research methodology used in conducting this study. Methodology refers to the actual method of research that the researcher uses to conduct his or her study as every research has its own individual approach (Creswell, 2014: 5). A mixed methods approach was used in this study. Mixed methods research (MMR) is a form of research in which a combination of both quantitative and qualitative approach is used in data collection, interpretation and presentation (Johnson *et al.*, 2007). According to Teddlie and Tashakkori (2007), MMR merged during the late 1970s when researchers began to employ both approaches to situations that required a pragmatic wide angled lens that uses all sources of data to give answers to practical situations. Thus, the same approach was used in this study.

Research methodology, however, is informed by the type of research undertaken, the researcher's sociological paradigm, and his or her ontological and epistemological assumptions and whether he or she wants to generate or test an existing theory (Mavetera, 2010: 52). There are four major types of research in the Social Sciences as follows: constructive research task; ideographic research task; and deductive theory. The absolute aim of a constructive research task is to build a theory. The aim of a nomothetic research task is to test a theory or a hypothesis. The purpose of a deductive research is to link an existing theory with research and lastly, ideographic research aims at exploring realities on the ground. A constructive approach was adopted in this study as it is concerned with the construction of a framework for information sharing in the North West Department of Education but has nomothetic characteristics since the researcher tested a theory and build another in the same research project, thus justifying the need for a mixed methods research. Figure 3.1 is

an illustration of the hierarchy of the order of a paradigm as advocated by Fayolle *et al.* (2005).

3.2 Main objective

The main objective of this study was to develop a framework for computerised information sharing for the North West Department of Education. Through this system, role players should be able leverage the benefits of cloud computing and change their administrative systems so that they are almost all electronic in nature. One wonders whether the cloud computing revolution should not be destined to finding its way into the principal's office in the NWDE.

3.2.1 The objectives of the study were to:

- Find out why the North West Department of Education is not taking advantage of the benefits of ICT; and
- Find out what could be done to improve the use of ICT in the Province.

3.3 General research problem explained

The main concern of this study is about the failure of the North West Department of Education (NWDE) to leverage the benefits of ICT in communicating data to and from schools. Currently, almost every school has a computer yet, there is almost no effort towards reaping the benefits of ICT. The Gauteng Department of Education has engaged in a massive computerisation of schools, where learners are given tablets to use in classes, but such is not the case in the North West Province. There are various reasons for the status quo revealed in the literature. Such challenges are discussed below as sub-problems.

3.3.1 Sub-problems re-stated

So far, the problem statement has exposed the phenomenon under investigation as relativistic in nature since subjects and objects cannot be separated from one another. The phenomenon under scrutiny is failure to leverage the benefits of ICT within the Department of Education in the North West Province. The researcher is of the view

that ICT decisions in the Province are taken by people of the Province, thus making them part of the reality under enquiry and, therefore, the enquiry cannot be one of objectivism. This has a bearing on the nature of the methodology since methodology is influenced by the nature or character of the phenomenon that is being investigated.

The first sub-problem experienced is such that in the case of burglary or any other way of losing data, paper-based records can disappear, thus the reason why the researcher advocates for a speedy migration to electronic governance, which renders organisations (schools) susceptible to massive loss of records in instances of burglary.

In practice, principals are expected to submit paper-based records to district offices despite the fact that they submitted the same records electronically. For example, leave records are submitted weekly both manually and electronically. Learner attendance records are captured both electronically and manually. This is tedious **duplication** of work. The two examples above are the researcher's personal experiences.

Traditional methods of office management are generally becoming antiquated in that paper-based administration is being overtaken by electronic records. Electronic records have the following advantages compared to traditional ones: they are easier to **access**; can store vast sums of data because they are not limited by space; and data can be sorted easily in whatever order the user chooses, for example, in descending or ascending order. Updating data is easier to do; for example, updating a client's physical address after they moved a house and most importantly, with electronic records, it is easier to do back-ups in cases of data losses.

3.4 Research questions

The research question asked in this study sought to find answers to the failure by the North West Department of Education to take advantage of the benefits associated with ICT. The following research question was asked: What can be done to enhance information sharing by leveraging the benefits of ICT? This research question is a direct product of the aim of the study. Although two methods were used to collect data (quantitative and qualitative), two subsidiary research questions were asked in the study. From the main research question, the researcher, through the aid of the

Klopper-Lubbe Matrix, formulated two more subsidiary questions from the main one. One of the subsidiary research questions focused on the quantitative aspect of the study while the other focused on the qualitative part. Out of each subsidiary research question, a questionnaire and interview questions were designed and developed.

3.4.1 Subsidiary research questions

Two subsidiary research questions emanated from the main research question. The first one was quantitative in nature while the other was qualitative. The quantitative question was as follows: what could be done to enhance information sharing in NWED? While the qualitative question was: why are ICT benefits not explored?

The list of other subsidiary questions provided here is not necessarily exhaustive. All the questions listed under the research questions in the first chapter were derived from the two main subsidiary research questions. Roode (1993: 1) argues that the “what is, how does, why is and how should” questions may not necessarily be used in totality, but the uniqueness of the investigation dictates which are necessary and which are not. Some of the questions are not listed but may be answered in the problem statement because as stated in Roode (1993: 8), the “what is” questions assist the researcher in exploring the fundamental nature of the research problem such as “what is the North West Department of Education?”, “what is a framework?”, “what is paper-based communication?”, “what is the quality of information?”, “what quality is the system?”, “what is the level of satisfaction towards the system? Among others. The second set of questions are the “how does” questions. An example of the how does questions as listed in chapter one is as follows: “how does inefficient information sharing happen?” The third set is the “why is” questions as follows: why is inefficient information sharing not addressed? The last one is the “how should” questions and it focuses on the conclusions of the research.

3.4.2 Subsidiary sections

With this sub-heading, the Klopper-Lubbe model refers to other parts of the research such as data collection methods, data analysis, ethics in research, sampling procedures, validation and any other component of a research project.

3.5 Chapter outline

The outline of this Chapter follows Saunders' research onion format as shown in Figure 3.2. The first part involves the discussion of research philosophies, followed by a discussion of research approaches, strategies and choices and time horizons. The last section is a discussion on techniques and procedures. An attempt is made to provide a methodology of choice from within the broad structure of the research onion. According to the structure of the research onion, firstly, the researcher is faced with the choice of a philosophy, which should inform the choice of approaches. Approaches then inform the choice of strategies, which in turn, influence the choice of time horizons and techniques.

3.6 Research philosophies

There are two major research philosophies that have been identified in the Western tradition of science, namely, positivist (sometimes referred to as scientific) and interpretivist (also known as anti-positivist) (Galliers, 1991: 327). This means research is either subjective or objective. When it is subjective or interpretivist, it does not exclude the researcher from the object of the inquiry but when it is scientific or objective, it excludes the researcher from the object of research. The objective-subjective dichotomy represents the ontological dimension of the research paradigm characterised by a combination of qualitative and quantitative methods of investigation. The other dimension is the epistemological one, which is represented by either the sociology of radical change or the sociology of regulation. The epistemological dimension may not subscribe to any particular form of inquiry because it has to do with the way reality is constructed.

3.6.1 Philosophical world view /research paradigm

A research document is a product of how the researcher sees the world and that is why a number of authors such as Creswell (2009) suggest that researchers are positivists, constructivists, advocacists or pragmatists. A research design is, therefore,

influenced by their philosophy. A philosophical world view is represented in four quadrants representing two dichotomies of sociology of regulation on the one side and sociology of radical change on the other. The other two dichotomies are subjectivity and objectivity, also on the opposite ends of the structure depicting world views. This structure is divided into four quadrants and can be summarised as researchers who are subjective pragmatists belonging to a sociology of radical change. The second group is subjective constructivists in the sociology of social order. The third category is one of objective positivists also in the sociology of social order and lastly, the object radical humanists belonging to the sociology of radical change.

3.6.2 Positivism

If researchers view the world as consisting mostly of social order (ontology) and hence, seek to study patterns of ordered events or behaviours and believe that the best way to study such worlds is using objective approach (epistemology) that is independent of the person conducting the observation, such as by using standardised data collection tools like surveys, then they are adopting a paradigm of functionalism (Bhattacharjee, 2012:19). Other authors refer to positivism as functionalism. Functionalism or positivism belongs in the objective social order. These researchers study reality much more scientifically. Positivism is, sometimes, referred to as “science method” (Mackenzie and Knipe, 2006). The authors further state that positivists and positivist research are usually associated with quantitative methods of data collection and analysis.

3.6.3 Social construction

The second world view is one of constructivism or interpretivism. It is in the quadrant of subjective social order. Research designs by constructivists do not generally attempt to test a theory but make a deduction from research to develop a theory or law. If they believe that the best way to study social order is through the subjective interpretation of participants involved, such as by interviewing different participants and reconciling differences among their responses using their own subjective perspectives, then they are employing an interpretivism paradigm (Bhattacharjee, 2012). The interpretive paradigm seeks to understand the world as it is, to understand

the basic nature of the social world at the level of subjective experience (Roode, 1993).

Social constructivists hold assumptions that individuals seek to understand the world they live in and work (Creswell, 2009). Researchers recognise that their own backgrounds shape how they interpret the world, and they place themselves in the research to acknowledge how their interpretation flows from their personal, background (Creswell, 2009). The difference here is that interpretivists are part of the social order while constructivists study a phenomenon as an external reality. The researcher's intent is to make sense of (or interpret) the meanings others have about the world (Creswell, 2009). Rather than starting with a theory (as in post-positivism), inquirers generate or inductively develop a theory or pattern of meaning (Creswell, 2009).

3.6.4 Advocacy

The third philosophy held by researchers is one of advocacy or radical humanism. It is found in the quadrant of objective radical change. These researchers are radical as the name suggests. This philosophical worldview focuses on the needs of groups and individuals in society that may be marginalised or disenfranchised (Creswell, 2009). Advocacy/participatory studies often begin with an important issue or stance about the problems in society, such as the need for empowerment (Creswell, 2009). This explains why these researchers are found not in the quadrant of sociology of regulation. If they wish to understand social change using the subjective perspectives of participants involved, then they are following a radical humanism paradigm (Bhattachjee, 2012: 19).

3.6.5 Pragmatism

According to the internet encyclopaedia of philosophy, "Pragmatism is a **philosophical** movement that includes those who claim that an ideology or proposition is true if it works satisfactorily, that the meaning of a proposition is to be found in the practical consequences of accepting it, and that unpractical ideas are to be rejected." If researchers believe that the world consists of radical change and seek

to understand or enact change using an objectivist approach, then they are employing a radical structuralism paradigm (Bhattacharjee, 2012: 19).

A pragmatist does not limit himself to any one system of world view and reality. This approach gives researchers the freedom to use a mixed methods research in that way they draw liberally from both quantitative and qualitative assumptions when they engage in their research (Creswell, 2009). This is the world view of this researcher, hence the pragmatic paradigm. As stated earlier, the Delon and Mclean Model were used under the quantitative section of the research while the Activity Theory was used to comprehend the situation as it manifests itself on the ground. Thus, in mixed methods research, inquirers employ both quantitative and qualitative data because as (Creswell, 1990) argues, they aim to give their best understanding of a research problem under scrutiny. Authors such as Agterfalk (2010) and Bakersville and Myers (2004) emphasise that information systems is actually a pragmatics discipline mainly concerned with research that is practical.

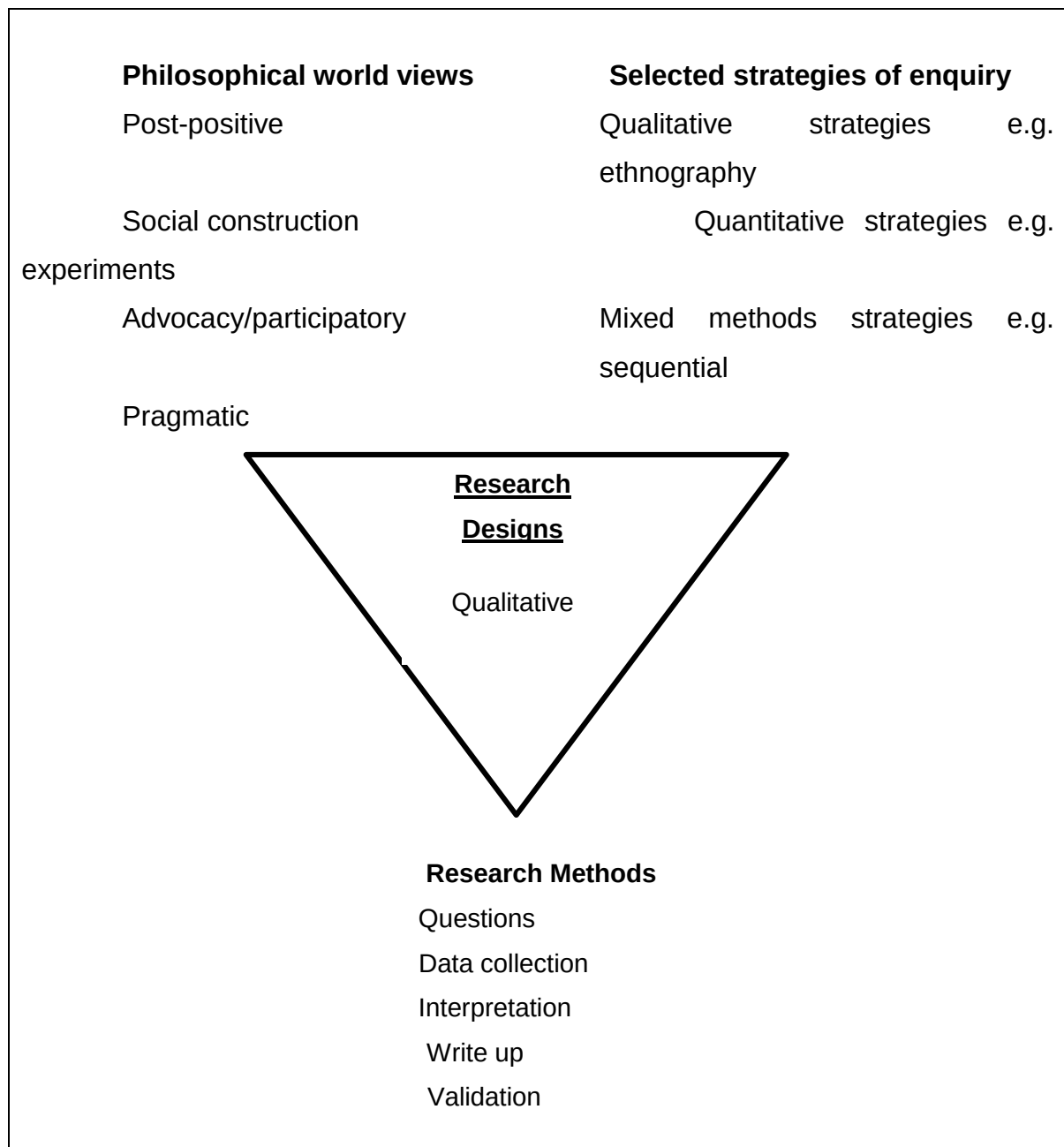


Figure 3.1: A framework for design - the interconnection of world views, strategies of enquiry and research methods, as adapted from Creswell, 2009

Assumptions about the nature of Social Sciences - the four paradigms

Table 3.1: Sociological paradigms (adapted from Burrell and Morgan, 1979)

Sociology of regulation			
O B J E C T I V E	Positivism or functionalism • Determination • Reductionism • Empirical observation • Theory verification	Constructivism or interpretivism • Multiple participant meanings • understanding • Social and historical construction • Theory generation	S U B J E C T I V E
	Advocacy/participatory/ radical humanism • Political • Empowerment issue oriented • Collaborative • Change oriented	Pragmatism/radical structuralism • Consequences of actions • Problem centred • Pluralistic • Real world oriented	
Sociology of radical change			

3.6.1 Ontological assumptions

The word ontology refers to the nature of reality. Scotland (2012: 1) argues that as researchers undertake research activities, there is a need that they adopt a particular perspective or position about how things in the world work or how things actually are. The way a researcher perceives reality is his or her ontological assumption about that reality. For example, some researchers could see reality as something external to the researcher only waiting for him to come and discover it. In other words, some researchers see reality as something objective, which has no attachment to the person researching about it or see it as subjective in that their ontological position is such that the researcher is part of the reality. In this sense, researchers would enquire and label the subject of their discovery and that is what makes them part of the reality. In

practice, the type of answers to questions relating to an ontological assumption of a researcher who is part of the reality would be, according to Creswell (2007: 17), subjective and multiple as seen by participants in the study. This definition refers to qualitative research. This means that when in a qualitative study the inquirer sees reality as subjective and multiple, whereas in a quantitative research reality, is objective and exists outside of the researcher's influence and objective findings are arrived at through quantitative research designs.

3.6.2 Epistemological assumptions

Epistemology refers to the relationship between what a researcher is researching and the researcher himself (Creswell, 2007: 17). Since the researcher lessens the distance between himself and what he or she is researching in a qualitative inquiry, then in a quantitative inquiry, there exists a distance between the researcher and the object of inquiry. A typical epistemological question would focus on the relationship between the researcher and what is being researched or put contextually, information systems conventions in the Department of Education and employees of the Department. The researcher, being an employee of the Department of Education, binds himself to what he is researching, that is, the conventions and practices around information systems. Thus, this applies to the qualitative part of the study. Creswell (2007: 1) further argues that a typical mixed methods researcher embraces multiple realities, be they of a reality of social order or of conflict, critical paradigm or scientific paradigm.

3.6.3 Axiological assumptions

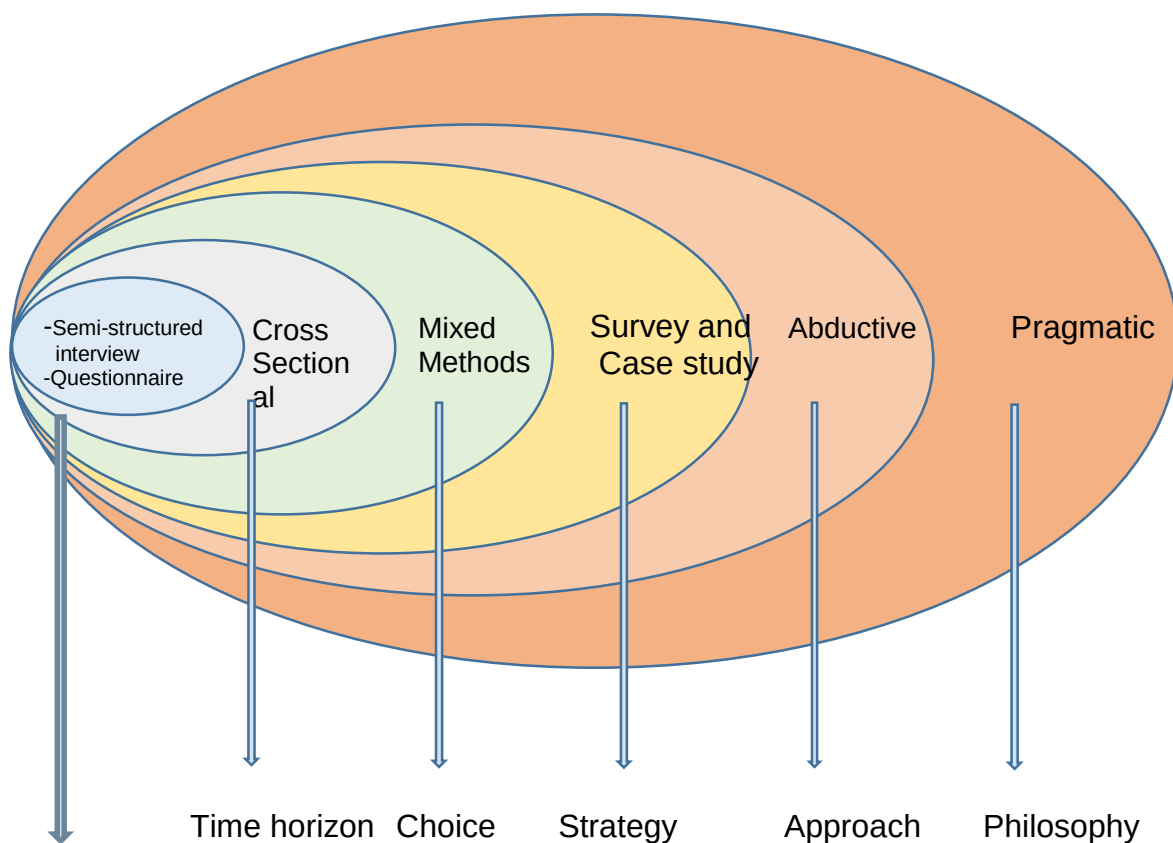
Axiological assumptions are values researchers bring into their research (Creswell, 2007: 18). Since this investigation has qualitative and quantitative procedures, the narrative will always be kept in the second person. Creswell (2007: 18) maintains a qualitative researcher acknowledges the fact that research is value laden. There are obviously elements of attachment to the Department and this could affect the researcher's judgement and the researcher, therefore, puts this forward as one of the possible weaknesses of the enquiry.

3.6.4 The pragmatic paradigm

Pragmatism is a philosophical doctrine traceable to the period of classical antiquity when people could not believe it was possible to acquire authentic knowledge about the real truth and were taught to use the limited information for the purpose of their professions (Ormerod, 2006: 892). Some of the early writers about pragmatism include John Dewey (1859-1952), Charles Saunders Peirce (1839-1914), William James (1842-1910), among others. William James introduced, for the first time into the world, the word pragmatism but credited it to Peirce in 1898 (Ormerod, 2006: 894). The word pragmatism originated from Latin and Greek and means deed.

The Cambridge Advanced Learner's Dictionary defines pragmatism as follows: when you deal with a problem in a realistic way rather than obeying fixed theories. de Vos *et al.* (2011: 40) state that the term paradigm originated in linguistics, where it means the various forms that a word can take in some languages according to the declension (when a noun) or conjugation (when a verb) of that word, especially as a model for other similar nouns or verbs. Guba (1990: 17) defines a paradigm as a worldview or a basic set of beliefs that guide action. According to Plano (2016: 57), a paradigm is a collection of assumptions and values about the nature of reality and knowledge that provide a foundation for a research study. The foregoing definitions could be said to be stating one common thing, which is the fact that a paradigm is a researcher's mental picture of the world and its processes. That mental picture will influence a researcher's judgement about the world and its processes. For example, if a researcher perceives the world and its processes as being independent of the researcher, then they would be more akin to an objective research and if they perceive a researcher as a constructor of reality, then they would be biased towards a subjective type of research. Scotland (2012: 1) states that a paradigm consists of the following components: ontology; epistemology; methodology; and methods. These have been explained in this study. Since different researchers have different world views or paradigms, their methodologies are bound to differ and this finds expression in data collection strategies. Scotland (2012: 1) further states that different paradigms inherently contain differing ontological and epistemological views; therefore, they have differing assumptions of reality and knowledge, which assumptions underpin their particular

research approach. This is reflected in their methodology and methods. Finally, the research strategy adopted in this study was inevitably informed by the researcher's paradigm about the world and the pragmatic paradigm. In order to illustrate the research design as used in this study, Saunders' research onion model was used as illustrated below.



Techniques and procedures

Figure 3.2: Procedural diagram using Saunders' research onion (2012) adapted for this study

Figure 3.2 shows by way of a research onion, the flow of the research activities in this mixed methods study. The activities flow from the outer layer of the onion to the inner layer. The outer most layer represents the **research philosophy**. Pragmatism was considered in this study. Pragmatism is one of the many philosophical standpoints of researchers and Goldkuhl (2004: 1) maintains that pragmatism can be understood as a philosophy that fully acknowledges the mutual permeation of action and knowledge. Peirce (1878) observes that as one comes down to what is tangible and practical as the root in every real distinction, no matter how subtle it might be; there is no distinction of meaning so fine as to consist in anything but a possible difference of practice. This means that the practical application of ideas is what matters to pragmatists. Goldkuhl (2004: 1) states that pragmatism means interest for practical consequences of knowledge. Creswell (2007: 22) notes that individuals holding a pragmatic worldview, focus on the outcomes of their research, the actions, situations and consequences of inquiry rather than antecedent conditions. That is why the view of the researcher is such that the practical application of the findings should improve administration in education.

There are different philosophies displayed in the outer layer of the research onion such as positivism, realism, interpretivism, objectivism, subjectivism, pragmatism, radical humanists, radical structuralists and functionalists. These philosophies, radical humanism, pragmatism, positivism and interpretivism, have been explained earlier and will not be dealt with here, including others which bear no significance for this study.

The **pragmatic** world view, as explained by Venkatesh *et al.* (2012: 17), considers practical consequences and real effects to be vital components of meaning and truth. The other important difference between qualitative and quantitative research is that quantitative research is deductive while qualitative is inductive (Venkatesh, 2012: 17). What this means is that deductive research seeks to test a theory while inductive inquiry, which is qualitative in nature, develops a theory. The one theory under scrutiny is ISSM and was tested using a questionnaire/survey and AT was used to interpret

people's attitudes and behaviours. It is the actual nature of the research questions that dictate to the researcher, the methods of data collection.

The diagram above shows that the researcher's ontological assumptions about the nature of reality informs his or her epistemology, which is the way to construct reality. The epistemology of the researcher in turn, informs the paradigm which turns out to be what informs the methods. The methods have the following as elements following one another from top to bottom in this order: research methods; data gathering methods; and methods of data analysis. With regard to this study, the diagram below shows how it fits into the hierarchy of the paradigm.

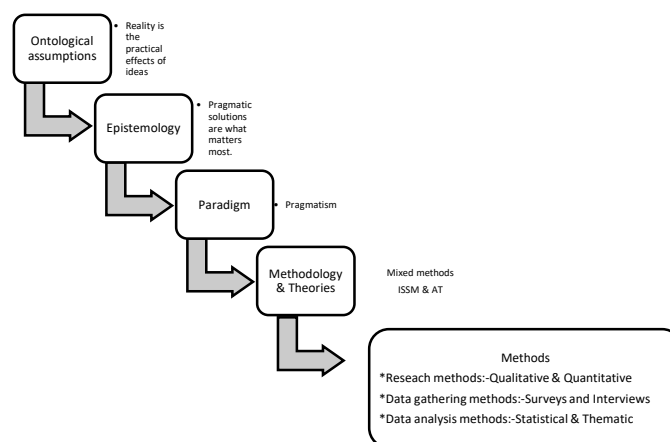


Figure 3.3: The hierarchical order of a paradigm adapted from Fayolle (2005)

The philosophy of pragmatism does not confine to any one particular philosophy or reality as it approaches research from all directions with a view to getting to understand reality as it manifests itself (Creswell, 2014: 39). Researchers employing mixed methods research, use both qualitative and quantitative approaches. Creswell (2014: 39) argues that pragmatists (individual researchers) have the freedom of choice. In this way, researchers have the freedom to select the methods, techniques, and procedures of research that can best address their needs and purposes. The ontology of reality as expressed by the mixed methods researcher is such that reality is neither expressed as independent of the mind nor constructed by the mind. This study is a multidimensional one because as Mingers (2001: 5) states, adopting a particular paradigm is like viewing the world through a particular instrument such as a telescope, an X-ray machine, or an electron microscope. Each reveals certain aspects, but each

is blind to others. Although they may be pointing to the same direction, each instrument produces a different, and sometimes, seemingly incompatible representation. Thus, in adopting only one method, one is often gaining only a limited view of a particular research situation. For example, attending only to that which may be measured or quantified, or only to individuals' subjective meanings and thus, ignoring the wider social and political context. This argument is a strong one in support of multi-method research, suggesting that it is always wise to utilise a variety of approaches. Creswell (2014: 5) argues that pragmatic researchers do not see the world as an absolute unity. In the same way, mixed methods researchers look to many approaches for collecting and analysing data rather than subscribing to only one way (e.g., quantitative or qualitative). It is for this reason that the researcher employed the "what is, how does, why is and how should" questions in the literature review.

3.7 Research approach

The second layer of the onion deals with research approaches. In this layer, a researcher chooses whether he or she would employ **inductive, deductive or abductive** approach to the phenomenon under investigation. A deductive argument is one in which the conclusion follows necessarily from one or more general principles referred to as premises (McIntyre, 2005: 31). Deductive reasoning is common among quantitative researchers and that is why they always have hypotheses in their inquiry. In other words, a deductive reason stems from the general to the specific. A researcher deduces from the stated principle, a generalisation or tests a theory or hypothesis.

The other form of reasoning is referred to as inductive reasoning. This is a form of thinking in which generalisations result from the accumulation of evidence (McIntyre, 2005: 31). Researchers move from the particular to the specific. Inductive reasoning is associated with quantitative research and can bring new knowledge by observing a sample and then drawing conclusions about the population (de Vos *et al.*, 2011:49). Another form of reasoning is abductive reasoning, which is a form of reasoning most associated with daily decision-making and is not as precise as deductive reasoning and happens when a researcher employs both deductive and inductive reasoning.

3.8 Research strategies

The third layer of the research onion shows research strategies as consisting of activities like performing experiments, doing surveys, engaging in case studies, taking up action research, grounded theory or ethnography and archival research. Researchers would naturally choose among the various strategies, those suited for their project. For the purpose of this study, a **survey questionnaire** and a **case study** were used. A questionnaire was designed and distributed among the sample and interviews conducted. They are usually presented in the form of booklets or sheets of paper for respondents to complete.

Research design refers to a formal and defined set of procedures for collecting, analysing and interpreting data to address a specific type of study purpose (Plano *et al.*, 2016). It is like an architectural outline or a master plan conceived to link data collection, data analysis, research questions and ensuring that the purpose of the research is achieved (Rog, 2009: 11). The rationale behind the mixed methods research was informed by the fact that the researcher's ontological assumptions about the social reality around the practices of information sharing are such that individuals involved in this ecosystem cannot be isolated from the reality at play. They are part of that reality under investigation, thus justifying the choice of the mixed methods research, using both qualitative and quantitative methods of data collection. According to Roode (1995: 4), social scientists are always faced with the ontological choice of whether reality forms part of the researcher or is not part of the researcher. If researchers consider themselves to be experiencing reality as something external to them or put differently as in Scotland (2012: 1) contending that phenomena have an existence waiting to be discovered through research, then they will be akin to a quantitative research method and if they view it otherwise, they will use the qualitative method. In fact, every researcher has his or her own ontological assumption about reality. According to Scotland (2012: 1), reality is always constituted with ontological assumptions, that is, assumptions that a researcher holds about a particular reality and as a result, upon engaging in a discovery, they need to adopt their own position which is always influenced by their philosophical view about the world. This attests to the adoption of a mixed methods research in this study. The situation on the ground with regard to information sharing culture in the North West Department of Education

was considered not as one removed from participants but that participants were part of the reality at play. School managers, deputy principals, heads of departments and administrative assistants are people working directly with all processes relating to information systems. They influence decisions about information systems, use it every day in their jobs, thus the reason why the researcher considered them part of the reality at play. This ontological disposition of the researcher informed the choice of the research design.

The other reason for a mixed methods approach was to attain completeness of a phenomenon under investigation as well as for one method to compensate for the weakness of the other. What a qualitative design may achieve is certainly not what a quantitative design may, and quantitative design may assist the researcher find what may not be possible with a qualitative method. Therefore, the researcher was able to achieve completeness in that one method compensated for the weaknesses of the other.

3.9 Choice of methods

This layer of the onion gives researchers the opportunity to choose between a deductive or inductive method. In an inductive method, a researcher would use a quantitative method and in a deductive method, they would employ a qualitative method.

3.9.1 Research method

The fourth layer is choices. It is obvious at this stage that the researcher used **mixed methods research**. The design of this method is the concurrent Quan + Qual design defined as a mixed method design in which researchers implement the quantitative and qualitative strands concurrently or independent from each other with the purpose of comparing or merging quantitative and qualitative results to produce more complete and validated conclusions (Plano *et al.*, 2016: 107).

One of the most notable shifts within the social sciences in the past twenty years has been the increasing acceptance and prominence of mixed methods research (Biddle *et al.*, 2015: 320). Tashakkori and Teddlie, (2009: 283) define mixed methods as a

process of integrating the qualitative and quantitative approaches to research. The authors (Plano *et al.*, 2016) actually differentiate between research methods and research methodology by assuming that the word methodology refers to a field of study concerned with developing, studying and discussing issues and procedures for integrating qualitative and quantitative approaches to research. Thus, a mixed methods research approach was used in this study as qualited and quantified by the research questions, the researcher's philosophy, approaches, strategies, choices time horizon, techniques and procedures. It is noteworthy to state that there have been different terminologies used to define mixed methods research by different authors and such terminologies include mixed methodology, multi-method research and triangulation, among others. In this study, more often than not, the researcher uses the term mixed methods depending on the source as may be quoted either verbatim or paraphrased. Again, in spite of the different definitions of the term methodology, the researcher uses both expressions interchangeably to refer to the methods used to conduct the study but not the study of research methods. Data was collected through a survey and interviews, probability and purposive sampling used to select participants for the study. Numerical and textual data was obtained in the study, while statistical and thematic approaches were used to analyse data. The conclusions had subjective and objective characteristics.

As stated earlier, convergent parallel methods, which is a type of mixed methods research, where a researcher uses both quantitative and qualitative data to get answers to research problems was used in the study (Creswell, 2014: 5). Thus, both data forms were collected at the same time and analysed separately, integrated together with a view to getting a holistic picture explained in the findings section of this study. Quantitative data was collected and analysed followed by the analysis of the qualitative data. The results and findings were brought together for comparison in order to identify how reality plays itself out on the ground as reflected in the results of the quantitative data obtained using Delone and Mclean the Activity Theory. The last stage of the analysis involved the interpretation of the convergence. There are three types of mixed methods research as follows: concurrent quantitative plus qualitative design; sequential quantitative plus qualitative design; and sequential qualitative plus quantitative design. The concurrent quantitative design, used in this study, was in

accordance with Plano *et al.* (2016:107). In a mixed methods design, a researcher uses both qualitative and qualitative methods of data collection and later compares or merges the results to arrive at a conclusion.

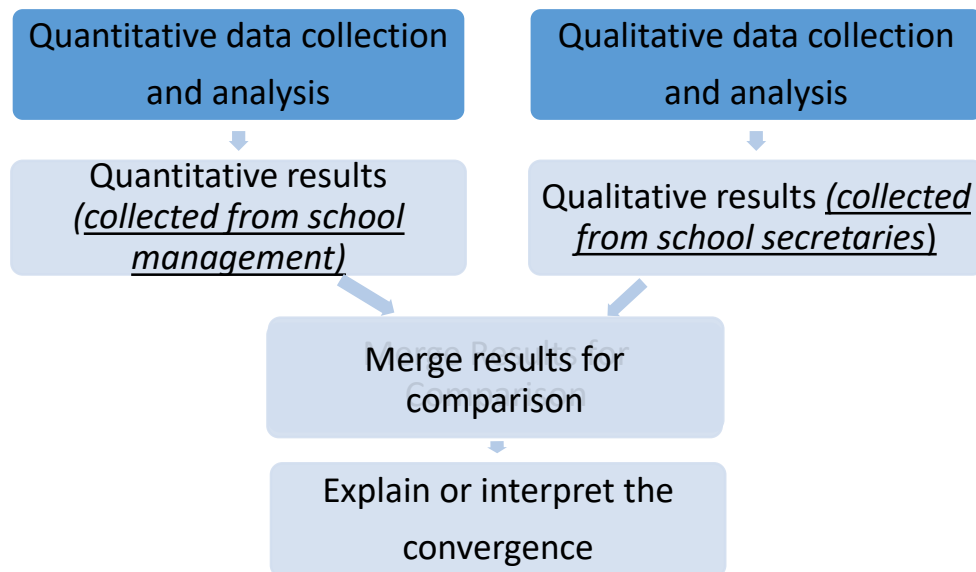


Figure 3.4: Convergent design from Wittink *et al.*, 2006

3.10 Aligning the research problem to the methodology

The Klopper-Lubbe model was developed to help student align the general research problem with the subsidiary problems and the research questions. Klopper and Lubbe (2012:1) argue that in a well-designed research project, the researcher extracts a specific number of subsidiary problems from the general problem, as well as the same number of subsidiary questions from the general research question in such a way that subsidiary questions and subsidiary problems are properly aligned. As shown in Table 3.2, the researcher aligned the problem, the subsidiary problem, the research questions and the methods.

Table 3.2: Aligning the research questions to the methodology using the Klopper-Lubbe (2003) as adapted for this study

General research problem	Subsidiary problems	Research questions	Questions that were answered qualitatively/quantitatively
The North West Education Department does not take advantage of the benefits of ICT and still relies on paper-based records.	Risk of loss of records through fire or burglary as well as time wasting in the delivery of physical records.	What can be done to enhance the current state of information sharing in NWED?	Quantitatively using ISSM.
	Difficulty in accessing physical records and tedious duplication of electronic records with paper ones.	Why are the benefits of ICT not taken advantage of?	Qualitatively using AT.

The Klopper-Lubbe model assists researchers to align the research problem with research methodology. This is the type of matrix as illustrated in Table 3.2. In this matrix, the research problem is subdivided into subsidiary problems. The subsidiary problems are as follows: the Department's apparent apathy towards ICT; the security of information is at risk; and the difficulty in accessing information. Then follows the research questions in the third column as follows: what can be done to enhance the

state of information sharing in the Province? and why is the Provincial Education Department not using ICT? The last column shows which questions were answered qualitatively and which ones were answered quantitatively.

3.11 Framework for integrating mixed methods research

According to Venkatesh *et al.* (2013: 2), research is possible using mixed methods research without relying on one particular paradigm, especially if the researcher is able to overcome the practical barriers associated with using both methods. There are authors who argue that the quantitative and qualitative approaches to research are not compatible. Venkatesh *et al.* (2013: 2) encourage information systems researchers to use methodical pluralism in their research as this will give them rich insights into their phenomena of inquiry. It should, however, be noted that the mixed methods approach used in this study, was limited to the pragmatic world view. Thus, from a pragmatic view, the researcher employed qualitative and quantitative methods to collect data using a survey and interviews. To be specific, qualitative data was collected using interviews while quantitative data was collected through a survey. The two methods were used concurrently and not sequentially.

3.12 Limitations of the mixed methods research

Among others, Grey (2009: 215) states that researchers may find it hard to deal with two types of data derived differently and end up misinterpreting it. David and Sutton (2011: 300) also state that researchers may find it difficult interpreting data from within the context of differing methods. This, therefore, means that merely converging data does not automatically translate into findings that can be judged to be valid. Grey (2009: 215) further states that synthesis could be a challenge as well. It should be noted that data from the two approaches was obtained differently as one form sought to assign numerical values to questions while the other addressed fluid issues such as people's understanding or interpretations of scenarios.

3.13 Time horizon for the research study

Time horizons are shown in the fifth layer, where a researcher is supposed to decide on either longitudinal or **cross-sectional time frames**. In this case, both qualitative and quantitative data were collected at the same time. The whole “road” from philosophies, through to approaches, strategies, choices, time horizons and techniques were informed by the research questions. Pragmatists believe in the dictatorship of the research questions (Venkatesh, 2012: 17).

3.14 Techniques and procedures for data collection

Techniques and procedures refer to the type of data the researcher uses. It could be primary or secondary data. Primary data is derived from first-hand sources. This can be historical first-hand sources, or data derived from respondents in a survey or interview data (Bryman, 2012).

3.14.1 Data collection methods

The researcher made use of only primary data in the study. Primary data refers to the type of data that a researcher collects directly. Primary data is collected using different methods depending on the methodology a researcher is using. Such data collection methods include **interviews, survey questionnaires** and direct observations. It is usually very cumbersome to collect data because the investigator may have to travel long distances between cities, towns or villages to collect data. A survey questionnaire was used to collect quantitative data. The other form of data is referred to as secondary data and is collected from published sources, however, such data was not used in this study.

3.14.2 A survey

A survey or questionnaire is a data collection method where a researcher prepares a list of questions for participants to respond to (Kumar, 2011: 138). A survey allows the researcher to collect quantitative data while interviews enable the researcher to collect qualitative data.

3.14.3 Instrumentation

With regard to the quantitative section of the instrument, the researcher employed the Subjective Evaluation Technique such as the Likert scale and others. In this case, the researcher constructed statements that were intended to measure constructs. For example, in order to measure Service Quality, a statement such as “consultants are responsive and offer a reliable service” could be constructed and presented to respondents for their responses.

It is a scale designed to measure how strongly subjects agree or disagree with statements on a 5 point scale (Sekaran, 2003: 197). The **Likert scale** was used to measure responses from the sample in the quantitative part of the questionnaire. The researcher chose the 5 point Likert scale since it is easier than any bigger one. The following examples of a likert scale were taken from Sekaran (2003: 197): Using the following Likert scale, state the extent to which you agree with each of the following statements:

My work is very interesting	1	2	3	4	5
I am not engrossed in my work all	1	2	3	4	5

3.14.4 Interviews

There are four types of interviews as follows: unstructured; structured; semi-structured; and focus group interviews (Creswell, 2014). An interview is usually conducted within the framework of a qualitative study. A qualitative research approach explores meaning and understanding that people attach to a social or human problems (Creswell, 2014: 32). This type of inquiry has, among others, characteristics such as being inductive in nature. Inductive research does not test a theory but creates it. The researcher collects data and interprets it. The interview is a process where a participant and an interviewer engage in the exchange of thoughts (de Vos *et al.*, 2011:342). Using the constructs of tools, subject, rules, object, community, division of labour and outcome in the Activity Theory, questions were framed and discussed with participants. With regard to the interviews, purposeful sampling was used to select participants such as school managers, deputy principals or heads of departments. .

A semi-structured interview was used to collect qualitative data as it is a method where researcher has pre-determined set of questions on an interview schedule (de Vos *et al.*, 2011: 352). A semi-structured interview assists the researcher to get guidance and focus on the schedule. Furthermore, the researcher was interested in getting the beliefs, perceptions and attitudes of participants with regard to information sharing.

Goal Question Metrics and Subjective Evaluation are guidelines presented by Panusuwan (nd) used to guide the formulation of questionnaires and survey questions. Through the Goal Question Metrics and Subjective Evaluation, the researcher was able to formulate questions by making statements that define individual constructs of each theory used in the study. Each construct was intended to measure each goal. For example, in AT, one of the constructs is Tools. In order to measure the attitude of school managers towards computer usage within NWED, a statement such as “in your opinion, what is the school manager’s attitude towards communication through emails” Was used. According to Panusuwan (nd), the researcher is able to trace back to the objectives of the study as stated in paragraph 3.2.1 above. The Goal Question Metrics was used in the qualitative section of the instrument.

The interviews were recorded using a voice recorder and the usual guidance provided for conducting interviews heeded to as follows: issues of ethics; making participants to feel at ease and comfortable; giving participants a copy of the schedule; being attentive; and establishing a rapport, among others.

3.14.5 Population of the study

In any research activity, there are items or units used as participants in the study and they constitute what is known as a population or universe (Kothari, 2004). A total population of 26 000 teachers and secretaries were considered for this study (Department of Education, 2009: 4). The Province consists of four districts and each district is sub-divided into Area offices and circuits. Participants consisted of school managers, their deputies, heads of departments and administrative assistants.

3.14.6 Sampling procedures

Sampling involves the selection of a certain number (a sample) out of a larger group (the sampling population) and use it as a basis for estimating or predicting the extent of prevalence of some information that is not known, regarding the bigger group (Kumar, 2011: 177). It is, therefore, fewer elements of a bigger group called a population that a researcher is interested in. Kothari (2004) observes that a sample design is a definite plan for obtaining a sample from a given population (Kothari, 2004). The reason for selecting a sample from a big population is because it saves time and costs, although there is, however, a possibility of errors. According to Kothari (2004: 58) the characteristics of a good sample are as follows: it must be truly representative; have a small sampling error; must be possible within the confines of the allocated budget; the researcher's bias need not interfere too much in the outcome; and the results of the sample generalisable to other situations.

Stratified sampling was used because from a population of school managers, deputy school managers, heads of departments and administrative assistants, each of them were represented in the sample. Out of a population of 26 000 teachers and secretaries that made up the population of the study, three hundred were sampled. Two hundred and ten (210) or seventy percent (70%) of the sample was from Ngaka Modiri Molema District, forty five participants or (15%) were from Ruth Segomotsi Mompati District, thirty participants or (10%) were from Kenneth Kaunda while fifteen or (5%) were from Bojanala District. The reason for choosing Ngaka Modiri Molema District (with the highest number of participants) was due to financial constraints and proximity. The researcher is resident in the District, thus it was easier for the project to be structured in such manner.

3.14.7 Sampling type

If a sample is taken from population that is not homogeneous in nature, then stratified sampling technique is generally applied in order to obtain a representative sample (Kothari, 2004: 62). The population was not a homogeneous group. It consists of individuals from different levels in the organogram of the Department of Education. Some were school managers, others were deputy school managers, heads of

departments as well as administrative assistants. Thus, due to the nature of the population, a stratified sample was used. Kothari (2004) contends that a stratified sampling results in more reliable and detailed information.

3.14.8 Data analysis

Tashakkori and Teddlie (2009: 301) state that there are three steps in analysing qualitative and quantitative data as follows: narrative data is analysed using qualitative thematic data analysis techniques; numeric data is analysed statistically and some of the results may be converted from one type to another and reanalysed using a new approach. Thus, the two forms of data were analysed separately and merged afterwards. With regard to qualitative data, the researcher summarised data using a typology of themes. The underlying meaning of participants' experiences or attitudes were not ignored since the researcher was aware of the difference between manifest and latent content analysis. In practical terms, narrative data was quantitised using quantitising techniques in order to transform it into numerical codes to create "similarity" between the two forms of data. It is after this stage that inferences can be made. Tashakkori and Teddlie (2009: 306) note that inferences are conclusions and interpretations made on the basis of data collected in a study.

3.15 Reasons for using AT and ISSM

Firstly, an attempt is made to explain positivism and interpretivism with regard to the topic since it is this dichotomy that informed the choice of the two approaches. Creswell (2014: 35) refers to paradigms as philosophical worldviews. Creswell (2014) further states that worldviews have to do with the way a researcher's philosophical view plus the type of research they want to engage in about a study. This shows that researchers are different and see the world or reality differently and the manner in which they perceive reality has a bearing on the way they undertake research.

In this study, as stated earlier, the Activity Theory (AT) and the Delone and Mclean's (ISSM) were used. The rationale for choosing these two approaches is because ISSM addressed the quantitative aspects of the study while the Activity Theory focused on the qualitative aspects. The Activity Theory is useful in qualitative research. Ditsa *et*

al. (2000: 243) argue that it is a powerful and clarifying descriptive tool rather than a strong predictive theory. Therefore, what is qualitative about this enquiry is the measurement of such fluid aspects as reasons for particular behaviours of people. In other words, how can one explain the fact that with so many obvious benefits of ICT, the North West Department of Education does not derive them. This is the area of the study that makes it interpretivist or qualitative.

Secondly, Engestrom's model demonstrates that the Activity Theory operates through contradictions and such contradictions exist within and between activity systems at various levels (Hardman *et al.*, 2015: 19). This, therefore, is an indication that there can be an activity system within an individual who experiences contradictions between what he or she wants to achieve and what he or she is doing. The second level of the activity system is one expressed between components of an activity system, for example, there could be a contradiction between the subject and the tools referred to as secondary contradictions (Hardman *et al.*, 2015: 19). The third level of contradictions happens between an object of a culturally dominant system and a dominant part of the activity system. The final contradiction manifests between two activity systems being the central activity system and neighbouring activities. The focus of this section of the study is on this final level of the theory. According to the researcher, there is a contradiction between the broader ITC world and the one within the North West Department of Education. Of particular interest to the researcher is the apparent apathy towards the benefits of ITC as expressed in earlier chapters, through observations such as the digital divide and financial constraints. The major focus is, therefore, the contradiction between the broader activity system of ITC in the world compared to ITC practices in NWED and the shared object/motive of ITC success. Ekundayo *et al.* (2012:4) posit that activities, by their nature, often result in an imbalance to original activity and have the potential for instigating a change process. Thus, ICT is supposed to propel users to leverage all benefits associated with it.

On the other hand, the research also has characteristics of the quantitative approach to inquiry. With ISSM, the researcher was able to interpret the situation with regard to ICT in the Province. It is a theory that predicts what makes information systems successful. This study is an attempt to prove or disprove the theory using quantitative

methods of data collection. According to this theory, information systems success is dependent upon the quality of information, the quality of the system, service quality, user satisfaction, usage intentions and system use. Once all these are in order, users of the system will be able derive Net System Benefits

The Activity theory produced qualitative data while the Delone Mclean model of information system success was used to assess the status of information flow on the ground. In other words, the Activity Theory was used to interpret the why, how does and how questions while the Delone and Mclean model was used to explain the “what is?” questions in the study. In practice, two instruments were used for data collection. One was aligned to AT while the other was aligned to ISSM. All questions were intended to obtain information on what practically happens when information has to reach district offices. Such questions were formulated using ISSM while questions on why people behave in a certain manner were asked using AT.

3.16 Limitations of ISSM and AT

ISSM was introduced in 1992 and in 2002, the same authors who developed it, subjected it to a review. After its review, the model experienced changes here and there. Authors such as Wong (2011) also suggested changes to the model. This argument seeks to provide grounds for the fact that the model is still under development and could, therefore, not be treated as a finished product. It is for this reason that the authors themselves brought about a ten-year review, which, for example, came with Net System Benefits, which was not part of the original model.

The other weakness of ISSM is the fact that many researchers only use it partially in their projects, thus they use construct selectively without applying the whole model to their activities. According to Urbach *et al.* (2012), many studies conducted had only made use of certain selected parts of the model, thus resulting in a certain dearth of literature on the application of the model as a whole. The third observation is that other researchers propose their own constructs to the model, thus an indication that the model could be still in its early stages of development and may therefore, not necessarily be a reliable measure for the success of information systems in organisations. Furthermore, constructs used in ISSM depend on a large number of measures used to describe the nature of each construct, which may burden

researchers with the difficult task of designing big questionnaires to satisfy all these measures. For example, in order to determine the quality of service, the following measures abound: empathy; flexibility; assurance; interpersonal quality; intrinsic quality; reliability; IS training; responsiveness; and tangibles. It is even a bit confusing when measures are repeated for different constructs. For example, adequacy defines the quality of information as well as user satisfaction.

AT is mainly recommended for interpretive research, thus making it unsuitable for quantitative or objective research. Ditsa *et al.* (2000) state that AT is a research approach in the interpretive mould that presents a framework within which to analyse the actions of people as they interact with each other in an attempt to achieve a desired outcome. The authors further maintain that in order to be able to use AT properly, researchers should immerse themselves into the activity system (AT) in order to understand even the history of the organisation and it is advisable that the time frame should be long enough.

3.17 Aligning the research problem, objectives and research question

The outline of this section follows the Rembrandt Kloppe model of aligning research problems, objectives and research questions (Figure 3.5). This is a model designed to assist researchers align their research problems, objectives and questions as illustrated in the figure in the next page.

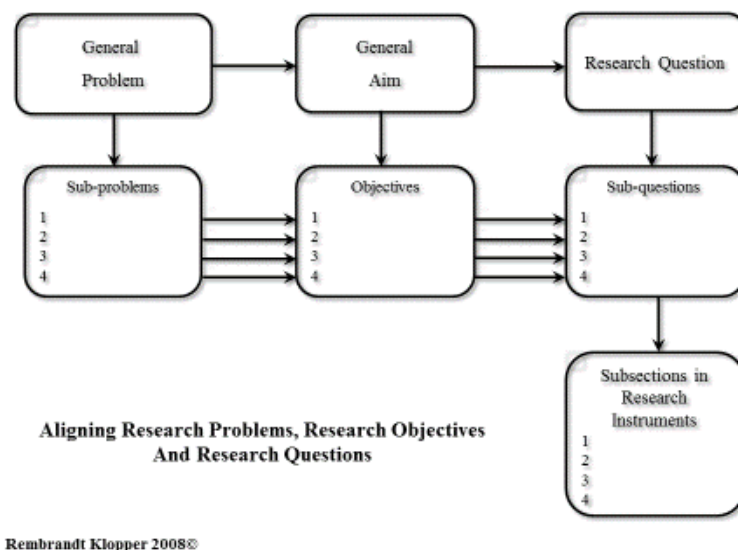


Figure 3.5: **The Rembrandt Kloppe model of aligning research problems, research objectives and research questions (2008)**

The model starts with the general research problem which has subsidiary problems. The subsidiary problems inform the objectives of the study, which are again informed by the general aim of the study, followed in the diagram by the research questions, which inform the subsidiary research questions. The objectives also inform the subsidiary research questions. The last part of the model is the subsidiary sections of the research instrument.

3.18 Purpose statement for triangulation

In this section the researcher used Creswell's (2011: 177) template for a purpose statement. Creswell (2011: 177) proposes that in the case of a convergent mixed methods research, the purpose statement should be stated according to the format stated herein. In this template, the researcher makes clear to the reader the type of research method used, which data collection methods employed and how the results would be analysed. The purpose statement is as follows: This mixed methods study will address the minimal use of ICT and a convergent mixed methods design will be used. It is a type of design in which qualitative and quantitative data are collected in parallel, analysed separately, and then merged. In this study, quantitative data was

used to test the theory of ISSM which predicts that service quality, system quality and information quality have equally a direct effect system use, usage intentions and user satisfaction and the same way user satisfaction impacts usage intentions, whereas system use impacts user satisfaction and finally, system use and user satisfaction inform the net system benefit of an entity. On the other hand, AT was used to understand the rationale behind minimal use of ICT on the ground. In other words, AT was used to interpret qualitatively, the situation as it happens. The reason for collecting both quantitative and qualitative data was to achieve completeness. Creswell (2011: 177) further states that the first example of a mixed methods purpose statement is a script for a convergent mixed methods strategy in which quantitative and qualitative data are collected and analysed.

3.19 Judging the fidelity of qualitative procedures

Validation for qualitative methods research is a relatively new concept (Venkatesh *et al.*, 2013:11). This validation, like in the case of a quantitative inquiry, has three elements, two of which are similar to those of a quantitative study but interpreted differently such as design validity, inferential validity and analytical validity. With regard to qualitative research, design validity is divided into descriptive validity, credibility and transferability. Credibility and transferability are explained later. Descriptive validity in qualitative research defines the accuracy of what is being reported (Venkatesh *et al.*, 2012: 13).

In qualitative research design, validity has three elements as follows: descriptive validity; credibility; and transferability (Venkatesh *et al.*, 2012: 13). In addition to design validity, there are two other forms of validity as follows: analytical validity; and inferential validity. Analytical validity is subdivided into theoretical validity, dependability, consistency and plausibility. The last form of validity, referred to as inferential validity, consists of interpretive validity and confirmability. The following section provides details of the structures of these types of validity.

3.19.1 Design validity

Credibility is an element of design validity and refers to the extent to which qualitative findings are perceived as accurately conveying the experiences of study participants (Plano *et al.*, 2016: 163). The researcher lived by the provisions of the definition of credibility by employing strategies such as peer debriefing, data triangulation and member checking. Bhattacharjee (2012: 110) maintains that credibility of interpretive research can be improved by providing evidence of the researcher's extended engagement in the field, by demonstrating data triangulation across subjects or data collection techniques, and by maintaining meticulous data management and analytic procedures, such as verbatim transcription of interviews, accurate records of contacts and interviews, and clear notes on theoretical and methodological decisions, that can allow an independent audit of data collection and analysis if needed.

Transferability refers to the degree to which conclusions from a mixed methods study can be applied to similar settings, contexts and people (Plano *et al.*, 2016: 163). Bhattacharjee (2012: 110) also contends that transferability in interpretive research refers to the extent of applying the findings to settings other than those the research was conducted in. The research was conducted in the North West Province and the findings thereof should be transferable to other provinces of South Africa and such is the practical meaning of transferability. Descriptive validity is about the accuracy of what is being reported (Venkatesh *et al.*, 2012: 13). Researchers report about events, objects and settings, among others and the accuracy thereof has a bearing on the validity of the study.

3.19.2 Analytical validity

Analytical validity finds expression when a qualitative study is well-designed, data properly collected and analysed and the findings are dependable, consistent and plausible (Venkatesh *et al.*, 2012: 13). Analytical validity is sub-divided into theoretical validity, dependability, consistency and plausibility.

3.19.3 Inferential validity

When a researcher interviews participants, they respond to questions and the researcher has the responsibility to capture their thoughts in the contexts they pronounce them and this has to do with their feelings, intentions and experiences and when their thoughts are accurately understood, this is referred to as **interpretive validity** (Venkatesh *et al.*, 2012: 13). When participants in the investigation can independently confirm the findings, this is termed **confirmability** (Bhattacharjee, 2012:110). It is worth noting that since this study is both subjective and objective and the qualitative aspects have no room for objectivity, then participants should agree with inferences arrived at by the investigator and this suffices for the fact that the results of the study are confirmable.

According to Bhattacharjee (2012: 110), interpretive research can be viewed as dependable or authentic if two researchers assessing the same phenomenon, using the same set of evidence, independently arrive at the same conclusions or the same researcher observing the same or a similar phenomenon at different times, arrives at similar conclusions. In the first chapter of this study, an attempt was made to provide a clear picture of the phenomenon under investigation, its location and how it manifests itself. A geographical map was also provided in an attempt to satisfy the conditions as laid down by Bhattacharjee (2012: 110) for the **dependability** of the study.

3.20 Judging the quantitative procedure

In a quantitative study, researchers make use of tools to conduct their research. These tools come in many forms, for example, survey questionnaires, among others. Researchers expect the findings produced by the tools they use to be consistent and stable. When this happens, that is when a tool produces the same results consistently, it is said to be reliable (Venkatesh *et al.*, 2012:12). **Reliability** is a precondition for quantitative research, which means that a study cannot be valid before it is reliable (Venkatesh *et al.*, 2012: 12). Another term for reliability is measurement validity.

Validity refers to the legitimacy of the findings (that is, how accurately the findings represent the truth in the objective world) (Venkatesh *et al.*, 2012: 12). There are four

major elements of validity as follows: internal validity; construct validity, external validity; and statistical conclusion validity (Bhattacharjee, 2012: 45). Internal validity also referred to as causality, seeks to examine whether the change in a dependent variable comes as a result of a corresponding change seen in a hypothesised independent variable, and not by variables that are not related to the research context (Bhattacharjee, 2012: 45). Internal and external validity are both referred to as design validity. The discussion of validity in this section is to provide clarity to the fact that there are independent and dependent variables in a quantitative investigation and if a change in an independent variable does not effect a change in a dependent one, the investigation may not be valid. Internal validity has to do with the behaviour of variables within their immediacy, excluding issues of generalisations. In other words, validity determines whether what the instrument is designed to measure, indeed measures that. It is for this reason that the researcher decided to conduct a pilot study to test the fidelity of the instrument.

McIntyre (2005: 66) states that a valid measure is one that is actually measuring what one thinks he or she is measuring. With regard to this study, it important to note that if the instrument were to measure the theoretical values of ICT, that would not necessarily translate into moves towards an e-governance system of information systems. The instrument therefore, embodies risks of being an unreliable measure of validity because if it is valid, then the outcome should lead towards leveraging the benefits of ICT by taking advantage thereof. Bhattacharjee (2012: 45) proposes three conditions for internal validity as follows: co-variation of cause and effect, which means that if there is a change in the independent variable (cause), there has to be one in the dependent variable (effect) and if there is no change in the cause, there should be no change in the effect.

There is also another form of validity referred to as external validity. This type, also known as generalisability, refers to whether the associations that are under observation, can be generalised from the sample to the population (population validity), or to other people, organisations, contexts, or time (ecological validity) (Bhattacharjee, 2012: 45). The findings of the study should be applicable to contexts beyond the sample. They should apply to other role players in ICT practices of the North West Department of Education and beyond. Statistical conclusion validity is the

third form of validity and judges the validity of inferences made out of the correlation between variables, that is, dependent and independent variables.

3.20.1 Piloting the research instrument

A pilot study was conducted with a smaller sample of five (5) participants with regard to the qualitative instrument and fifteen (15) respondents using the quantitative tool. The purpose of a pilot study is to see if the instrument answers the research questions, responds to propositions and the hypotheses. Furthermore, the purpose of the pilot was to evaluate the instrument in order to identify its strengths and weaknesses. The quantitative instrument was also subjected to a reliability test. Cronbach's alpha showed that the questionnaire reached acceptable standards of reliability, $\alpha=0,976$. The weakness of the instrument was only 0,024 weak. These results, therefore, validated the quantitative instrument. The qualitative instrument was checked against the repetitive nature of questions and was found to be non-repetitive.

3.20.1.1 Results of the pilot study

A pilot study was conducted in order to see if the questionnaire as designed was addressing the research question. A pilot study asks whether something can be done, should the researchers proceed with it, and if so, how? Junyong (2017). The purpose of the pilot study was not only limited to assessing the quality of the questionnaire but to improve the quality of the questionnaire and of the whole research project. After the pilot study, slight improvements were effected on the questionnaire.

Qualitative results

The research question for the qualitative section of the study focused on the reasons behind the non-implementation of change in the use of ICT. The researcher used Versus Coding in the analysis of the data gathered through interviews. Saldanha (2009) defines coding as a short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data. There are different types of coding, however, in this study, Versus Coding was used due to the manner in which the questionnaire was designed (each

question was dichotomous in that it compared the relationship between two elements). For example, a question would attempt to establish how ICT policies affect electronic communication. In this way, the question had ICT policy on the one hand and electronic communication on the other. All questions in the qualitative section of the questionnaire were structured in this manner, thus justifying the reason for the adoption of the Versus Coding approach.

Saldana (2009) suggests that researchers should categorise all codes into one of three categories of stakeholder, perceptions/actions or issues. All the codes in the analysis were categorised as issues. Issues in the analysis consisted of the following: tools versus object; subject versus object; rules versus object; community versus object; and division of labour versus object.

Twenty-nine (29) questionnaires were handed out for piloting and the results showed that some questions looked similar and were, as a result, replaced. Some questions did not address the research question and were also replaced. It was again found that some questions did not address the hypotheses and were replaced with those that addressed the hypotheses. However, the overall quantitative results showed a positive picture about ICT practices on the ground.

Qualitative findings

Ten participants were interviewed, and out of nine (9) questions, four (4) did not address the research questions sufficiently, an indication that some propositions were difficult to fathom. At the end, only five (5) propositions were maintained with five questions as the researcher wanted to maintain only questions that had a relationship with the five constructs of the Activity Theory and the object, which is efficient information sharing practices. Finally, the pilot revealed a positive picture in people's attitudes towards IS.

With regard to the research questions, results of the pilot study answered the research questions as they projected a picture of the nature of the problem, which was, however, a positive one. These results informed the nature of the approach towards addressing the challenges. Both qualitative and quantitative results projected a positive relationship between people and ICT artefacts. Furthermore, with regard to

the reason for the slow adoption of ICT, responses could be ascribed to the digital divide as revealed in the literature review.

3.21 Evaluation of the generated theory

There are several criteria on how to evaluate a theory. For example, Cramer (2012: 9) lists six criteria as follows: comprehensiveness; precision and testability; parsimony; empirical validity; heuristic value; and applied value. The theory generated in this study is not conclusive and could serve endeavours towards improved information sharing. It is, therefore, the wish of the researcher that it passes the following criteria.

3.21.1 Comprehensiveness

Cramer (2012: 9) maintains that good theories should describe, explain, predict and control phenomena and behaviour. The theory considered in this study was espoused to serve as a framework for information sharing and should therefore describe how information sharing can be enhanced. It should explain, predict, and control it.

3.21.2 Precision and testability

Good theories should expose themselves to rigorous hypothesis testing (Cramer, 2012: 9). The theory considered should also be precise. It was envisaged that constructs were involved in the theory, clearly defined and well interrelated. Simon and Goes (2012) use a different nomenclature and maintain such theories are accurate.

3.21.3 Parsimony

According to Cramer (2012: 9), people tend to prefer simpler and easier to comprehend theories as opposed to complex ones. Simon and Goes (2012) posits that a theory should be constructed with the fewest possible steps. This is not to suggest that it is intended to be simple for the sake of simplicity because all important constructs will not be left out.

3.21.4 Consistency

Another interesting measure of a theory is consistency as provided for by Simon and Goes (2012). It is about both internal and external consistency. This means that under the same conditions of experimentation, the instrument used should be able to yield the same results and when this happens, the research or theory generated can be said to be consistent (Girden *et al.*, 2011:3). Other additional criteria for the evaluation are discussed in Chapter 5.

3.22 Ethical considerations

Plano *et al.* (2016: 219) define a mixed methods ethics as a set of moral principles aimed at assisting researchers in conducting mixed methods research ethically and in compliance with existing standards for research involving humans. In an attempt to subscribe to the definition above, participants were requested to voluntarily sign informed consent forms. No one was forced to take part in the study without his or her consent. This was done with a view to subscribing to the principle of **voluntary participation**, which requires that no one should be made to take part in a study through force. Thus, all procedures and every other important information were disclosed to participants. Permission to conduct the study was sought and obtained from the Head of the Department of Education in the Province.

Another important consideration for ethical research is that the study has to be seen as something that would bring about positive change (McIntyre, 2005: 77). The aims of the study was to bring about positive change that could improve communication or information sharing within the Department of Education. The other important point researchers need to bear in mind is the fact that research should not bring any harm to participants. For example, historical records show atrocities committed in the name of research. It is documented that in Germany, physicians committed atrocities to humans experimenting with them by having them to drink sea water in order to find out how long a human being could survive without fresh water (McIntyre, 2005: 77). It is reported that many people died out of such experiments and those who survived, had to live with a painful physical or psychological scar. This is just one example of unethical conduct in research. This study is designed not to cause any harm to

participants and with qualities of trust and honesty as well as privacy, confidentiality and anonymity.

3.23 Summary of chapter

Ontological assumptions about the limited use of ICT within the Department of Education (North West Province) suggest that participants and the researchers accommodate diverse views with regard to the situation. The epistemological stance encouraged the adoption of a mixed methods research, where qualitative and quantitative data were merged to achieve completeness. The research onion was used to summarise the research design used in this study. Pragmatism was considered as a useful philosophy as it is both deductive and inductive. A survey and case study were used to collect data. The next chapter is the presentation of findings.

CHAPTER 4 - FINDINGS

4.1 Introduction

4.1.1 General orientation

The aim of the study was to establish a framework for information sharing for the North West Department of Education. The researcher sought to establish facts around the non-utilisation of ICT, given its obvious benefits. In order to establish these facts, the Delone and Mclean's Model of information systems success (ISSM) and Engestrom's Activity Theory were considered in the study. The choice for this approach was based on the two major research questions since the first one was qualitative in nature and the other quantitative. The quantitative research question was as follows: what can be done to enhance the current state of information sharing in the North West Department of Education? The second research question was as follows: why is the Department of Education not taking advantage of the benefits of ICT? The first model, Delone and Mclean Model of Information Systems Success (ISSM), was used to develop the quantitative research tool while the second one, Engestrom's Activity Theory (AT), was used to develop the qualitative tool. From the conceptual model of ISSM and AT, the following research questions were asked. A questionnaire and semi-structured interviews were used to collect data to provide answers to the research questions.

4.2 Conceptual framework

The conceptual framework for this study was informed by Engestrom's Activity Theory and the Delone and Mclean Model of Information Systems Success. The research questions were asked based on this conceptual framework. The hypotheses were stated from the constructs of the conceptual framework. The constructs, in accordance with Delone and Mclean Model of Information Systems Success are as follows; quality of information; quality of system; quality of service; user satisfaction; usage intentions/system use; and Net System Benefits. The instruments were designed

based on the conceptual model. Six sets of questions were included in the research instrument and it provided the best information for the study.

4.3 Strengths and weaknesses of the instrument

Information systems research is mainly about people and computers. In order to evaluate complex skills such as research, valid and reliable instruments must be designed (Aguilar *et al.*, 2014). It is in the context of this statement that the researcher made use of statistical instruments to gauge the reliability and validity of the research instrument. The statistical tests to which the instrument was subjected to, were as follows: reliability and validity test; Kaiser-Meyer Measure of Sampling Adequacy Test; Bartlett's Test of Sphericity; and the Confirmatory Factor Analysis Test as discussed below.

With regard to the literature on information systems, there is no study that has combined the Activity Theory and the information systems success Model of Delone and Mclean. There is again no research instrument that used the whole ISSM model in research. Researchers have used only one or two, if not, three constructs of the model. As far as the researcher was able to establish, this is the only time a research instrument employed all constructs of the model to analyse an ICT phenomenon.

ISSM was developed in 1992 and reviewed after 10 years. This is an indication that the model is still under construction or is designed to change according to the needs of the ICT environment. Some of the constructs of ISSM use similar variables, for example, reliability is used to denote quality of the system quality and quality of information. The third weakness of the instrument is the difficulty in bringing together AT, which is constructivist in nature and ISSM, which is objectivist. The fourth weakness is that it was not easy to extract a community out of the AT theory as the Department of Education was the community under investigation with all the elements of AT.

4.4 Demographic characteristics

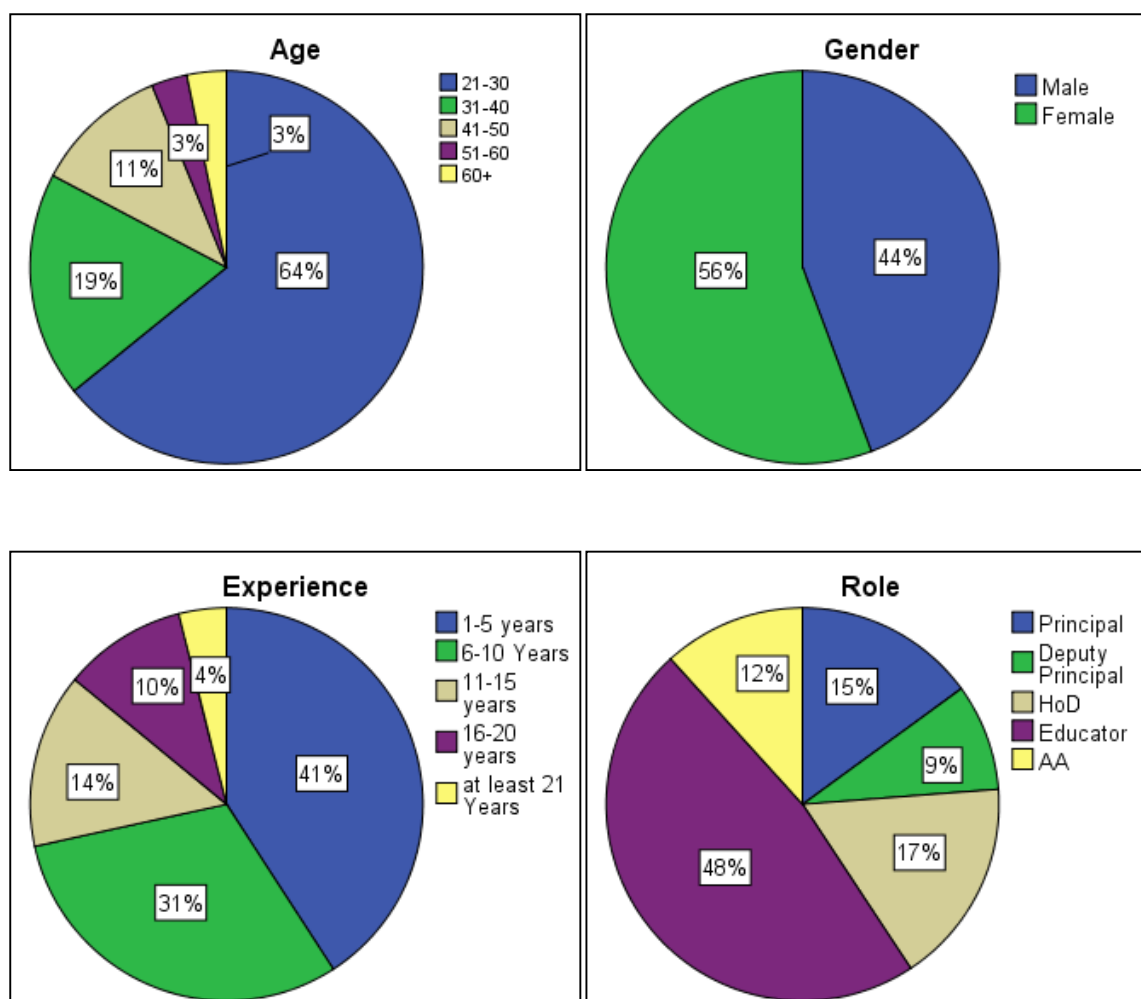


Figure 4.1: Demographic characteristics of respondents

The demographics of the respondents revealed that majority of them were aged between twenty-one and thirty (representing sixty four percent of the sample). Nineteen percent were between thirty-one and forty, eleven percent were between forty-one and fifty, three percent were between fifty-one and sixty while the same percentage was aged sixty years old.

With regard to gender, fifty six percent of respondents were males while forty four percent were females. Experience-wise, forty one percent of participants had between one and five years of work experience, thirty one percent had between six and ten years of work experience, fourteen percent had between eleven and fifteen years' experience, ten percent had between sixteen and twenty years of experience while

four percent had above twenty-one years of service. The role of respondents was spread as follows: forty eight percent were educators; seventeen percent were heads of departments; twelve percent were administrative assistants; fifteen percent were principals while nine percent were deputy principals

4.5 Reliability and validity tests

Cronbach's alpha measures internal consistency, meaning that it concerns itself with the closeness of the relationship between items of measurement as a group. It was developed by Lee Cronbach in 1951 to provide a measure of internal consistency of a test or scale (Tavakol *et al.*, 2011). When the value of alpha is higher, the items in a test are said to be related. Tavakol *et al.* (2011) state that alpha is an important concept in the evaluation of assessments and questionnaires. Reliability refers to the consistency of measurement (Gabrenya, 2003). When the measurement is consistent, then the results could be said to be valid.

Table 4.1: Reliability and validity tests

	Reliability statistics	
	Cronbach's Alpha	Number of items
H ₁	0.841	10
H ₂	0.780	10
H ₃	0.664	10
H ₄	0.856	9 ¹
H ₅	0.800	7 ²
H ₆	0.856	10

Reliability test was performed in order to establish if the instrument used was consistent. A measure is said to be consistent if it produces the same results under similar conditions. The instrument used to collect quantitative data for this study produced the results as shown in Table 4.1 when tested for its reliability and validity.

The results of reliability analysis revealed that the items of H₃ were of acceptable reliability since the Cronbach Alpha for this construct was approximately equal to the benchmark of 0.7, recommended by Alfred *et al.* (2018). The items of all other constructs were of good reliability since the Cronbach Alpha for each construct was greater than the recommended benchmark.

¹ The variable “H4.8. The system enhances progress in my work” was excluded since its Corrected Item-Total Correlation was negative

² The variables “H5.6. The system is generally used.”, “H5.9. I would rather capture information using computers than doing it manually” and “H5.10. I make use of the system” were excluded since its Corrected Item-Total Correlation was negative

4.6 Construct validity of the measuring instrument

4.6.1 Factorability and sampling adequacy

Table 4.2: Factorability and sampling adequacy

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy		.879
Bartlett's Test of Sphericity	Approx. Chi-Square	7238.043
	Df	1540
	Sig.	.000

The KMO test measures how suited data is for factor analysis and uses the formula (which is the sum of the observed correlation coefficients⁰) + (the sum of the partial correlation coefficients between all pairs of variables).

The statistical analysis is a measure of sampling adequacy or it measures whether or not the sample was adequate. This is done by comparing the values of the correlation coefficients as observed, in relation to the values of the partial correlation coefficients. The Bartlett's Test of Sphericity is a statistical measurement that is interested to test if variances are equal across samples and when this happens, it is called homogeneity (Arsham *et al.*, 2013). The test was first introduced by Maurice Bartlett in 1937. In a situation where an assumption of the sample is equal, then a Bartlett's test is conducted to prove such assumption.

The **KMO** is greater than the benchmark of 0.7, as recommended by Yang *et al.* (2016). Hence, the sample is adequate enough for factor analysis to be conducted. In addition, the Bartlett's test of Sphercity is significant at 1% (p-value <0.01), hence the correlation matrix for the dataset is factorable (Yang *et al.*, 2016). The data satisfies the key preliminary analysis for factor analysis, hence the researcher proceeded with the analysis.

4.6.2 Confirmatory Factor Analysis (CFA) using Structural Equation Modelling (SEM)

Table 4.3: Confirmatory Factor Analysis using Structural Equation Modelling

Comparative Fit Index (CFI)	0.730
Tucker-Lewis Index (TLI)	0.717
RMSEA	0.061
SRMR	0.062

Structural Equation Modelling (SEM) is a useful statistical technique used for construction and for testing models in the Social Sciences (Hooper *et al.*, 2008: 1). This technique was employed in this study in order to validate the model, which is the final product of this research. Elements of the SEM used are the Comparative Factor Index (CFI), the Tucker Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA) and the Standardised Root Mean Square Residual (SRMR).

4.6.2.1 The CFI

CFI is also known as the Bentler Comparative Fit Index and specifically serves to compare the fit of a target model to the fit of a model that is independent, a model in wherein the variables are assumed to be uncorrelated. In this context, fit refers to the difference between the observed and predicted covariance matrices, as represented by the chi-square index. In short, the CFI represents the ratio between the discrepancies of this target model to the discrepancy of the independent model. Roughly, the CFI thus, represents the extent to which the model of interest is better than the independent model. Values that approach 1, indicate an acceptable fit. It is usually expressed mathematically by the formula below.

$$\frac{d(\text{Null Model}) - d(\text{Proposed Model})}{d(\text{Null Model})}$$

4.6.2.2 The Tucker Lewis Index

The Tucker Lewis Index (TLI) is also one of the comparative fit indices used in the Structural Equation Modelling. When TLI is lower, the model becomes unacceptable and when it is higher, the model is less acceptable. RMS, also referred to as RMR or RMSE, represents the square root of the average or mean of the covariance residuals. The differences between corresponding elements of the observed and predicted covariance matrix is such that zero represents a perfect fit, but the maximum is unlimited.

4.6.2.3 RMSEA

The Root Mean Square Error of approximation (RMSEA) is concerned with issues about the size of the sample. It analyses the discrepancy between the hypothesised model and the population covariance. The figures in RMSEA range from zero to one. When the figure is smaller, this shows a better model fit but when the figure is bigger, it does not demonstrate a good model fit. It is used to supplement the chi-square test. Table 4.3 shows that RMSEA is 0.061, thus making the data to fit the model.

4.6.2.4 Standard Root Mean Square Residual

Standardised Root Mean Square Residual (**SRMR**) is an absolute measure of fit and is defined as the standardised difference between the observed correlation and the predicted correlation (Chen, 2007). It is a positively biased measure and such bias is greater for small N and low for other studies.

4.7 Correlation analysis

Inferential statistics use data from a sampled population to make inferences about a larger population and are used to test a hypothesis (Ali *et al.*, 2016). As is the case in this study, the results analysed were obtained from a sample and interpreted using inferential statistics, where the extent of the dependent variables was interpreted (this is referred to as correlation analysis). Correlation analysis measures the relationship between two or more quantitative variables (Swanepoel *et al.*, 2018). The end result of a correlation analysis is a correlation coefficient, which usually ranges between -1

and +1, in which case, -1 shows that the two variables are perfectly related in a negative manner and a correlation coefficient of +1 shows two variables that are perfectly related in a positive way and a correlation coefficient of zero shows that two variables are not related at all (Gogtay *et al.*, 2017). In this study, six variables: quality of service; quality of information; quality of system; usage and usage intentions; user satisfaction; and net system benefits were considered. Correlation analysis was performed in order to assess the relationship between the six variables. The associations or relationships between concepts lie between +1 and -1.

Table 4.4: Correlation coefficients table

	Quality of information	Quality of information systems	Quality of service	User satisfaction	Usage and usage intentions	Net system benefits
Quality of information	1					
Quality of system	0.539	1				
Quality of service	0.011	0.023	1			
User satisfaction	0.401	0.435	0.052	1		
Usage and usage intentions	0.340	0.402	0.012	0.398	1	
Net system benefits	0.345	0.508	0.012	0.421	0.465	1

There were moderate ($0.3 \leq r < 0.5$), significant ($p\text{-values} < 0.01$) and positive correlations between the level of user satisfaction and the following variables: quality of information ($r=0.401$) and quality of the system ($r=0.435$) (Weinberg and Abramowitz, 2016). That is, as the quality of the system and quality of information improve, the usage/ usage intentions also improves.

There were moderate ($0.3 \leq r < 0.5$), significant ($p\text{-values} < 0.01$) and positive correlations between usage / usage intentions and the following variables: quality of information ($r=0.345$) and quality of the system ($r=0.402$) (Weinberg and Abramowitz, 2016). That is, as the quality of the system and quality of information improves, the usage/ usage intentions also improve. There were also moderate ($0.3 \leq r < 0.5$), significant ($p\text{-values} < 0.01$) and positive correlations between the level of net system benefits and the following variables: the level of user satisfaction (0.421) and usage/usage intentions ($r=0.465$) (Weinberg and Abramowitz, 2016). That is, the more the level of user satisfaction and usage/usage intentions, the more the net system benefits. There was a moderate ($0.3 \leq r < 0.5$), significant ($p\text{-value} < 0.01$) and positive correlation between the level of user satisfaction and usage/usage intentions ($r=0.398$) (Weinberg and Abramowitz, 2016). That is, the more the level of user satisfaction, the more the usage/usage intentions.

Table 4.5: Analysis of hypothesis one (H₁)

H1	Estimate	Std.Err	z-value	P(> z)
H1.1	0.511	0.053	9.624	0.000
H1.2	0.605	0.048	12.471	0.000
H1.3	0.629	0.051	12.426	0.000
H1.4	0.637	0.051	12.578	0.000
H1.5	0.676	0.050	13.513	0.000
H1.6	0.616	0.056	11.021	0.000
H1.7	0.522	0.057	9.151	0.000
H1.8	0.515	0.056	9.225	0.000
H1.9	0.512	0.058	8.814	0.000
H1.10	0.538	0.064	8.463	0.000

Table 4.5 shows the extent of the validity of the constructs of the questionnaire. The general concept of validity was traditionally defined as the degree to which a test measures what it claims, or purports to be measuring (Brown, 1996). It is demonstrated practically that a test is actually measuring what it claims to measure as

shown by p-values. In this case, all the p-values in Tables 4.5 - 4.10 were below 0.05 in all constructs, thus validating the model as a final product of the study.

Table 4.6: Analysis of hypothesis two (H₂)

H2	Estimate	Std.Err	z-value	P(> z)
H2.1	0.395	0.045	8.707	0.000
H2.2	0.468	0.046	10.224	0.000
H2.3	0.419	0.046	9.062	0.000
H2.4	0.452	0.046	9.842	0.000
H2.5	0.446	0.051	8.755	0.000
H2.6	0.501	0.051	9.902	0.000
H2.7	0.467	0.051	9.204	0.000
H2.8	0.564	0.051	11.026	0.000
H2.9	0.571	0.053	10.768	0.000
H2.10	0.621	0.090	6.876	0.000

Table 4.6 like 4.5 above, shows values as depicting the extent of the validity of the constructs. All the p-values were below 0.05 and validated the final model. In hypothesis two as shown in Table 4.6, all p-values were smaller than 0.05, indicating a strong evidence against the null hypothesis. Thus, all the null hypotheses were rejected. Therefore, the quality of the information system is not poor.

Table 4.7: Analysis of hypothesis three (H₃)

H3	Estimate	Std.Err	z-value	P(> z)
H3.1	0.482	0.066	7.276	0.000
H3.2	0.655	0.058	11.377	0.000
H3.3	0.643	0.053	12.049	0.000
H3.4	0.429	0.057	7.481	0.000
H3.5	0.195	0.069	2.849	0.004
H3.6	0.328	0.063	5.204	0.000
H3.7	0.173	0.066	2.603	0.009
H3.8	0.196	0.065	3.026	0.002
H3.9	0.199	0.065	3.059	0.002
H3.10	0.209	0.064	3.286	0.001

Table 4.7 shows the values as depicting the extent of the validity of the constructs. Ten questions were asked and all the p-values were below 0.05 and validating the final model. The Table shows that the instrument used measured what it was intended to measure, thus the reason why the p-values were below 0.05. The margin of error was estimated at 5% in the Table and this was applicable to all the ten questions of hypothesis 3.

Table 4.8: Analysis of hypothesis four (H₄)

H4	Estimate	Std.Err	z-value	P(> z)
H4.1	0.426	0.05	8.458	0.000
H4.2	0.636	0.049	12.99	0.000
H4.3	0.573	0.049	11.661	0.000
H4.4	0.629	0.055	11.358	0.000
H4.5	0.675	0.055	12.248	0.000
H4.6	0.562	0.05	11.185	0.000
H4.7	0.591	0.052	11.32	0.000
H4.9	0.706	0.056	12.613	0.000
H4.10	0.778	0.057	13.535	0.000

Hypothesis four stated that the level of user satisfaction is low. All the p-values were below 0.05, thus implying that the instrument used measured what it was supposed to measure. Thus, the null hypothesis was rejected and the alternative hypothesis accepted. On rejecting the null hypothesis, it can be safely stated that the level of user satisfaction is high.

Table 4.9: Analysis of hypothesis five (H₅)

H5	Estimate	Std.Err	z-value	P(> z)
H5.1	0.417	0.055	7.53	0.000
H5.2	0.548	0.052	10.534	0.000
H5.3	0.633	0.051	12.47	0.000
H5.4	0.682	0.051	13.422	0.000
H5.5	0.678	0.058	11.743	0.000
H5.7	0.654	0.057	11.531	0.000
H5.8	0.604	0.061	9.956	0.000

Hypothesis 6 stated that the usage and usage intentions are low. Table 4.9 shows that the p-values were all below 0.05, thus the null hypothesis was rejected. Therefore, the usage and usage intentions were high.

Table 4.10: Analysis of hypothesis six (H₆)

H6	Estimate	Std.Err	z-value	P(> z)
H6.1	0.386	0.041	09.458	0.000
H6.2	0.496	0.045	11.063	0.000
H6.3	0.542	0.046	11.696	0.000
H6.4	0.620	0.047	13.107	0.000
H6.5	0.606	0.051	11.807	0.000
H6.6	0.683	0.049	13.800	0.000
H6.7	0.546	0.046	11.769	0.000
H6.8	0.546	0.047	11.631	0.000
H6.9	0.554	0.055	10.008	0.000
H6.10	0.566	0.063	09.033	0.000

The validity test shows that each of the items were loading significantly (p -values < 0.05) onto their respective constructs (H1-H6). Hence, the constructs of the SEM model are valid. The measuring instrument produced reliable and valid results. The questionnaire was found to be reliable based on Cronbach's Alpha. The validity of the constructs of the questionnaire was confirmed using Confirmatory Factor Analysis. Subsequent to the reliability and validity tests, clustered bar charts were used to summarise responses from participants to test each hypothesis. The findings with regard to the hypotheses are as follows:-

4.8 How does the study measure up against Structural Equation Modeling?

The Comparative Fit Index (CFI) was less than the lower benchmark of 0.9 as recommended by Abdullah *et al.* (2016), an indication that the fit index model does not fit the data well. On the contrary, the Tucker-Lewis Index (TLI) was very close to the benchmark of 0.8, Root Mean Square Error of Approximation (RMSEA) was less than 0.1 (Jayasinghe *et al.*, 2015), and the Standardised Root Mean Square Residual (SRMR) was less than 0.1 (Barolli *et al.*, 2017), therefore, three out of four of the fit indices indicated that the model fits the data well. As such, it is concluded that the structural model fits the data well. The following results confirm the validity of each construct.

4.9 Responses per construct (itemised)

4.9.1 Quality of information

I derive satisfaction from using computers for my work because of the following reasons:

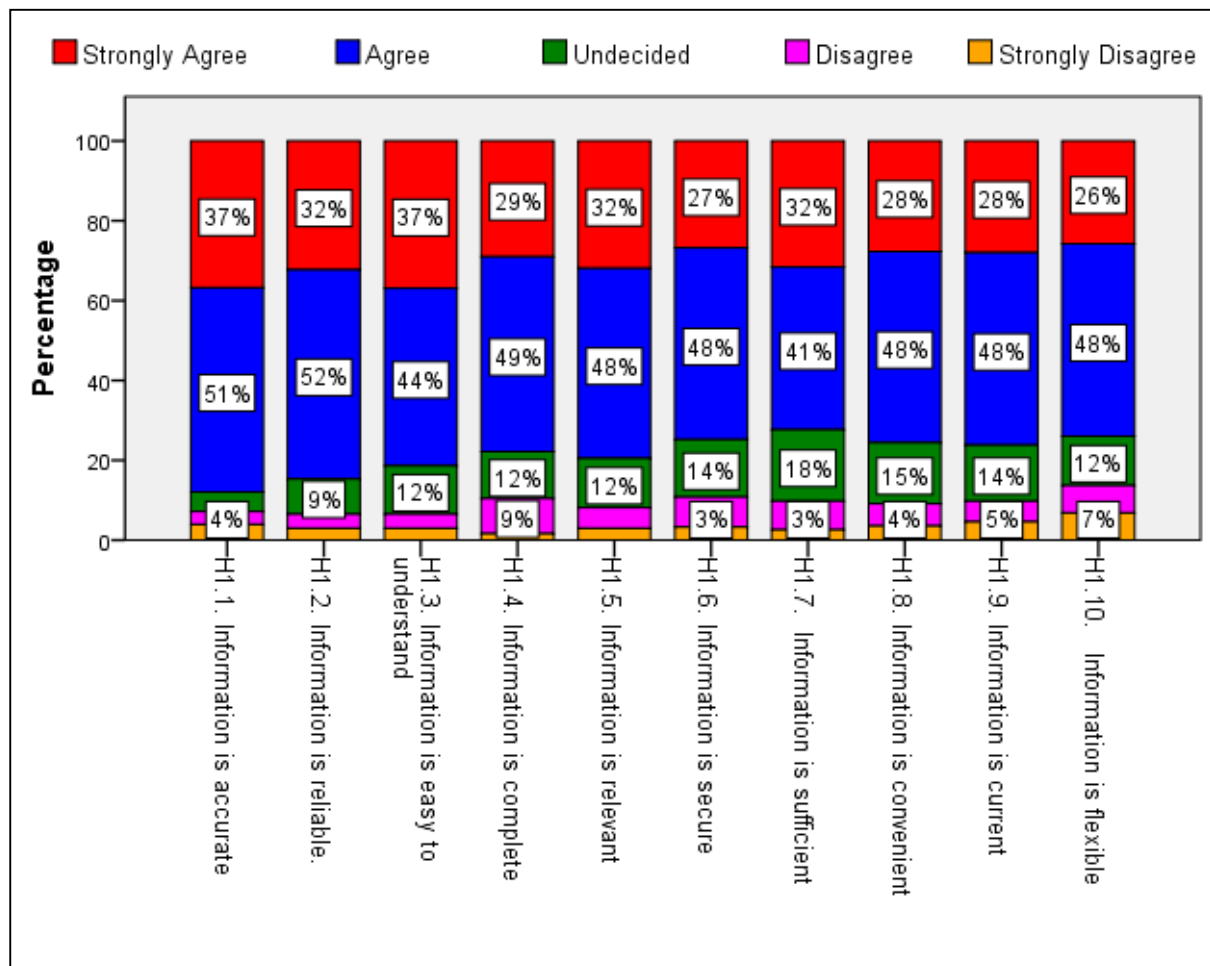


Figure 4.2: Itemised responses per construct A

The results in Figure 4.2 show that majority of respondents were in agreement (agree to strongly agree) with the measures of the quality of information. Constructs used to measure quality of information were accuracy of information, reliability of information, ease of understanding, completeness of information, relevance of information, the security of information, sufficiency of the information, convenience of the information, currency of the information and flexibility of the information.

It can, therefore, be safely concluded that quality of information was good because more than 50% of respondents indicated it was accurate, reliable, understandable, relevant, complete, secure, sufficient, convenient, current and flexible. The quality of information is very important in organisations (Lee *et al.*, 2002). Furthermore, Lee *et al.* (2002) emphasise that the quality of information (IQ) has become a major concern for many organisations and has again become very active in Management Information Systems (MIS) research. Thus, if quality of information is important, it can, therefore, be stated that when it appears as good as found in this study, then this should augur well for the Department of Education.

4.9.2 The quality of the information system

The quality of the information system meets the following criteria:

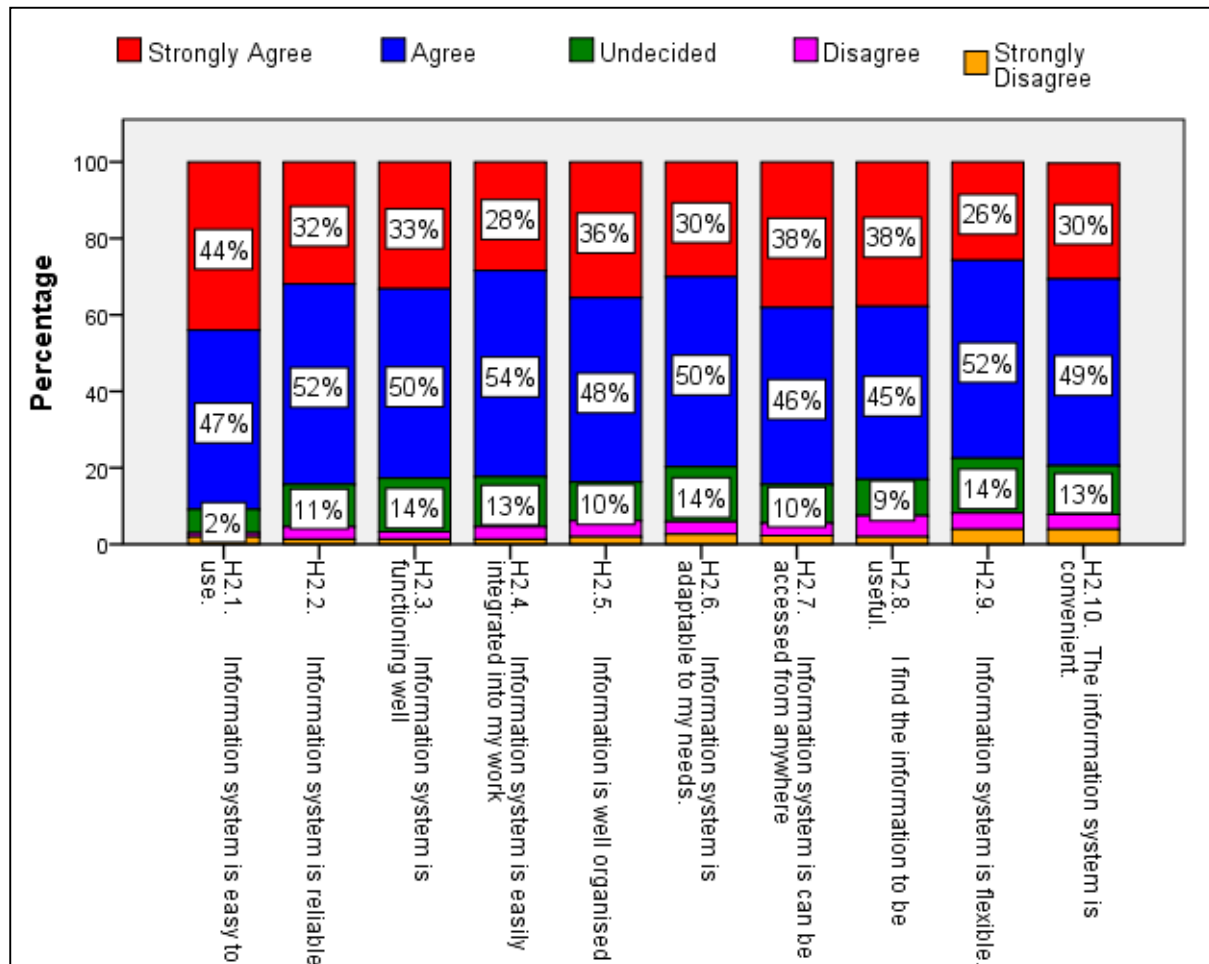


Figure 4.3: Itemised responses per construct

Quality of system refers to the ideal features of a system outputs (Mamary *et al.*, 2014)). The desirable characteristics are listed as measurements of quality in the questionnaire such as ease of use, reliability, well-functioning, ease of integration, organisation of the system, adaptability, ease of access, usefulness of the information, flexibility of the system and convenience. The results show that majority of the respondents were in agreement (agree to strongly agree) with the measures of the quality of information system.

Therefore, with all ten measurement items supported, it can be concluded that the quality of the system was good. Over 70% of participants believed the system was easy to use, reliable, functioning well, well integrated into their work, well organised, adaptable, accessible, useful, flexible and convenient. According to Al-Mamary *et al.* (2014), the type of information systems that employs modern technologies has the ability to present users of ICT with information that is easy to understand, thus making it possible for them to use it more effectively and enhance performance, which ultimately translates into high quality information. Since respondents indicated that the information system was good, it can be deduced that organisational performance is enhanced by good quality information systems. Mamary *et al.* (2014) argue that there is, no doubt, that when an information systems is good, it will produce information that is good and such information will ultimately impact the whole organisation.

4.9.3 The quality of service

I am happy with the service we get from technicians because:

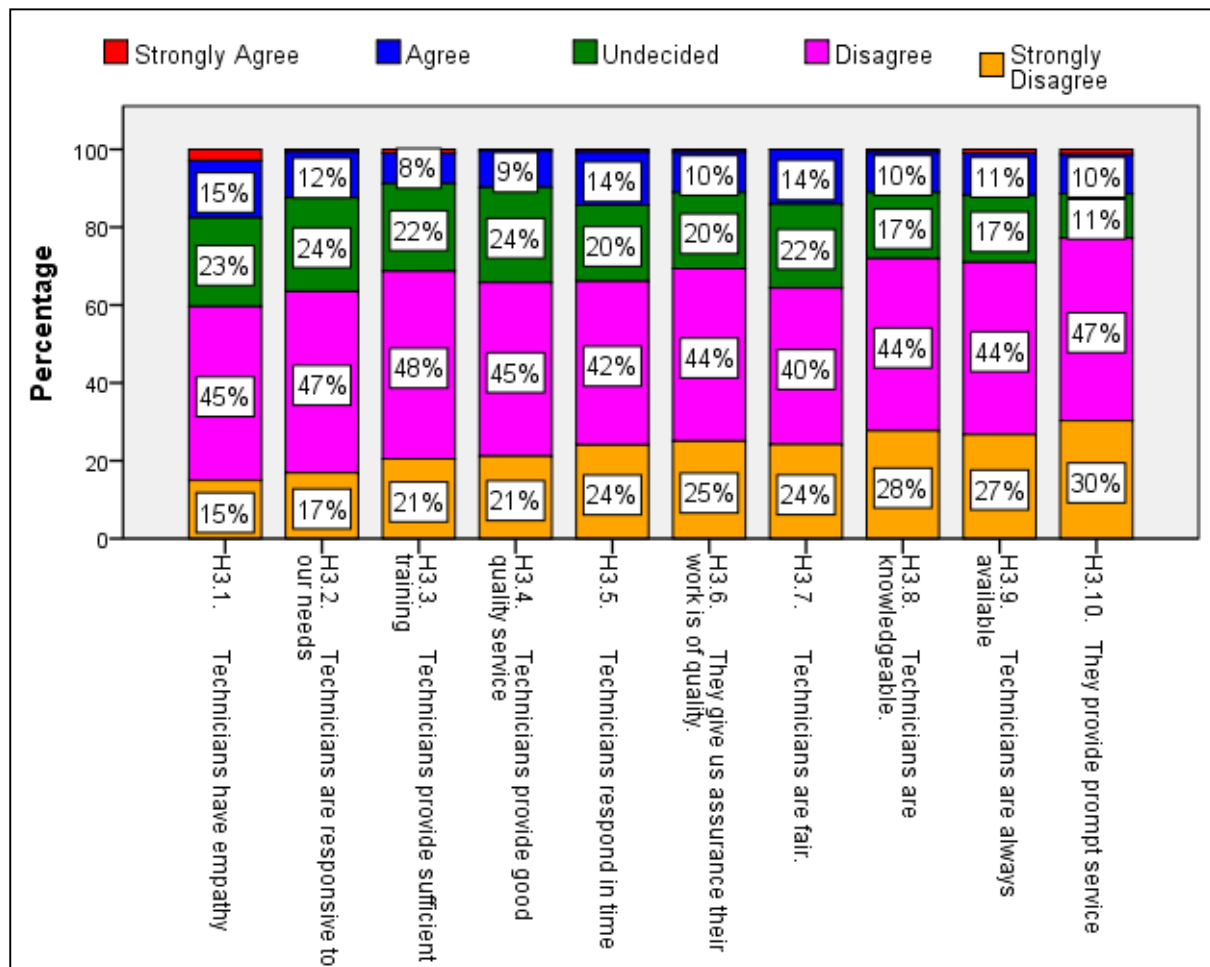


Figure 4.4: Itemised responses per construct

Quality of service refers to the support employees receive from the technical division of a firm (Bharati *et al.*, 2003:1). Bharati *et al.* (2003) further stress that technical support is imperative to users and customers and the whole organisational performance. According to Parasuraman *et al.* (1985), the quality of service is determined by comparing what a consumer believes should be offered and what a service provider provides. It is a measure of how well the service level delivered matches customer expectations, and delivering quality service means conforming to customer expectations on a consistent basis (Lewis and Booms, 1983). In this case, users of the information systems, accordingly compared the service as provided by the Department's technical division with their own expectations. However, their

expectations were not met with regard to the quality of the service people receive from the Information Technology Division. The results show that majority of respondents were not in disagreement (disagree to strongly disagree) with the measures of the quality of the service. The following measures were used: empathy; responsiveness to people's needs; training of personnel; timeous response of technicians; quality of work; fairness; technician's knowledge; availability of technicians; and promptness of service.

None of the constructs measuring quality of service was supported and, therefore, quality of service remains an area of need for the Department of Education in the Province. More than 60% of participants were not happy with the quality of service received from technicians. They maintained technicians lacked empathy, were not responsive to their needs, did not provide sufficient training, did not provide good quality service, did not respond in time, did not provide quality assurance of their service, were not fair, reported late, had limited knowledge, were not always available and did not deliver prompt service. This, therefore, means that the quality of service in the Department of Education is poor.

4.9.4 The level of user satisfaction

As a user of the information system, I am satisfied because:

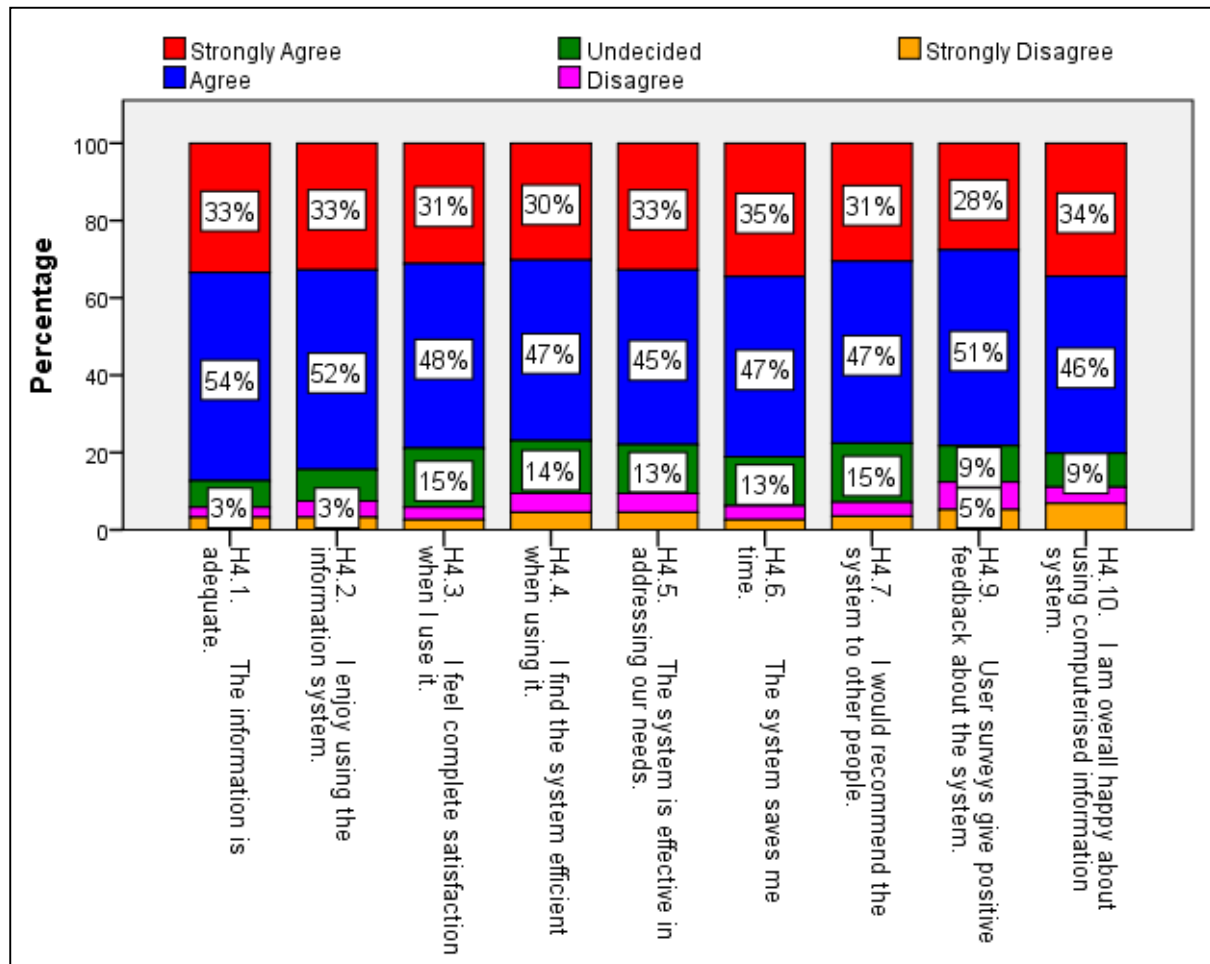


Figure 4.5: Itemised responses per construct D

The results show that majority of respondents were in agreement (agree to strongly agree) with the measures of the level of user satisfaction. User satisfaction is another construct of the ISSM model. Elements used to measure user satisfaction were adequacy, enjoyability of the system, feeling of satisfaction when using the system, efficiency, effectiveness in addressing needs, time saving, whether users would recommend it to other people, feedback from user surveys and overall happiness in using the system.

With regard to measuring **user satisfaction**, the results in Figure 4.5 show that majority of respondents supported the view that the level of user satisfaction was high.

4.9.5 Usage and usage intentions of the system

As a system user, I am satisfied that we have fully incorporated ICT in our work because:

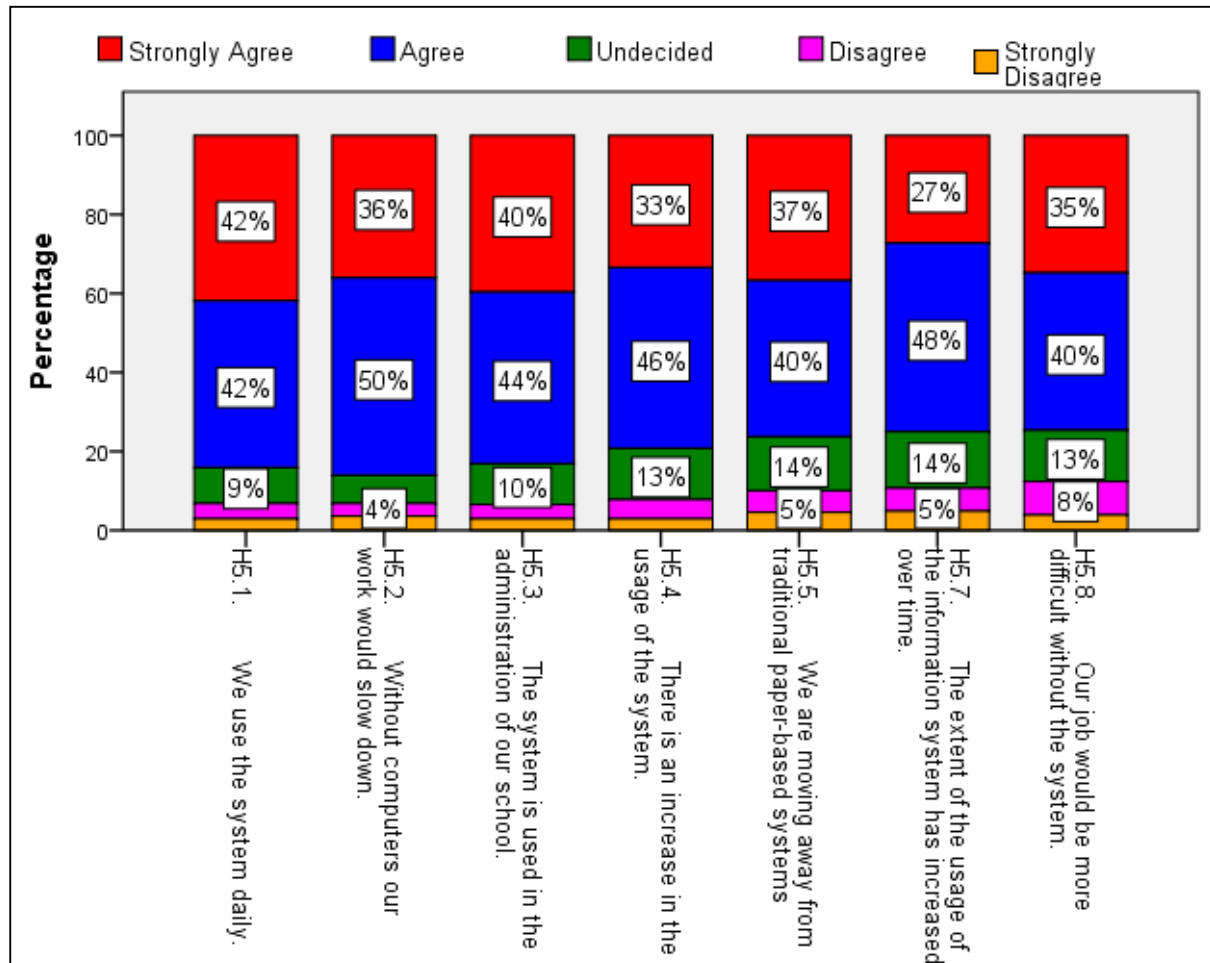


Figure 4.6: Itemised Responses per Construct E

The results in Figure 4.7 show that majority of respondents were in agreement (agree to strongly agree) with the measures of the usage and usage intentions of the system. Variables used to measure usage and usage intentions were as follows: daily usage, whether or not computers would speed up or slow down work; use and non-use of the system; increase or decrease in use; are schools moving away from the traditional paper-based administration; increase or decrease in use over time; and whether jobs would be more difficult without the system. Final usage and usage intentions were

higher than without an information system, an indication that usage and usage intentions were good.

4.9.6 The Information System's Benefit to Schools.

Computers have improved our general administration because:

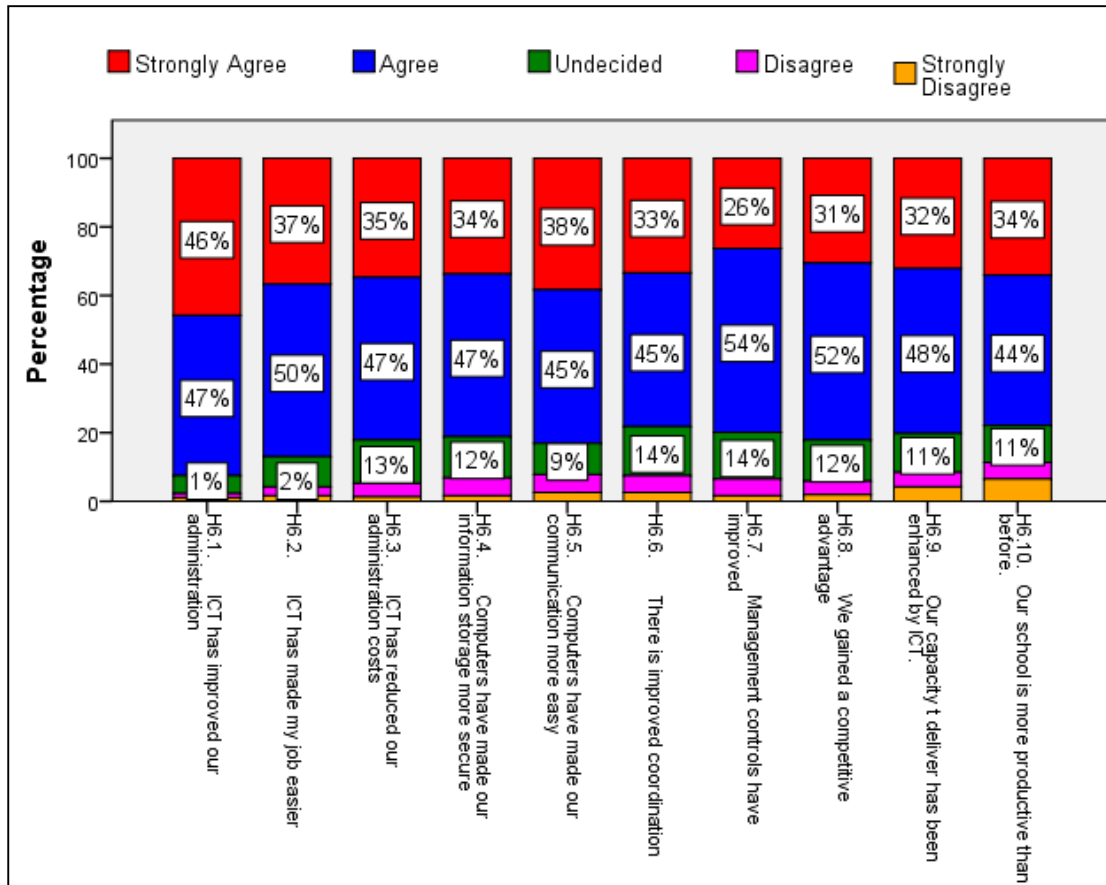


Figure 4.7: Itemised responses per construct F

The results show that majority of respondents were in agreement (agree to strongly agree) that the information system has benefitted schools adequately. The last item of measurement was net system benefits. The question sought to establish if the information system has benefitted schools. Items employed in measuring the ISSM model were as follows: administrative improvements; ICT making jobs easier; reduction in administrative costs; easing of information storage; improvement of communication; improvement in coordination; improved management controls; gaining of a competitive advantage; enhanced capacity to deliver; and productivity.

Thus, with regard to ISSM, the net system benefits yielded a positive correlation with other constructs, with the exception of quality of service.

4.10 Reliability test for the variables in the quantitative theme

Table 4.11: Item - total statistics

Item - total statistics				
	Scale mean if item deleted	Scale variance if item deleted	Corrected item - total correlation	Cronbach's Alpha if item deleted
Quality of information	11.9837	4.428	.536	.678
Quality of system	12.1010	4.529	.610	.659
Quality service	10.2280	6.105	.028	.798
User satisfaction	12.0228	4.473	.547	.674
Usage and usage intentions	11.9902	4.526	.537	.678
Net system benefits	12.1140	4.395	.576	.665

Table 4.11 shows that if the item “quality of service” is excluded from the analysis, Cronbach’s Alpha will increase to 0.798 (from 0.735) and its corresponding Corrected Item - Total Correlation was also relatively low (0.028). To confirm this, the validity of the paths involving the “quality of service” was tested next.

Table 4.12: Path - List

Path List							
Path			Parameter	Estimate	Standard Error	t Value	Pr > t
Quality of services	==>	User Satisfaction	Parm 7	0.05362	0.06185	0.8670	0.3860
Quality of service	==>	Usage and usage intentions	Parm 8	-0.00700	0.06222	-0.1126	0.9104

All the paths involving the item “quality of service” were insignificant (p-values > 0.05), hence this item was not included in the final model as it jeopardises reliability. Table 4.12 shows that exclusion of quality of service from the model that depicts the relationship between various constructs was insignificant since the p-value was greater than 0.05. It also shows the extent of the relationship between quality of service and user satisfaction as well as that between quality of service and usage and usage intentions.

Table 4.13: Fit summary

Fit summary	
Root mean square residual (RMR)	0.0498
Goodness of fit index (GFI)	0.9033
Bentler comparative fit index	0.8081
Bentler-Bonett NFI	0.8056

Results of the fit indices show that RMR was less than the benchmark of 0.5 and GFI greater than the benchmark or 0.9, hence indicating that the structural model fits the data well (Hooper *et al.*, 2008). Although CFI and NFI were slightly lower than the recommended benchmark of 0.9 (Hooper *et al.*, 2009), these indices were very close to this benchmark with a difference of 0.0919 and 0.0944 respectively. As such, it is concluded that CFI and NFI somewhat, support the findings of RMR and GFI, hence the structural model generally fits the data well.

Table 4.14: Standardised results for Path List

Standardised results for Path List							
Path			Parameter	Estimate	Standard Error	t Value	Pr > t
Quality of information	===>	User satisfaction	Parm1	0.26310	0.05979	4.4002	<.0001
Quality of system	===>	User satisfaction	Parm2	0.25996	0.05983	4.3452	<.0001
Quality of information	===>	Usage and usage intentions	Parm3	0.20724	0.06136	3.3774	0.0007
Quality of system	===>	Usage and usage intentions	Parm4	0.27985	0.06059	4.6185	<.0001
User satisfaction	===>	Net system benefits	Parm5	0.24648	0.04974	4.9552	<.0001
Usage and usage intentions	===>	Net system benefits	Parm6	0.36891	0.04780	7.7179	<.0001

All the variables in the model were tested and Table 4.14 shows the results of the Path List test. The results show that all the paths were significant (p-values < 0.05). As

such, the model was valid. This, therefore, validates the model against the required standard since all the p values were below 0.05.

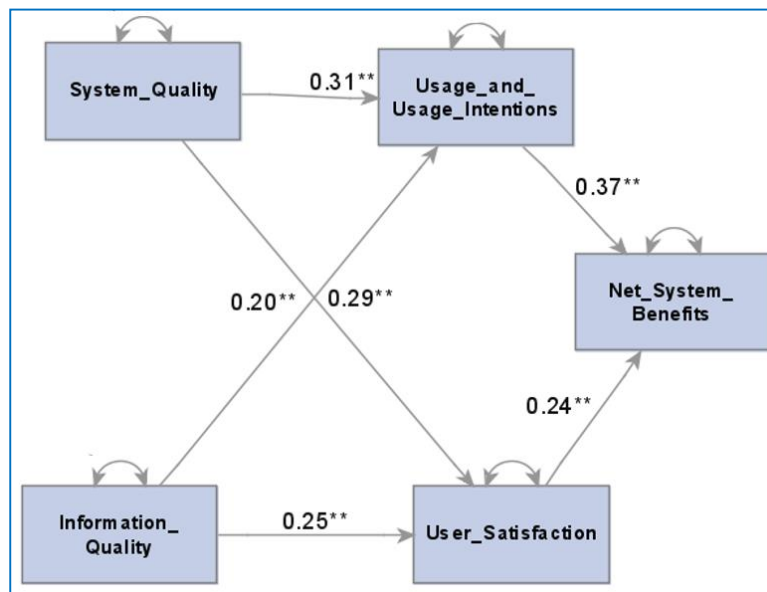


Figure 4.8: Relationships between the variables of information sharing practices

4.11 Interpretation of Figure 4.8

A model is a product of a theory or test. Hasan and Banna (2010) argue that in information systems research, researchers build new theory from their research findings. Hasan and Banna (2010) further contend that in the field of IS, researchers regularly use existing theories from more established disciplines to interpret or make sense of their data. All the variables of the model were tested individually in a questionnaire. The decimals between constructs reflect the extent of the relationship. They show how each variable or construct influences the other, that is, the higher the decimal, the higher the influence.

The relationship between each of the items in the diagram is described based on correlation coefficients between the variables and the interpretation is guided by the

benchmarks defined by Weinberg and Abramowitz (2016). The quality of the system had a moderate ($0.3 < r^3 \leq 0.5$), positive and significant (p-value < 0.01) influence on usage and usage intentions. Both the quality of the system and the quality of information had weak ($0 < r \leq 0.3$) positive and significant (p-value < 0.01) influence on user satisfaction. The quality of information had a weak ($0 < r \leq 0.3$) positive and significant (p-value < 0.01) influence on usage and usage intentions. Usage and usage intentions had a moderate ($0.3 < r \leq 0.5$), positive and significant (p-value < 0.01) influence on net system benefits. User satisfaction had a weak ($0 < r \leq 0.3$) positive and significant (p-value < 0.01) influence on net system benefits.

4.12 Summary of the qualitative findings

Codes are used in a qualitative enquiry to sum up the essence of responses of participants in an interview (Saldanha, 1987). In this study, codes were used to summarise and cluster together, responses that transmit messages with a particular context. There were six themes as shown in Tables 4.15 to 4.20. Coding is the process of organising and sorting data and helps researchers to summarise and synthesise what is happening in the data (Tips and Tools #18, ND). The questions were dichotomous in that responses could indicate one of the two possibilities. For example, when participants were asked about the availability of machines, their responses could either indicate whether or not they had enough supply. According to Kawulich (2015), there is no prescribed way to carry out the process of analysing qualitative data, thus the themes were re-organised into subsidiary themes and subsidiary themes into codes as per this illustration.

Themes  Subsidiary Themes  Codes

³ r =Correlation Coefficient

4.12.1 Theme One: Computers and information sharing

Table 4.15: Computers and information sharing

COMPUTERS AND INFORMATION SHARING			
Subsidiary-themes →	Availability of computers	Connectivity problems	Condition of computers
Participant 1	Not enough machines	No problems with connectivity	Bad condition
Participant 2	Not enough computers	No network at times	Only the laptop works
Participant 3	We have enough	Schools are no exception to connectivity	They are all functional
Participant 4	Not enough but not worried	Yes and No	Only the laptop works
Participant 5	Not enough	We still have connectivity challenges	If laptop goes, all information is lost
Participant 6	Available but under-utilised	Here and there, we struggle with connectivity	All working
Participant 7	They are used for administration only	Problems of connectivity have been reduced	All working
Participant 8	We have enough for administrative purposes	Connectivity is the problem of government and service provider	All working
Participant 9	Not enough	No connectivity problem because of wi-fi	Good condition

The first question sought to establish the relationship between computers and information sharing within the Department of Education. It was phrased to check if there were enough computers for schools. The second question focused on issues of connectivity while the last one focused on the conditions of computers at schools. The variables used were availability of computers, connectivity and the condition of machines.

Use was made of codes to arrange data. With regard to the first sub-theme “availability of machines”, the researcher used codes to show either shortage or sufficient supply of computers. Majority of respondents indicated that they did not have **enough machines** at school for administrative purposes and for the student population as captured in the following excerpts: P1 : *“I think the government should provide us with enough machines”*; P 3: *“Staff members capture their own marks using computers.”* As summarised in Table 4.15 (column one), five of the participants were not happy with the supply of computers by the government. Presnky (2001) describes the world of ICT in terms of access. The author argues that people with maximum access to ICT are digital natives while those with limited access are digital immigrants, thus people with limited access to ICT are on the wrong side of the digital divide. However, this argument may not necessarily address the issue of the digital divide significantly, since the focus of this study is on information sharing by officials of the Department of Education. The findings of this study reveal that there are enough machines for administration; thus if there are enough machines for administration, it is a positive sign for efficient information sharing practices.

Codes were used to denote challenges of connectivity or the absence thereof. Although many participants hinted at challenges of connectivity, the overall picture is that connectivity has improved over time. For example, Participant 5 indicated as follows: *“The modem supplied by the government does not work”* while Participant 1 maintained *“the wi-fi connections that we use have helped a lot because we do not need physical connections anymore”*. Majority of participants stated that (wireless fidelity) wi-fi connections have eased the problems of connecting to the Internet. Although Dzansi *et al.* (2014) state that rural areas have a challenge in that they lack fixed line telephony, this does not come out as a problem because the advent of wireless connectivity has eased that out. Dzansi *et al.* (2014) further argue that wireless connection does not come cheap, however, the results of this study show that this is no longer a problem as all schools are currently online irrespective of where they are. Thus, in the final analysis, connectivity is no longer an issue.

With regard to the last question, many respondents indicated that their computers were in good condition. Almost all participants indicated that their computers were in good working condition as captured in the following excerpt: Participant 1: *“The*

machines are old, some are working, some are not but we make do with what we have.” Participant 5 complained about the danger of losing the only laptop he/she had because he/she ran the risk of losing all the information as captured in the following excerpt: *“We only have one laptop, what happens if it is lost? We will lose all the information.* Thus, it can be concluded that the relationship between computers and information sharing, based on variables used, is a positive one and, therefore, computers are not seen as an impediment to information diffusion within the Department of Education, North West Province, South Africa.

Although Dzansi *et al.* (2014:342) point out that many, if not all urban schools in South Africa are fully equipped with ICT equipment, the same cannot not be said of rural schools. The findings are in agreement with the views of other researchers who found machines were used for administrative purposes only, and not sufficient to be rolled out to the student population. This is so because participants in the study were relatively rural as they were based in one of South Africa’s rural provinces. According to de Vries and Reid (2003: 789), rural in the South African context, refers to places outside of major urban centres, (metropolises, large cities and provincial capitals). This study was conducted in the North West Province, which can be classified as rural, according to the definition above. This argument is backed by Pelgram (2000), who attests that infrastructure was a major impediment to ICT adoption, in a worldwide study.

Thus, with enough machines, without problems of connectivity and with computers that are generally in working condition, it can be concluded that computers are not an impediment to effective information sharing. There is, therefore, a positive relationship between tools and the object or computers and information sharing in accordance with Engestrom’s Activity Theory. As Kaptelinin *et al.* (1995) put it, tools shape the manner in which people interact with reality. It can, therefore, be concluded that with a positive correlation between tools and the object, indeed ICT within the Department of Education has brought about an improvement in the area of information sharing.

4.12.2 Theme two: Personnel and information sharing

Table 4.16: Personnel and information sharing

PERSONNEL AND INFORMATION SHARING			
Subsidiary themes →	Attitudes towards ICT	Provision of training	ICT skills
Participant 1	Only young teachers use computers	No training	Insufficient skills
Participant 2	Attitude is changing slowly	No training at all	Teachers are less skilled
Participant 3	Attitudes are changing	No training to teaching staff	Generally, skills are good
Participant 4	Attitude is good	No training	Teachers are less skilled
Participant 5	People do not want to learn	No training	Low skills level
Participant 6	Attitudes are right	No training	Some are not skilled
Participant 7	Attitudes are acceptable	No training	All offices have computers
Participant 8	People are beginning to like computers	Never trained	Many have good skills
Participant 9	We will arrive	No training	Office personnel are better skilled

The next question in the qualitative section of the study focused on the relationship between personnel and information sharing. The researcher sought to check if staff in the Department were not impeding the flow of information. Variables used were people's attitudes towards ICT, provision of training and people's ICT skills. Majority of respondents felt that **attitudes** were changing for the better and people were more receptive to ICT initiatives. Laaria (2013: 1) states that when the attitude of a school manager towards ICT is not positive, this would affect the school's adoption of the technology adversely. Since respondents indicated that peoples' attitudes were changing, this could be understood to include those of school managers and a positive result could be expected in the future as captured in the following excerpts: Participant 2 *"The attitude is changing slowly and many people are beginning to adapt to new*

technology.” Participant1 commented about the fact that older teachers do not use computers but only young ones.

Training is commonly known to improve people’s **skills**. With regard to the provision of training, the results show a negative trend in that all of participants felt they had experienced no training at all. For example, Participant 2 maintained *“the department only brought computers and never trained us”*. This gave a negative relationship between training and other constructs of the conceptual framework. According to Tayo *et al.* (2014), the major challenge facing school administrators is their level of skill and knowledge.

The final question in this section addressed the issue of level of **skills**. Half the number of respondents indicated personnel were skilled while the other half maintained they were not. In a worldwide study by Pelgram (2000), the second most important impediment to ICT adoption in schools was the level of skills of teachers. The study revealed that when the skills of educators are low, adoption becomes low and when skills are high, the level of adoption also improves. Thus, the findings are in agreement with this argument as it emerged that the skills of teachers were improving for the better, thus responding to the relatively low level of adoption. Adoption is lower because machines are not enough for the student population in schools.

With limited skills and absence of training, plus a gradually changing attitudes from bad to good, it can be concluded that the Department of Education has not done enough to address this gap. Within the context of the theory under scrutiny, which classifies personnel and information sharing under the headings subject (personnel) and object (efficient information sharing), it can, therefore, be concluded that personnel with limited levels of skills, attitudes that are still changing and with no training can only impede desirable computerised communication between schools and districts. This finally shows a negative relation between personnel and information sharing. Deursen and van Dijk argue that with the ever-increasing information on the internet and the fact that many people depend on information, their internet skills are very important in today’s world. It can again be deduced that when people lag behind in ICT skills, they help widen the digital divide. It can, therefore, be concluded that

personnel are an impediment to information sharing with respect to skills, training and attitudes.

4.12.3 Theme three: Policies and information sharing

Table 4.17: Policies and information sharing

POLICIES AND INFORMATION SHARING		
Subsidiary themes →	Availability of ICT policy	Availability of ICT budget
Participant 1	No ICT policy	No ICT budget
Participant 2	ICT policy is available	No budget
Participant 3	Policy encourages access	We are trying
Participant 4	Our policy encourages access to ICT	We are trying
Participant 5	No policy	Budget for small items only
Participant 6	No policy	No budget for ICT
Participant 7	Policy is under development	No budget
Participant 8	We encourage staff to use ICT	No budget
Participant 9	Schools do not have ICT policy	No budget

The third set of questions focused on ICT policies. The questions were asked to gauge if policies are or are not impeding information sharing. Only two concepts were used as follows: availability of ICT policies; and availability of budget. Tusubira and Mulira (2004: 1) state that it is commonly accepted that when organisations integrate ICT in their functions, they ultimately improve their efficiency, cut costs and become more competitive. The researcher, therefore, sought to understand if there were budgets for ICT and if schools had ICT policies. It was found that in most cases, there were no ICT budgets in schools and no ICT policies in place. Dzansi *et al.* (2004:14) argue that the installation of ICT is not cheap and installing it in poor rural areas can be even more expensive due to transportation as well as other logistical costs. This could also be due to lack of budget in rural schools of the North West Province. How does this

scenario impact on information sharing practices? It be argued that the absence of a budget reflects the absence of funds to take care of ICT needs.

This scenario provided a negative relationship between policies and ICT budgets on the one hand and information sharing on the other. With regard to the Activity Theory framework, policies and information sharing would be represented by rules and object where rules in the theory are represented by policies and the object in the theory by information sharing. Therefore, if policies and budgets are non-existent, then this poses a challenge since according to the theory, rules are supposed to enhance the achievement of goals, which within the context of this study, and are proper information sharing systems of administration. This is so because, as an element of the theory, rules affect the outcome and exist in reality. Participant 1 maintained as follows: *“We do not have an ICT policy but one day, we will have it and we will encourage everybody to embrace it.”* With regard to the issue of ICT budget, participants maintained as follows: *“We only budget for ink, minor repairs and cartridges.”* This scenario provided an environment that was **not conducive** to efficient information sharing.

4.12.4 Theme four: Department of Education and information sharing

Table 4.18: Department of Education and information sharing

DEPARTMENT OF EDUCATION AND INFORMATION SHARING			
Subsidiary-themes →	Exposure to ICT	Level of education	Poverty
Participant 1	Teachers have less exposure to ICT	No relationship between ICT growth and level of education	It depends on the technology used
Participant 2	There are interesting developments like data-driven districts	There is no connection between ICT growth and levels of education	Poverty plays no role in ICT
Participant 3	People are well-exposed to ICT	Levels of education do not affect ICT growth	Poverty affects every aspect of life, thus ICT is no exception
Participant 4	There is a lot of exposure	Educated people use more of ICT than otherwise	Everybody uses ICT, rich or poor
Participant 5	Teachers are less exposed to ICT	Everybody is free to use ICT	Poor communities do not use ICT
Participant 6	There is exposure to everybody	Education plays no role here	Children only use ICT at school
Participant 7	Exposure is there for everybody	Everyone can use a computer	People have computers at home
Participant 8	Everybody is exposed to ICT	Growth in level of education should inspire ICT usage	Illiteracy discourages ICT growth
Participant 9	Exposure and usage are minimal	Poverty has no effect	Poverty does not affect ICT diffusion because even poor communities use cellphones

The forth question of the questionnaire sought to establish the picture around information sharing, using subsidiary themes of exposure to ICT, levels of education and poverty. With regard to exposure, majority of participants maintained that people are more exposed to ICT than before. Out of nine participants, five indicated that generally, the population is sufficiently exposed to ICT. Participant 2 indicated as follows: *“There are interesting developments, for example, data-driven districts is one innovation in mind.”* Participant 4 indicated as follows: *“Yes, there is a lot of exposure because now, circulars are sent through WhatsApp.”* The literature on the digital divide has moved beyond a recognition of limited access to computers to include even skills needed to navigate the Internet (Deursen and van Dijk, 2010:1). The findings revealed that the digital divide in the older context of a reduced access to computers, has had an improvement in the North West Department of Education. Most participants maintained there was increased access to ICT in schools.

With regard to the level of education and ICT, the general outcome was that education cannot be a factor because even people who had never been to school, were using technologies such as WhatsApp. Participants 1, 2, 3, 5, 6 and 9 maintained there was no connection between literacy level and usage of ICT as only participants indicated level of literacy affected usage of ICT negatively. Thus, participants felt that everybody could use technology irrespective of their level of education. This is, however, in direct contrast with the general view that the relationship between literacy and ICT is a positive one.

Sikhakhane (2005) posits that poorer communities find it difficult to choose a computer and leave food. The last item sought to test diffusion of ICT and poverty. Participants indicated that in the general sense, poverty plays a role in the diffusion of ICT but it cannot be concluded that poor communities do not use ICT. Sayel (2012) also argues that the digital divide is wider in third world countries compared to those in the first world. Participant 3 maintained that *“poverty affects every aspect of a poor person’s life and I think ICT is no exception”*. Thus, the participant made it clear that there was no way poverty could not impact negatively on poor people’s access to ICT resources. Participants 4, 5, 6, 7 and 8 held the same view. In the final analysis, although poverty proved to impede access to ICT, literacy and exposure to ICT did not emerge as

impediments to the growth of ICT. It can, therefore, be concluded that the Department of Education is receptive to ICT because two out of three constructs were supported.

4.12.5 Theme five: Employment position and information sharing

Table 4.19: Employment status and information sharing

EMPLOYMENT POSITION VS INFORMATION SHARING		
Subsidiary-themes →	Using power to block others from access to ICT	Leadership role in usage of ICT
Participant 1	There is no connection between status and ICT	We encourage all to use ICT
Participant 2	Position has no influence	Leaders should take a leading role
Participant 3	No, positions are irrelevant	Leaders should lead, even ICT processes
Participant 4	No relationship between status and ICT	Leaders should set a good example
Participant 5	No	We are trying
Participant 6	No, position is irrelevant	Leaders are not involved
Participant 7	Positions are not used to block access to ICT	We encourage others to use ICT
Participant 8	No, I do not think positions are used to bar people from ICT	I motivate staff to use ICT
Participant 9	No	We are involved

The fifth set of questions focused on the relationship between power and information sharing. The questions sought to find out if people were using their positions to bar others from accessing ICT resources and the role leadership in the promotion of ICT. Most, if not all respondents maintained there was **no connection between lack of access to ICT and leadership** positions of people in schools. In other words, participants maintained managers did not use their seniority to block junior officials from accessing computers as captured in the following excerpts: Participant 4 *“I am unable to associate status with access to ICT within a school context, there is no way,*

especially in our school. I can claim that only certain people of a particular status can gain access to the machines, not everybody is allowed access.” This view was held by all participants.

The second question focused on the role of leadership in ICT. Only one participant felt leaders were not doing enough to address challenges related to ICT as follows: “Our leaders never discuss ICT in meetings and that is why adoption is so slow.” Some interviewees maintained leadership was doing well as captured in the following excerpt: *“As a leader, I am constantly encouraging my staff to use ICT in their teaching”* (Participant). Majority of participants maintained they viewed leaders as ICT enablers. It can, therefore, be concluded that the structure of organograms in schools **encourage** electronic sharing of information.

4.12.6 Theme six: Overall conception of an ideal information sharing platform

Table 4.20: Participants’ conception of an effective information sharing system

Theme 6 →	OVERALL CONCEPTION OF A GOOD INFORMATION SHARING PLATFORM
Participant 1	One that is accessible to all
Participant 2	WhatsApp is one example
Participant 3	Email, SMS and WhatsApp
Participant 4	One that is accessible to all
Participant 5	The current one that we have is fine
Participant 6	One that is electronic
Participant 7	All forms of communication are important
Participant 8	One that uses every available method of communication
Participant 9	Sms, WhatsApp and Email

The last question focused on participants’ conception of an ideal information systems platform. This question elicited varying responses from participants. Majority

maintained the current information system they had was fine, others said they preferred one that was accessible to all while some opted for an electronic system. The view of participants varied between two ideas of an electronic system and one that was accessible to all. Five participants said an ideal communication system was an electronic one while four maintained the best one was the one that serves all people as captured in the following excerpt: *“I do not know much about information sharing platforms but I can see a movement from paper-based to electronic communication and I think electronic is better than paper”* (participant 6).

4.13 Comparison with earlier studies

The ISSM model is limited in that it ignores the context in which information system is taking place (Cauter *et al.*, 2017), thus necessitating the use of AT in the research in order to make up for the missing context. The findings of Cauter *et al.* (2017) revealed that ISSM is a useful analytic tool for public sector organisations as well. The use of theory, especially the Activity Theory in this study, was informed by the fact that the theory was approved for research in ICT and has been used by other researchers. Hashim and Jones (2007) found that the Activity Theory is geared towards a practice which embodies a qualitative approach that offers a different lens for analysing processes and their outcomes.

Lim and Hang (2003) found that there is no tool that is good or bad in itself; and the effectiveness thereof is a result of, and contributes to the whole configuration of events, activities, contents and interpersonal processes taking place in the context where it is used. This means that the environment in which an ICT tool finds themselves in, has an effect on the tool and may affect the organisation. In other words, the good or bad nature of the tool cannot be isolated from the cultural tenets of an organisation. Within the context of this context, it cannot be conclusive to argue that ICT alone is an impediment to technology that is not attractive to educators without analysing the culture of the community. In spite of this, it was found that ICT is not an impediment to information sharing.

With regard to educators and information sharing, Prestridge (2012) found that the more competent educators were, the more confident they were in using it in their daily

teaching activities. Furthermore, BuabenG-Andoh (2012) states that challenges with regard to adoption of technology by educators can be categorised into three areas as follows: being personal; institutional; and technological. Becta (2004) advises that it is important to understand these barriers in order to establish a remedy for educators.

4.14 Summary of chapter

This chapter has provided a summary of the findings from the qualitative and quantitative approaches. The conceptual framework that informed the study was discussed and explained. The strengths and weaknesses of the research instrument, the various statistical tests conducted to test the reliability and validity of data were presented and described. A correlations analysis, including a discussion of the analysis of each hypothesis as well as the actual result for every hypothesis and proposition were provided. The next chapter provides an in-depth discussion of the findings of the study.

CHAPTER 5 - DISCUSSION AND CONCLUSIONS

5.1 Introduction

The previous chapter focused on the findings of the study. This chapter focuses on the discussions and interpretation of the findings. The first part of the chapter provides a brief summary of the findings, followed by a discussion of lessons drawn from the study and finally, recommendations for further research, policy making and practice.

5.2 Summary

The problem statement of the study was that the North West Education Department does not take advantage of the benefits of ICT and still relies on paper-based records. The research questions were as follows: What can be done to enhance the current state of information sharing in NWED? and why does NWDE not take advantage of the obvious benefits of ICT? The literature review revealed that, among others, the diffusion of ICT focuses on management as managers play an important role in the diffusion of ICT. They can either be an impediment or facilitators to such diffusion. Another important factor has to do with the digital divide. This divide is such that first world countries are pacier than their third world counterparts with regard to the adoption of ICT.

5.3 The conceptual framework restated

In the field of IS, researchers use and adapt existing theories to make sense of their data (Hasan and Banna, 2010). The conceptual framework used in this study consisted of Engestrom's Activity Theory (AT) and the Delone and Mclean's (ISSM). The two theories were interpreted within the context of the Department of Education in the North West Province, implying that an ideal information sharing platform would satisfy the requirements of the same conceptual framework. This conceptual framework is such that with ISSM, good quality of information, good quality of system and good quality of service should influence usage and usage intentions as well as user satisfaction and the two should impact on the overall organisational benefits to be ICT-wise. The net system benefits would, in turn, encourage usage and usage intentions as well user satisfaction. Once all these requirements are met, then

information systems could be said to be successful in an organisation. It is for this reason that research questions were constructed within this framework.

The second theory was the Activity Theory. With this theory, also within the context of the Department of Education in the North West Province, an ideal information sharing platform would be one where computers, people, policies, the whole Department and the Departmental organogram, all work towards the attainment of an ideal information sharing platform, which is the final outcome of the Activity Theory.

5.4 The research question restated

The research questions were:

What could be done to enhance information sharing in the Province? The second one was: - Why is the North West Department of Education not leveraging the benefits of ICT? The first question was answered using ISSM while the second one was answered using AT. All the hypotheses and propositions were re-stated in Chapter 4 and discussed against the literature review.

The conceptual framework was designed within the confines of ISSM and AT. Both theories were thoroughly discussed in chapters two, three and four. ISSM is a theory that was designed by Delone and Mclean, which stipulates the ideal conditions under which the information systems can be said to be successful while the Activity Theory was proposed by Engestrom and describes how an activity system functions. These were the two lenses the researcher used to analyse the phenomenon of information sharing in the North West Department of Education.

The following hypotheses were stated: the quality of information is poor; the quality of the information systems is poor; the quality of service is poor; the level of user satisfaction is poor; usage and usage intentions are low; and lastly, the information system has not benefited schools sufficiently. The propositions were: technology is not attractive to educators; personnel are an obstruction to ICT diffusion; policies in education do not enhance information sharing; the general community of the

Department of Education is not receptive to ICT; and lastly, the job descriptions do not encourage an improvement in ICT communication.

5.5 Answers to the research questions

Responses to the research question, in the quantitative section of the study, which sought to answer the question with regard to what can be done to enhance information sharing, analysis of the quality of information, quality of service, usage and usage intentions, user satisfaction and net benefits were such that quality of information, quality of system, user satisfaction, usage and usage intentions were all good, with the exception of quality of service. In the qualitative section, constructs used had to do anything, with the exception of addressing the quality of service by the Department. Thus, the answer to the first research question, as informed by the outcome of the questionnaire, was that computers, data and technicians' output in schools should be of good quality. With regard to the second research question, it was revealed that computers, people, policies and budgets should be in order. Thus, in order to structure a framework for the enhancement of information sharing, the constructs of the framework were made of the major elements as deduced from the outcome of the research questions.

Table 5.1: Major constructs of an information sharing framework

Research question 1	Research question 2
What can be done to enhance information sharing in NWED? (Indicators)	Why is NWED not taking advantage of ICT benefits? (Indicators)
• Quality of system (Computers)	• Tools (Computers)
• Quality of information (Data)	• Subject (People)
• Quality of service (Technical support)	• Rules (Policies)

Table 5.1 shows that deducing from the two theories (ISSM and AT used in the study), the requirements for information sharing were computers, data, technical support, people and policies. The answer to the second research question, which focused the concern that the Department was not taking advantage of the advantages of ICT, is

that machines should be available, working and connected. People skills should be upgraded and schools should use policies and budget for ICT.

The proposed framework

The proposed framework to enhance information sharing is presented in the form of an operation where there are inputs, transformation and output. There are three major input characters in the framework as follows: people; machines; and policies. The interaction between people and machines is controlled by policies.

Table 5.2: A framework to enhance information sharing

	Actor	Issues/Problems	Solutions Set
1	ICT Infrastructure • Desktops • Laptops • Tablets • Phones • Networks	• Ill-equipped ICT laboratories • Unconnected machines • Obsolete machines • No networks • No internet services	• Provide equipment • Connect machines to the internet e.g. Wi-Fi • Provide good quality machines • Avail networks • Provide internet
2	People • Principals • Deputy principals • HoDs • Teachers • Secretaries • Learners	• Untrained personnel • Poor ICT skills • Minimal exposure to ICT • Poor attitudes to ICT	• Train personnel • Expose them sufficiently to ICT • Re-skill under skilled people
3	Policies	• No ICT policies	• Train personnel on policy development. • Develop ICT and implement policies
4	Budgets • ICT Budgets	• No ICT Budgets	• Prepare and make available ICT budgets • Provide training on budgeting
5	Services/technical support	• No empathy • No training • Lack knowledge • Lack fairness • Unavailable • Not prompt • No quality assurance	• Develop a training programme for ICT practitioners and train technicians sufficiently In Human Relations and ICT technical knowledge

5.5.1 ICT infrastructure

ICT infrastructure refers to all ICT equipment in schools and could take the form of desktop computers, laptops, tablets, phones and networks. The following issues were

identified: ICT laboratories are ill-equipped; and machines lay unconnected and many are obsolete. Generally, there is shortage of proper ICT infrastructure and internet connectivity is in short supply. This translates into poor quality of data and poor information sharing. Availability of machine is an important requirement for information sharing. What remains obvious is that no computerised information sharing can take place without the mediation by computers. In the Department of Education, there are few machines to cater for the needs of both learners and teachers. In many instances, it was found that there was an under-supply of computers and schools chose to use machines for administrative purposes only. In other cases, there was only one machine for the whole school and there were concerns that if lost, all school data would be lost. Dzansi *et al.* argue that although significant strides have been made, since democratisation in 1994, it is evident that it will take some time before rural areas of South Africa too will have access to sufficient infrastructure needed to make ICT integration into rural schools much easier.

According to Redman (2018), when the quality of data is poor, it affects the whole process of machine learning. Redman further argues that data must be right, correct, properly labeled and so forth. It emerged from this study that data plays a very important role in information sharing because it affects all other components of the information systems. Data or quality of information, as depicted in the Delone and Mclean model, has an impact of the other three constructs of the model.

5.5.2 Connectivity

Another important component of information system is telecommunications as it connects through cables or Wi-Fi (online Encyclopaedia Britannica). In the Department of Education, it emerged that most of the problems related to connectivity were eliminated by the arrival of wireless networks such as Wi-Fi. Zhang (2007) notes that when connectivity is high, this enables a firm to enjoy the economic benefits associated with that. With the advent of wireless connections, the Department of Education should leverage the benefits of connectivity.

5.5.3 People skills and attitudes

The study was conducted within the Department of Education, North West Province, South Africa. Therefore, the people referred to here are school managers, deputy school managers, heads of departments and secretaries. The principal is a key player with regard to the promotion of ICT within the school. Sadegul (2006) states that when a principal's ICT skills are lacking, he or she would find it difficult to encourage ICT integration in the school. Without reducing the importance of other role players, the principal should be at the forefront of ICT promotion in the school. Mutala (2007) states that generally, there is an acute shortage of ICT skills necessary for driving the economy. Mutala (2007) further articulates that the digital economy needs highly skilled ICT specialists. This position shows the importance of ICT skills as they apply broadly and specifically to education. This study revealed that the Department of Education has not done enough to improve the skills of personnel with regard to ICT. In fact, no training whatsoever, was ever provided for teachers by the government. Apart from lack of training, the research shows that people skills are also lacking, and this worsens an already dire situation. What is required in terms of people skills is that the government needs to take pains to improve the skills of people in ICT so that they can be able to meet the demands of a modern ICT environment such as the one explained by Mutala above. The study also revealed that teachers' attitudes to ICT are poor and need to improve.

5.5.4 Quality of service

Quality of service refers to the technical support provided by technicians. Issues identified under quality of service were as follows: technicians' knowledge; level of training; their empathy; quality assurance; and promptness of the response to queries. It was found that they did not show any empathy or proper knowledge of their task. With training, it was found that they did not provide any training to personnel in the Department of Education and did not give any quality assurance after they had provided a service. It is, therefore, proposed that technicians be offered training on all issues identified above and that they give clients a quality assurance certificate after attending to queries. The last issue of concern was the availability of technicians. It is

thus, proposed that the government increases the number of ICT technicians to meet the demand by clients.

5.5.5 Budgets

Schools operate with ICT budgets for the better part of time and they do not develop ICT policies to guide their actions. A budget is an instrument used to assist business managers to achieve certain objectives (Ojua, 2016). Without proper ICT budgets, school managers, just like business managers may not achieve their set objectives if they do not employ the use of ICT budgets when they plan their annual activities. This could explain the situation where some schools only had one laptop and many did not have any for students but for school administration only. An improvement in this area could be of help in terms of closing the gap with regard to the shortage of machines.

5.5.6 Policies

Another important consideration was the absence of policies to guide ICT activities in the school. According to Reimer *et al.* (2009), a policy is a guide formulated to inform the actions of an organisation and is established with a view to addressing a particular need so that entities can achieve their goals and objectives. With regard to ICT matters, schools that do not have policies have no guide towards their ICT objectives. It was found that all the schools surveyed did not have ICT policies yet, they had some supply of ICT equipment. Their policy could guide in terms of access, acquisition and disposal.

5.6 Analysis of the hypotheses

5.6.1 Hypothesis one: the quality of information is not good

The hypothesis for the first question was as follows: the quality of information is not good. The subsidiary questions focused on accuracy of information, reliability, ease of understanding, completeness, relevance, security, sufficiency, convenience, currency and flexibility. All of these constructs were supported, thus disproving the assertion that the information was not good. Thus, the hypothesis as stated in the study, was, therefore, not supported and, therefore, the quality of the information is good. Quality of information is one of the constructs of the ISSM theory used in the

study. Since all constructs of the element of quality of information support the fact that the quality of information is good, this supports the view by Delone and Mclean (1992) that the quality of information has a bearing on usage and usage intentions as well as the final net benefits to the system. Therefore, quality of information influences net system benefits positively. Since the relationship between qualities of information was positive, it is, therefore, argued that if quality of information is good and the people's attitudes are good as shown in the results of the qualitative study, then the hypothesis that the quality of information is not good is, therefore, not supported.

5.6.2 Hypothesis two: the quality of the information system is not good

The hypothesis for this question was that the quality of the information system is not good. Constructs for the questionnaire were ease of use, reliability, well-functioning system, ease of integration into work, organisation of the system, adaptability, ease of access, usefulness and flexibility of the system. All respondents supported the fact that the information system was good. This hypothesis was not supported and thus, logical to state that the quality of the information system was good.

5.6.3 Hypothesis three: the quality of the service is not good

The third hypothesis focused on the quality of the service from the technical section of the Department of Education. It stated that the quality of service was not good. This hypothesis was supported outright by majority of participants. It is the only hypothesis that was supported in the Delone and Mclean Model of Information Systems Success. It was, therefore, excluded in the final framework for information sharing. With this one, the conclusion reached was that the quality of service was poor.

5.6.4 Hypothesis four: the level of user satisfaction is low

This hypothesis focused on the level of system user satisfaction. It stated that the level of satisfaction is high. Constructs for user satisfaction were adequacy, enjoyment, complete satisfaction, efficiency, addressing of user needs, time saving, recommendation to others, feedback from other users and overall happiness. All respondents were satisfied with the information system and the hypothesis was, therefore, not supported. Since majority did not support the hypothesis, it was, therefore, concluded that the level of user satisfaction was high.

5.6.5 Hypothesis five: the usage and usage intentions of the system are low

The fifth hypothesis was about usage and usage intentions. It stated that the level of usage and usage intentions are high. The questionnaire made use of words such as daily use, what the system is used for, and increase or decrease of system use, among others. This hypothesis was also not supported and, therefore, the conclusion that the usage and usage intentions are high was arrived at.

5.6.6 Hypothesis six: the information system has benefitted schools adequately

The sixth hypothesis stated that the information system has benefitted schools adequately. Constructs for the questionnaire were improved administrative practices, system making jobs easier, cost reduction, security of information storage, easing of communication, improved coordination, enhanced management controls, gaining of a competitive advantage, improved capacity to deliver and general productivity of schools. This hypothesis was also not supported in the findings and it can be concluded that the information system has benefitted schools adequately.

5.7 Discussion of the quantitative findings

5.7.1 Computers and information sharing (tools versus object)

The literature review revealed that before the era of Wi-Fi, connectivity was a concern for many authors. It looks like the arrival of Wi-Fi services has put that problem to rest because people can connect from any point as long as the signal is strong enough. Majority, if not, all of respondents were concerned that they did not have enough computers in schools. It was again evident that the computers were mainly used for administrative purposes only and learners did not have access to them. Many schools have no problem with availability of computers for their work and connectivity problems have been sorted out by the substitution of fixed line connectors with wireless fidelity (wi-fi) services and other remote connections. There is not much difference between urban and rural schools with respect to the initial problems of connectivity. With regard to the condition of computers, it emerged that many are in working conditions and thus, pose no problem for the information sharing activity. Finally, connectivity, availability of computers and their condition do not serve as barriers to information sharing. The

proposition that technology is not attractive to personnel was not supported. Thus, it is concluded that computers are not an impediment but proper facilitators of information sharing.

5.7.2 Personnel and information sharing (subject versus object)

It emerged from the findings that the attitudes of the personnel are not hostile to the computerised information sharing. Although the literature demonstrated that the digital divide is determined largely by the economic conditions in different geographical areas, this does not seem to be the case with the education sector in the North West Province as the findings show that people's attitudes are not negative towards technology. Furthermore, many participants felt that there was not enough training for personnel in matters of ICT. This lack of training results in shortage of skills. The attitudes of the personnel are good, it is only personnel training and the availability of skills that are an impediment to the diffusion of ICT. Since their attitudes are right, it would be good for the government to encourage and facilitate training for personnel. Thus, the, proposition that personnel were an obstruction to ICT diffusion was not supported, an indication that people do not impede information sharing but enhance it.

5.7.3 Policies and information sharing (rules versus object)

Policy development and implementation is lagging. The study revealed that many schools do not have ICT policies and that there was no budget allocated for such. It would be ideal for schools to include in their annual budgets, a portion reserved for technology in order to take care of smaller ICT needs like ink cartridges and data, among others. How they operate without an ICT budget in the information age, leaves much to be desired. The proposition that policies in the Department are an impediment to ICT adoption was also not supported. It is evident that policies towards ICT are not in the way of efficient information sharing need.

5.7.4 Department of Education and information sharing (community versus information sharing)

Exposure to ICT, level of education and poverty were the three variables used to assess the extent of access. Generally, participants argued that poverty and level of education play some role and are not very significant because even uneducated people use such services as WhatsApp (a downloadable messenger for smartphones) and Facebook (a social networking website). It was evident that the Department itself is not an impediment to ICT in the Province, this as well disproves the proposition that the general community of the Department of Education is not receptive to ICT. People are receptive to ICT and are positive about its impact on information sharing.

5.7.5 Employment status and information sharing

There is no evidence of the use of positions to bar people from having access to ICT in schools. In fact, many participants are of the view that managers encourage junior officials to use computers more. Therefore, the proposition that people use their employment status to bar others from access to ICT is disproved as it was not supported. Division of labour, as one of the constructs of the Activity Theory, did not come as an impediment towards ICT adoption and use. It is for this reason that respondents argued that they did not see their employment status as impeding junior officials from accessing ICT resources in their schools. Therefore, the conclusion is that senior employees do not use their status to bar junior members of staff from accessing ICT.

5.7.6 Conception of an efficient information sharing service

Many, if not all participants consider the existing system of information sharing as one that is acceptable and good to them. They have no other imagination of a better information sharing service than the one that is currently employed. They cited variables such as accessibility, WhatsApp, electronic mail (email), short message service (sms) and every other method that can be used to reach people. Their view of an efficient information sharing platform is non-committal because they are ready to learn and adopt any new technology for as long as it improves their delivery of work.

In the final analysis, the attitudes of personnel towards ICT were not as they were initially imagined by the researcher as they were positive and receptive to it.

5.8 Methodological reflection

In this section, the researcher discussed the extent to which the methodology influenced the results. Firstly, use was made of both the qualitative and quantitative methods of research, with the quantitative approach as the main method.

The use of ISSM alone was to get an understanding of the practical application of the phenomenon of information sharing as it manifests itself on the ground. The researcher actually tested the theory against what was happening on the ground. The Activity Theory, on the other hand, was used to understand the rationale behind inadequate use of ICT. Thus, the methods employed attempted to get both the practical application of ICT as well as the reasons for such. With this in mind, the researcher hoped to achieve a well-rounded three hundred and sixty degree-like response to the research questions. The qualitative aspect of the study was, however, only intended to fill the gap that could not be filled by the quantitative approach. Thus, the main research question was addressed in the quantitative questionnaire.

5.9 Summarized hypotheses, propositions and the outcomes

Table 5.3: Summary of findings

Hypotheses	Outcome	Propositions	Outcome
Quality of information is poor	Not supported	Technology is not attractive to educators	Not supported
Quality of information system is poor	Not supported	Personnel are an obstruction to ICT diffusion	Not supported
Quality of service is poor	Supported	Policies do not enhance efficient information sharing	Supported
User satisfaction is low	Not supported	The general community of education is not receptive to ICT	Not supported
Usage and usage intentions are low	Not supported	Job descriptions do not encourage an improvement in ICT communication	Not supported
Information system has not benefited schools adequately	Not supported		

Table 5.1 provides a summary of the research findings from both the qualitative and quantitative parts of the study. Only quality of service was not supported, while with regard to ISSM, the only hypothesis that was not supported was policies. This section provides a comparison of the findings of this study with those of other researchers who have examined the same topic. Unfortunately, there are not direct similarities as there no studies that have used the same conceptual framework like the current one; that is, a combination of the Activity Theory and ISSM. However, there are several articles on ISSM in research and AT is also used alone in different contexts.

5.10 Scientific reflection

The scientific reflection addresses the unique contribution of the study to the body of knowledge. Using the Delone and Mclean Model of Information Systems Success, the researcher endeavoured to test the application of the theory on the ground. It emerged that all the constructs related to theory were supported, with the exception for the construct of service. These constructs included quality of system, quality information of, intention to use and use, user satisfaction and net system benefits.

With regard to the qualitative aspect of the study, all the constructs were supported. With the questionnaire, the researcher sought to find reasons for the non-implementation of a computerised system of information sharing and it has emerged that all validation of the propositions were supported. Finally, the quality of information system has a bearing on usage and usage intentions in addition to user satisfaction and ultimately, net system benefits. Quality of information also has a bearing on usage and usage intentions as well as user satisfaction and net system benefits. The extent of the influence of one construct on the other is indicated in the model.

5.11 Type of theory

Gregor (2006) argues that there are five major types of theory in Information Systems, one of which is the theory on Design and Action. This type of theory articulates how things should be done. The aim of this study was to develop a framework to enhance information sharing. The researcher was concerned about the slow pace of ICT adoption and sought to develop a framework to enhance communication between schools and district offices.

Table 5.4: Ideal characteristics of information sharing practices

Practices of information sharing	Theme	Ideal characteristics
	Quality of information	Accuracy, reliability, complete, relevant, understandable, secure, sufficient, current, flexible and convenient
	Quality of system	Ease of use, reliable, well-functioning, integrated into work, organised, adaptable, accessible from anywhere, useful, flexible and convenient
	Quality of service	Empathy, responsiveness, training, quality service, timeous response, quality assurance, fairness, availability and prompt service
	User satisfaction	Information adequacy, enjoyable system, complete satisfaction, system efficiency, time saving system, recommendable system, positive survey feedback, overall happiness, flexible and convenient
	Usage and usage intentions	Daily use, increased use, efficiency and be usable for administrative purposes

In order to enhance information sharing, the environment should have the characteristics according to Table 5.4.

Table 5.5: Ideal characteristics of information sharing environment

Context/environment of information sharing	Theme	Ideal characteristics
	Computers	Accuracy, reliability, complete, relevant, understandable, secure, sufficient, current, flexible and convenient
	Personnel	Ease of use, reliable, well-functioning, integrated into work, organised, adaptable, accessible from anywhere, useful, flexible and convenient
	The Department	Empathy, responsiveness, training, quality service, timeous response, quality assurance, fairness, availability and prompt service
	Job position	Information adequacy, enjoyable system, complete satisfaction, system efficiency, time saving system, recommendable system, positive survey feedback, overall happiness, flexible and convenient
	Policies	Daily use, increased use, efficiency and be usable for administrative purposes

At the centre of the figure, where the two circles intersect, is the meeting point of the environment and the practices of information sharing. The outcome of the interaction of the two systems or themes depends on the characteristics of each environment. This means that if one or both themes is/are positive or negative, information sharing will be enhanced or weakened because it is the final product of the interaction of the two themes in the ecosystem of practices and the environment

5.12 The general evaluation of the framework for information sharing

5.12.1 Who is the framework intended for?

This study was conducted within the North West Department of Education, consisting of schools, district offices and the head office. These are the entities for which this study is intended. S Although the study was conducted in the North West Province, study is intended for academics as well as the education sector in general.

5.12.2 Was the research problem addressed?

The research questions sought to establish the reasons behind the non-implementation of a computerised platform for information sharing and what accounts for such situation. The research problem was addressed in that the outcomes of the study were reflected in the responses to the research problem. The outcome is a framework that can be adopted by the Department of Education to address challenges related to ICT on the ground and, in doing so, a particular context could be considered. The situation and the context have already been discussed in this study.

5.12.3 What unique problem does the research problem address?

The unique problem the research sought to address was the context of information systems and the activities on the ground. It also focused on the absence of a unified information sharing platform, such that the obvious ICT benefits are taken advantage of, for example, the virtualisation of the administrative environment. It further focused on the perceived limited use of ICT within the Department of Education, where computers are only used for administration and learners are left out.

5.12.4 Using the information sharing framework

The framework can be used to improve ICT services within the Department of Education to streamline or guide ICT policy development. Once adopted, the framework can guide the ICT Division of the Department to formulate a policy for the Department with emphasis on certain parameters. Such parameters are quality of information, quality of service, quality of system, user satisfaction, usage and usage intentions and system benefits and, obviously, the context. Of particular importance in this instance is the fact that quality of service did not pass the test. Therefore, in

adopting this framework, the Department should underline the fact that particular attention should be directed at quality of service.

5.12.5 Challenges identified

Philosophical dilemma of multi-methods research did not escape the researcher. Although reality on the ground is multi-dimensional, the researcher himself is not multi-dimensional. Though pragmatic, a researcher will always exercise a particular bias in his or her approach. Therefore, the challenge of the researcher in this instance has been the merging of divergent world-views into one. The second challenge was with regard to data collection. Some participants did not want to be bothered with ICT issues because they knew little about them. Others did not complete the questionnaire as a whole, many did not honour appointments, while some refused to participate completely.

5.12.6 Factors to be considered by the Department of Education when adopting the framework

The framework itself is a product of a research project conducted within a particular context as outlined in the discussion of the qualitative findings. It can be argued that ISSM, in this study, happens within the Activity Theory. Therefore, the framework is not an isolated system but a system within a system. This can be visualised by placing the framework inside the Activity System. The other issue for consideration is that ISSM is still under construction and can change as the ICT environment changes. Thus, in adopting a particular framework, which has been influenced by a particular theory, it should be noted that the theory itself is dynamic and thus, subject to environmental changes.

5.12.7 Applicability of research methods

There was a paradigm war in the 1980s, where it was considered impossible to use a multi-methods approach in one study and this war was fuelled by some dogmas such as the incompatibility thesis (de Lisle, 2011). A mixed methods approach was used in this study and the rationale for using such approach was informed by the research questions. The first research question was quantitative in nature while the second was qualitative. The first question focused on what was happening while the second

focused on why it was happening. Thus, it became naturally appropriate to employ a mixed methods approach in a case where there are two dissimilar research questions. In the final analysis, the quantitative questions were answered using ISSM while the qualitative ones were answered using the Activity Theory.

5.12.8 Were the data analysis techniques used aligned with the method used?

Qualitative findings were analysed qualitatively using themes while quantitative results were analysed quantitatively using statistical methods. Tables were developed to visualise qualitative themes and a final conclusion made around a particular theme. Reliability and validity tests were conducted for the quantitative results. Even the final model was also evaluated statistically.

5.12.9 Has the framework generated new philosophical ideas?

Several studies have been conducted on information systems, however, none has explored a combination of ISSM and AT. This is the first in IS research and thus, a new philosophical dimension such that the context and the activities on the ground are explored side by side using the two theoretical lenses. Thus, the new philosophical direction is one of information sharing activities taking place within the AT context and information systems practices seen using ISSM. The interaction of the two activities produce an information sharing of a certain kind.

5.12.10 Has the theory unified various previously unrelated concepts?

Yes, this theory has brought together constructs of the Activity Theory and Information Systems Success Model under one roof and as far as was able to determine, the author was unable to find any such unification elsewhere in the world. The product of the two theories is the novel idea of this research project.

5.12.11 Has the theory produced unconventional ideas?

The convention in the Department of Education has always been the culture of paper-based information sharing. The new culture, as promoted by this study, is of electronic communication where schools are encouraged to use e-mails, whatsapp, Short Message Service (SMS), Intranet, Internet and various other services.

5.12.12 Has the study achieved its aims and objectives

The study has achieved the goals and objectives as stated in Chapter One. The research questions were answered in the research procedure that included the literature review and methodology. The framework to enhance information sharing was designed using the literature review and the empirical processes. As far as could be established, no similar framework exists anywhere else in the world. Hence, the proposed framework could be used as a model and adopted in other countries as well.

5.13 Recommendations

5.13.1 For policy and practice

It is therefore, recommended that the quality of information, quality of system, usage and usage intentions, user satisfaction and the net system benefits should all play a role in the design of an information systems in the context as outlined in the Activity Theory analysis. It was found that the environment or context in which the information systems operates is a positive one as all propositions were refuted thus, giving a positive relationship with ICT. This environment is where ISSM operates. This, therefore, places a positive influence on ICT or the outcome of the Activity Theory questionnaire reflects that the environment of ICT in the Department of Education influences ICT activities positively.

Since the ICT environment is positive because almost all propositions formulated around constructs of the Activity Theory are not supported, it is recommended that ISSM be used to measure what is actually taking place on the ground for positive outcomes. This then proves that activities on the ground are an outcome of their environment. Erumban and de Jong (2006) state that technology adoption decisions are a product of people's subjective attitudes in organizations or countries and are influenced by cultural characteristics.

5.13.2 Recommendations for further research

Further research on ICT should as well address the absence of efficient services and to seek answers for the non-support of one key element of the ISSM theory, which is

peculiar to the Department of Education in the North West Province. Further research needs to explore the infusion of context into ISSM using an analytic tool. A study on the promotion of policy guided management approach to ICT is also recommended.

5.13.3 Limitations of the study

This study was limited to the theories used by the researcher, to the exclusion of other theories that could be pertinent to ICT research. Furthermore, it should be noted that this study is limited only to the Department of Education and the findings cannot apply in other settings. The data collection strategy ensured that the main findings from the quantitative approach and the supplementary qualitative aspect yielded appropriate outcomes. Thus, this study is limited to this design only.

Conclusion

The first research question sought to find out what could be done to establish a computerized information sharing platform while the second focused on the reason behind the minimal use of ICT services. Thus, there is a need to train personnel on ICT as this would increase the pace of the diffusion of technology. There is also a need to improve the service provided by the technical division since people are receptive to ICT innovations. As was revealed in the qualitative section of this study, the quality of information is good, the quality of information system is poor, quality service of is poor, level of user satisfaction is high, usage and usage intentions are high, the information system has benefitted schools adequately, technology is not attractive to personnel, personnel do not obstruct ICT diffusion, policies enhance efficient information sharing, the general community of the Department of Education in the Province is receptive to ICT and senior employees do not use their status to bar others from accessing ICT resources. The final question had to do with addressing peoples' conception of an efficient information sharing platform and they were satisfied with the current status of information sharing practices.

It is, therefore, concluded that the proposed information sharing platform should be in accordance with Figure 5.2. This Figure shows that major issues identified had to do with the infrastructure of ICT, people, policies, budgets and services. The framework

suggests that addressing issues relating to these constructs will enhance information sharing in the North West Department of Education.

References

- Abdullah, M. A., Yahya, W. K., Ramli, N., Mohamed, S. R. & Ahmad, B. E. 2016. *Regional Conference on Science, Technology and Social Sciences (RCSTSS 2014): Business and Social Sciences*, Springer Singapore
- Afshari et al., (2008), School leadership and information technology, *The Turkish online Journal of educational technology (TOJET)*, Volume 7, issue 4 article 9.
- Akbaba-Altun, (2006).c, *Educational Technology and Society*, 9(1),176-187
- Alfred, R., Iida, H., Ibrahim, A. A.
- A. & Lim, Y. 2018. *Computational Science and Technology: 4th ICCST 2017, Kuala Lumpur, Malaysia, 29–30 November, 2017*, Springer Singapore
- Alexander van Deursen and Jan van Dijk (2010), *Internet skills and the digital divide*, *New Media and Society*, 13(6) 893–911,
- Ali Z, Bhaskar SB. Basic statistical tools in research and data analysis. *Indian Journal of Anaesthesia*, Wolters Kluwer-Medknow, p 54
- Al-Mamary Y.H, Shamsuddin A, Aziati N, (2014), The relationship between system quality, information quality and Organisational performance, *International Journal of Knowledge and Research in Management*, Vo 4, Issue 3, July 2014
- Alshehri et al., (2010), implementation of e-government: Advantages and challenges, IASKE-ALT2010, CONFERENCE PROCEEDINGS
- Barolli, L., Enokido, T. & Takizawa, M. 2017. *Advances in Network-Based Information Systems: The 20th International Conference on Network-Based Information Systems (NBIS-2017)*, Springer International Publishing.
- Bass et al., (2003), Predicting Unit Performance by Assessing Transformational and Transactional Leadership, *Journal of Applied Psychology*, Vol 88, No:2, 207-218
- Batta et al., (2012), E-Governance in E-Administration, *International Journal of Computing and Business Research*, ISSN (online)

- Bickman and Rog,(2009), *The SAGE Handbook of Applied Social Research Methods* SECOND EDITION, Vanderbilt University, USA and Florida International University, USA, Westat, Inc.
- Bickman *et al.*, (2009) *Applied research design, The Sage handbook of Applied Social Research Methods*, Sage Publications Inc, California,
- Biddle *et al.*, (2015), Axiology and Anomaly in the Practice of Mixed Methods Work: Pragmatism, valuation, and the Transformative Paradigm, *Journal of Mixed Methods Research Vol 9(4)*, SAGE Publications Cambridge Advanced Learner's Dictionary, (2008), Cambridge University Press, New York
- Becta. (2004). A review of the research literature on barriers to the uptake of ICT by teachers. Retrieved 14 October 2017.http://partners.becta.org.uk/page_documents/research/barriers.pdf
- Bharati P.and Berg D, (2003) Managing Information Systems for Service Quality: a study from the other side, *Information Technology and People*, Vol 16, No 2, pp183-202
- Bradley N (2013), *Marketing Research, Tools and Techniques*, Oxford University Press, Oxford, United Kingdom
- Brown, J. D. (1996). Testing in language programs. Upper Saddle River, NJ: Prentice Hall Regents.
- Buabheng-Andoh, (2012), Factors influencing teachers' adoption and integration of Information and communication technology into teaching: A review of the literature *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 2012, Vol. 8, Issue 1, pp. 136-155.
- Campbell *et al.*, (2002), Barriers to Adopting Technology for Teaching and Learning', *Educause Quarterly*, 25 (2), 22-28
- Cramer (2012), Six Criteria for a Viable Theory: Putting Reversal Theory to the Test, *Journal of Motivation, Emotion and Personality*, Vol: 1, No: 1
- Creswell J.W (2014), *Research Design, Qualitative, Quantitative and Mixed Methods Approaches*, SAGE Publications, thousand Oaks, Carlifornia
- David and Sutton, (2011), *Social Research; An Introduction*, Second Edition, SAGE Publications Ltd, London

- Cauter L, Verlet D, Snoeck M, Crompvoets J, The explanatory power of the Delone & McLean model in the public sector: A mixed method test, *Information Polity* 22 (2017) 41–55
- Chen, F. F. (2007). Sensitivity of Goodness of Fit Indexes to Lack of Measurement Invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, 14(3), 464-504. doi:10.1080/10705510701301834
- Chen and Wellman, (2004), The Digital Divide-Within and Between Countries, *IT and Society*, Volume 1, Issue 7, pp18-25
- Cho *et al.*, (2011), How does leadership affect information systems success? The role of transformational leadership, *Information and Management journal*, vol 48, pp 270-277
- Conradie and Rood, *Realities versus ideals with regard to e-learning in South Africa*
- David and Sutton, (2011), *Social Research; An Introduction*, Second Edition, SAGE Publications Ltd, London
- De Lisle J (2011), The Benefits and Challenges Of Mixing Methods and Methodologies: *The Carribean Curriculum*, Vol. 18, 2011, 87–120.
- De Lone and Mclean, (2003) The Delone and Mclean Model of Information System Success, a Ten-year update, *Journal of Management Information Systems*, Spring 2003, vol 19, No:4
- Deursen and Van Dijk (2014), the Digital divide shifts to differences in usage, *New Media Society*, SAGE Publications, Vol 16(3), 506-526
- De Vos *et al.*, (2011), *Research at Grass Roots, for the Social Sciences and Human Service Professions*, Van Schaik Publishers, Pretori
- De vries and Reid (2003), Do South African Medical Students of rural origin return to rural practice?, *South African Medical Journal (SAMJ)*, 2003, Vol 93, No 10
- Ditsa and Davis, (2000), Activity Theory as a Theoretical Foundation for Information System Research, Proceedings of the Information Resources Management Association International Conference,
- Dzansi and Amedzo (2014), Integrating ICT into rural South African schools: Possible solutions for challenges, *international Jurnal of Education Science*

- Erumban AA, de Jong B, (2006), Cross Country Differences in ICT Adoption, a Consequence of culture?, *Journal of World Business*, Vol 41, Issue 4, Dec 2006
- Fink A (2010), Conducting Research Literature Review: From internet to Paper, Sgae Publications, Inc, London UK
- Fuchs and Horak, (2008), Africa and the digital divide, *Science Direct*, 99-116
- Gabrenya W.K. (2003), Reliability, *Research Skills for Psychology Majors, Everything You Need to Know to Get Started*,
- Galliers (1991), Information Systems Research, *Contemporary Approaches and Emergent Traditions*, Elsevier Science Publishers, North Holland
- Ghamrawi . (2013), The relationship between the leadership styles of Lebanese public schools principal and their attitudes towards ICT versus the level of ICT use by their teachers
- Girden *et al.*, (2011), *Evaluating Research Articles, From Start to Finish*, Third Edition, SAGE, Publications Inc, California
- Goldkuhl, (2004), Meanings of Pragmatism: Ways to conduct Information Systems Research, 2nd International Conference on Action in Language, Organisations and Information Systems, Sweden.
- Green, D. R. (1998). *Consequential aspects of the validity of achievement tests: A publisher's point of view*. Educational Measurement, 17 (2), 16-19.
- Gregor S. (2006) The Nature of Theory in Information Systems, *MIS Quarterly* Vol. 30 No. 3
- Grey (2009), *Doing Research in the Real World*, SAGE, Publications Ltd, London
- Gogtay NJ, Thatte UM, (2017), Principles of correlation Analysis, Statistics for Researchers, *Journal of the Association of Physicians*, Vol 65, March, 2017
- Guba, (1990). *The paradigm dialog*. Sage Publications.
- Hardman, (2005), An exploratory case study, of computer use in a primary school mathematics classroom: New technology, new pedagogy? *Perspectives in education, volume 23*(4)
- Hasan, H. & Banna, S. (2010). The unit of analysis in IS theory: The case for activity. The Fifth Biennial ANU Workshop on Information Systems Foundations (pp. 1-18). Canberra: ANU.

- Hashim *et al.*, (2007), Activity Theory: a framework for qualitative analysis, 4th International Qualitative Research Convention (QRC), 3-5 September 2007, PJ Hilton, Malaysia
- Jayasinghe, K., Nath, N. & Othman, R. 2015. *The Public Sector Accounting, Accountability and Auditing in Emerging Economies*, Emerald Group Publishing Limited.
- Junyong In, (2017), introduction of a Pilot Study, *Korean Journal of Anesthesiology*, 70(6): 601–605
- Johnson *et al.*, (2007), *Toward a Definition of Mixed Methods Research*, Journal of Mixed Methods Research 1(2), 112-133
- Islam *et al.*, (2007) Understanding e-governance: A theoretical approach, *Asian Affairs*, volume 29, No: 4, 29-46, October-December 2007
- Kaptelinin *et al* (1995), Activity Theory: Basic Concepts and Applications, A summary of a tutorial given at the East West HCI 95 Conference, 1995
- Karuga, G. G. & Richardson, V. J. (2007). *Assessing leading institutions, faculty, and articles in premier information systems research journals. Communications of the Association for Information Systems*, 20(16), 142.
- Kawulich B, (2015) Data Analysis Technique in Qualitative Research, University of Georgia, Conference Paper
- Kiposi *et al.*, (2012), Challenges facing adoption of information communication technology (ICT) in educational Management in schools in Kenya, *Journal of Sociological Research*, Vol 2, No:1.
- Khan *et al.*, (2012), Barriers to the introduction of ICT into education in developing countries: the example of Bangladesh, *International journal of instruction*, Vol 5, No:2
- Klopper and Lubbe, (2012), International Conference on Information Resources Management, Vienna University Austria, Using Matrix Analysis to Achieve Traction, Coherence, Progression and Closure in Problem-Solution Oriented Research
- Kumar R (2011), *Research Methodology, a step-by-step guide for beginners*, SAGE Publications India Pvt Ltd, New Delhi
- Kothari C, (2004), *Research Methodology, Methods and Techniques*, New Delhi, India

- Lee W, Diane M.S, Kahn B.K, Wang R,(2002), AIMQ: a methodology for information quality assessment, *information and Management*, 40, 133-136.
- Lewis R.C, Booms B.H, (1983), The Marketing Aspects of Service Quality in Emerging Perspectives on Service Marketing, In L. Berry, G Shostack, and G.Upah, (Eds), *American Marketing Association*, Chicago, Illinois, pp 99-107, 1983
- Lewis-Beck *et al.*, 2004, *The Sage Encyclopaedia of Social Science Research Methods*, Sage Publications
- Lim and Hang (2003), An activity theory approach to research of ICT integration in Singapore schools, *Computers & Education* 41 (2003) 49–63
- Mackenzie and Knipe, (2006) Research Dilemmas: Paradigms, Methods and Methodology. *Issues in Educational Research*, 16, 193-205.
- Makewa *et al.*, (2013), ICT in secondary school administration in rural southern Kenya: An educator's eye on its importance and use, *The International Journal of Education and Development using Information Technology (IJEDICT)*, Vol 9, Issue 2, pp 48-63
- Marakas G.M and O'Brien J.A (2013), *Introduction to Information Systems*, McGraw-Hill, New York.
- Martinez *et al.*, (2008), E-administration: Communication Technologies at the service of citizens, European Association of management and business economics: National congress (22 2008 Salamanca)
- Mingaine L, (2013) Challenges in the Implementation of ICT in Public Secondary Schools in Kenya, *Journal of Education and Learning*; Vol. 2, No. 1; 2013
- Mingers (2001), Combining IS Research Methods: Towards a Pluralist Methodology, *Information Systems Research*, _ 2001 INFORMS, Vol. 12, No. 3, September 2001, pp. 240–25
- McIntyre, (2005) Bridging the gap between research and practice, *Cambridge Journal of Education*, 35:3, 357-382, DOI: 10.1080/03057640500319065
- Meyer and Gent (2016) The Status of ICT in Education in South Africa and the Way Forward
- Parasuraman A.P, Berry L.L, Zeithami V.A, A conceptual model of service quality and its implication for further research (SERVQUAL), *Journal of Marketing*, Vol 49, 1985, 41-50

- Nayak *et al.*, (2016) E-governance in India: Critical issues and challenges,
international journal of scientific research, Volume : 5 | Issue : 9 | September
2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48
- Ngwangwu *et al.*, (2013), Management Information System as a Technique in the
Administration of Secondary Schools in ABA Zone South East Nigeria,
International Journal of Learning and Development, Vol 3, No 3
- Plano *et al.*, (2016), *Mixed Methods research, a guide to the field*, Sage publications,
Thousand Oaks, California
- Plano and Ivankova, (2016), *Mixed Methods Research, A guide to the field*, Sage
Publications, Inc, Washington DC
- Oboegbulem *et al.*, (2013), The Place of ICT (Information and Communication
Technology) in the Administration of Secondary Schools in South East State of
Nigeria, *US China education Review*, April 2013, Vol 3 No 4
- Ojua M.O.(2016) The Importance of Budget and Bugetary Process among
Non- Publicly Accountable Entities (NPAEs): A Survey of Micro-Sized Firms
in Nigeria
- O'leary Z, (2010), *The essential guide to Doing your Research Project*, SAGE
Publications, Thousand Oaks, California, USA
- Ormerod, (2006) The History and Ideas of Pragmatism, *Journal of Operational
Research Society*, 57, 892-909
- Pasensie K, 2004, How far down the information superhigh way is South Africa's
education, South African Catholic Bishops' Conference
- Roode J (1993), Implications for teaching of a process based research framework for
information systems, *Proceedings of the International Academy for Information
Management Conference*, Orlando Florida.
- Pelgram, (2000), Obstacles to the Integration of ICT in Education: Results From
Worldwide Educational Assessment, *Computers and Education*, 37, 163-178
- Qureshi A A (2013), Impact of leadership on meaningful use of ICT, 3rd world
conference on learning, teaching and educational leadership-WCLTA 2012
- Prensky (2001), Digital Natives, Digital Immigrants, On the Horizon,(MCB University
Press, Vol 9, No 5, October 2001
- Prestridge S, (2012), The Beliefs Behind the Teacher that Influences their ICT
Practices, *Computers & Education* 58 (2012) 449–458

- Radu et al., (2014), Theoretical and practical aspects of e-administration, *Zeszyty Naukowe DWSPiT*, (7) 185-210
- Redman TC, (2018), If your data is bad, your machine learning tools are useless, *Havard Business Review*
- Reimer et al, (2009) The Importance of Policy for the Community Economic Development: A case study of the Manitoba Context, *Linking, Learning Leveraging, Social Enterprises, Knowledgeable Economies and Sustainable Communities*
- Remler D.K and Van Ryzin G.G. (2011), *Research Methods in Practice, Strategies for Description and Causation*, SAGE Publication, Thousand Oaks, Carlifornia, USA
- Ridley D (2012), *The Literature Review, A Step by Step Guide for Students*, Sage Publications, Thousand Oaks, California 2nd Edition
- Roode J. (1993), Implications for teaching of a process based research framework for information systems, *Proceedings of the International Academy for Information Management Conference, Orlando Florida*
- Sadegul A. (2006), Complexity of Integrating computer technologies into Education in Turkey, *Journal of Educational Technology and Society* Vol 19 No:1, pp 176-187
- Saldanha J, (2016), *Coding Manual for Qualitative Researches*, Sage Publication, London,
- Saunders et al., (2012), *Research Methods for Business Students*, 6th edition, Pearson
- Schiller (2003), Working with ICT, perceptions of Australian principals, *Journal of Educational Administration*, Vol. 41 Iss 2 pp. 171 – 185
- Scotland J (2012), Exploring the Philosophical Underpinnings of Research: Relating Ontology and Epistemology to the Methodology and Methods of the Scientific, Interpretive, and Critical Research Paradigms, *English Language Teaching*; Vol. 5, No. 9; 2012, Canadian Centre of Science and Education

- Sekaran, (2003), *Research Methods for Business, a skill building approach*, Hermitage Publishing Services, Malloy Lithographing, Inc
- Seyal (2012), A preliminary study of school administrators` use of information and communication technologies: Bruneian perspective, *International journal of Education and Development using Information and Communication Technology (IJEDICT)*, Vol 8, Issue 1. Pp29-45
- Simon M, (2011) *Dissertation and scholarly research: Recipes for success* (2011 Ed.). Seattle, WA, Dissertation Success, LLC.
- Shah (2014), Impact of management information system (MIS) on school administration: What the literature says, 5th World Conference on Educational Sciences-WCES 2
- Shelly G.B and Rosenblatt H.J (2012), *Systems Analysis and Design*, Eighth Edition, Boston, USA
- Sikhakhane *et al.*, (2005), An investigation into some problems in rural local Communities in Kwazulu Natal, South Africa, *Alternation*, 12.1a (2005) 43-66 ISSN 1023-1757
- Simundic A, (2017), Bias in Research, *Lessons in Biostatistics, BioChemia Media*. South Africa. 2017. Publication on National e-government Strategy and Roadmap, Electronic Communications and Transactions, Act NO:25 OF 2002. (Notice No 341) Government Gazette, No. 40772, 7 APRIL 2017
- Stuart *et al.*, (2009), School leaders, ICT competence and championing innovations, *Computers and Education* 53
- Swanepoel JWH, Swanepoel CJ, van Graan fc, Allison JS, Santana L, (2018), *Elementary statistical methods*, 6th edition, Ivyline Academic Publishers, Potchefstroom
- Tashakkori and Teddlie, (2009), *Integrating Qualitative and Quantitative Approaches to Research, In Applied Social Research Methods*, Sage Publications, California
- Teddlie and Tashakkori (2011) *Mixed Methods Research, Contemporary Issues in an Emerging Field*, The Sage Handbook of Qualitative Research
- Tavakol M, Dennick R, (2011), Making sense of Cronbach's alpha, *International journal of medical evaluation*, Vol 2, p 53-55

- Tayo S *et al.*, (2014), Information Communications Technology and Public School Administration in Osun State, Nigeria, *International Journal of social science and Education*, Vol 4, Issue 4
- Tong *et al.*, (2010). Conditions and constraints of sustainable innovative pedagogical practices using Technology. *International Electronic Journal for Leadership in Learning*, 9(3).
- Tusubira and Mulira (2004), Integration of ICT in organisations: Challenges and best Practice Recommendations based on the experience of Makerere University and other organisations, *Conference o Universities: Taking a leading role in ICT enabled human development, 6-8 September 2004, Kampala Uganda*
- Twycross A, Shields L, (2010), Validity and Reliability, What's it all about? Part 2 Reliability in Quantitative Studies. *Paediatric Nursing*, 16 (10) p. 36
- Urbach and Mueller (2011), The Updated Delone and Mclean Model of Information Systems Success, *and Practices, Information Science reference*, Hershey
- Vahidov R, (2012), Design-type Research in Information Systems, findings and Practices, *Information Science reference*, Hershey
- Venkatesh V, Brown S.A. and Bala H, Bridging the Qualitative-Quantitative Divide: Guidelines for Conducting Mixed Methods research in Information Systems, *MIS Quarterly Vol X, No X 2012-2013*
- Vrabie (2014), Education- a key concept for E-Administration, Science Direct, Elsevier, 5th World Conference on Learning, teaching and educational leadership, WCLTA
- Weinberg, S. L. & Abramowitz, S. K. 2016. *Statistics Using IBM SPSS: An Integrative Approach*, Cambridge University Press.
- Weng *et al.*, (2014), The relationship between technology leadership strategies and, Effectiveness of school administration: An empirical study, *Computers and Education*
- Wong Z. (2011), A proposed revision to the Delone and Mclean's IS Success Model, 2010 International Conference of E-business, Management and Economics, IPEDR vol.3, (2011)IACSIT Press, Hong Kong
- Wenhong *et al.*, (2004) The global digital divide-within and between countries, *IT and Society*, Volume 1, Issue 7, Summer 2004, pp18-25.

- Yagamat, (2010), Activity Systems Analysis Methods, Understanding Complex Learning Environments,
- Yang, G. C., Environments, AO, S. I., Huang, X. & Castillo, O. 2016. *Transactions on Engineering Technologies: International MultiConference of Engineers and Computer Scientists 2015*, Springer Singapore.
- Zhang M.J. (2007), Information Systems Connectivity as a Moderator of the Effects of IS Support for Information Interpretation on Firm Performance: An Empirical Study, *International Journal of Mnagement*, Vol. 24, No. 2

APPENDIX A

Research Instrument

APPENDIX A: RESEARCH INSTRUMENT

Information and Communications Technology (ICT) questionnaire

The purpose of this questionnaire is to examine the circumstances around the non-implementation of ICT-based information sharing system by the North West Department of Education. The questionnaire is structured around the Activity Theory in an attempt to gauge people's attitudes and values on ICT adoption. Please contextualise your responses to the overall Department of Education in the Province. Thank you for taking time to be a participant.

QUALITATIVE QUESTIONNAIRE

Please tick your age		21-30	31-40	41-50	51-60	61+			
Please tick your gender		Male				Female			
For how long have you been working with the Department?		1-5 Years	6-10 years	11-15 years	16-20 years	21+ years			
What is your position within the Department?	Principal	Deputy Principal	HoD	Educator	AA				

1. TOOLS VS OBJECT (Computers vs Efficient Information Sharing)
 - 1.1 What do you think about the availability of computers in your school?

- 1.2 Would you say the government has addressed connectivity problems enough and why?
- 1.3 Tell me about the state/condition of computers in your school. Are they functional?
2. SUBJECT VS OBJECT (Personnel vs Efficient Information Sharing)
 - 2.1 What is your personal impression about the attitudes of personnel about computers?
 - 2.2 Would you say the Education Department personnel have received sufficient training in ICT?
 - 2.3 Comment about your impressions with regard to ICT skills of the personnel in NWED.
3. RULES VS OBJECT (Policies vs Efficient Information Sharing)
 - 3.1 Does your ICT policy encourage access to computers by all in the school and why do you think so?
 - 3.2 How does the Department's/school budget policy assist in facilitating ICT diffusion?
4. COMMUNITY VS OBJECT (Ministry of Education vs Efficient Information Sharing)
 - 4.1 Why do you think the Education Department as a community is well-exposed to ICT benefits?
 - 4.2 How do the educational levels of the NWED affect ICT growth?
 - 4.3 How has poverty affected ICT diffusion in your school community?
5. DIVISION OF LABOUR VS OBJECT (Employment Position vs Efficient Information Sharing)
 - 5.1 Would you say people's positions in the school influences access to ICT?
 - 5.2 What is your impression about the role of leadership in the usage of ICT in your school?
6. What is your overall conception of a good information sharing platform for the North West Department of Education?

QUANTITATIVE QUESTIONNAIRE

The following set of questions are structured around the Delone and Mclean Model of Information Systems Success. The aim of the questionnaire is to investigate ICT diffusion in the North West Department of Education. Thank you for taking time to complete the questionnaire.

Please tick your age	21-30	31-40	41-50	51-60	61+	
Your gender	Male			Female		
Your work experience?	1-5 Years	6-10 years	11-15 years	16-20 years	21+ years	
What is your role within the Department?	Principal	Deputy Principal	HoD	Educator	AA	

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. I derive satisfaction from using computers for my work because:-					
1.1 Information is accurate	1	2	3	4	5
1.2 Information is reliable.	1	2	3	4	5
1.3 Information is easy to understand	1	2	3	4	5
1.4 Information is complete	1	2	3	4	5
1.5 Information is relevant	1	2	3	4	5
1.6 Information is secure	1	2	3	4	5
1.7 Information is sufficient	1	2	3	4	5
1.8 Information is convenient	1	2	3	4	5
1.9 Information is current	1	2	3	4	5
1.10 Information is flexible	1	2	3	4	5

2. The quality of the information system meets the following criteria:	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
2.1 Information system is easy to use	1	2	3	4	5
2.2 Information system is reliable	1	2	3	4	5
2.3 Information system is functioning well	1	2	3	4	5
2.4 Information system is easily integrated into my work	1	2	3	4	5
2.5 Information is well-organised	1	2	3	4	5
2.6 Information system is adaptable to my needs	1	2	3	4	5
2.7 Information system can be accessed anywhere	1	2	3	4	5
2.8 I find the information to be useful	1	2	3	4	5
2.9 Information system is flexible	1	2	3	4	5
2.10 The information system is convenient	1	2	3	4	5

3. I am happy with the service we get from computer technicians because:-	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1.1 Technicians have empathy	1	2	3	4	5
1.2 Technicians are responsive to our needs	1	2	3	4	5
1.3 Technicians provide sufficient training	1	2	3	4	5
1.4 Technicians provide good quality service	1	2	3	4	5
1.5 Technicians respond in time	1	2	3	4	5
1.6 They give us assurance their work is of quality	1	2	3	4	5
1.7 Technicians are fair	1	2	3	4	5
1.8 Technicians are knowledgeable	1	2	3	4	5
1.9 Technicians are always available	1	2	3	4	5
1.10 They provide prompt service	1	2	3	4	5

4. As a user of the information system/computers, I am satisfied because:-	Strongly Agree	Agree	Agree	Undecided	Disagree	Strongly Disagree
4.1 The information is adequate	1	2	3	4	5	
4.2 I enjoy using the information system	1	2	3	4	5	
4.3 I feel complete satisfaction when I use it	1	2	3	4	5	
4.4 I find the system efficient when using it	1	2	3	4	5	
4.5 The system is effective in addressing our needs	1	2	3	4	5	
4.6 The system saves me time	1	2	3	4	5	
4.7 I would recommend the system to other people	1	2	3	4	5	

4.8 The system impedes/disturbs progress in my work	1	2	3	4	5
4.9 User surveys give positive feedback about the system	1	2	3	4	5
4.10 I am overall happy about using computerised information system	1	2	3	4	5

5. The extent of the usage of computers in our school satisfies the following criteria:-	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
5.1 We use the system daily.	1	2	3	4	5
5.2 Without computers, our work would slow down.	1	2	3	4	5
5.3 The system is used in the administration of our school.	1	2	3	4	5
5.4 There is an increase in the usage of the system.	1	2	3	4	5
5.5 We are moving away from traditional paper-based systems.	1	2	3	4	5
5.6 The system is unused.	1	2	3	4	5
5.7 The usage of the information system has increased over time.	1	2	3	4	5
5.8 Our job would be more difficult without the system.	1	2	3	4	5
5.9 I would rather capture information manually than use computers	1	2	3	4	5
5.10 I never use the system	1	2	3	4	5

6. Computers have improved our general administration because:-	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
6.1 ICT has improved our administration	1	2	3	4	5
6.2 ICT has made my job easier	1	2	3	4	5
6.3 ICT has reduced our administration costs	1	2	3	4	5
6.4 Computers have made our information storage more secure	1	2	3	4	5
6.5 Computers have made our communication more easy	1	2	3	4	5
6.6 There is improved coordination	1	2	3	4	5
6.7 Management controls have improved	1	2	3	4	5
6.8 We gained a competitive advantage	1	2	3	4	5
6.9 Our capacity to deliver has been enhanced by ICT.	1	2	3	4	5
6.10 Our school is more productive than before.	1	2	3	4	5

APPENDIX B

Informed Consent

05 June 2017

CONSENT FORM TO PARTICIPATE IN A RESEARCH INTERVIEW

Dear participant

This is an invitation extended to you requesting your voluntary participation in the interview conducted as part of my research project as a doctoral degree student with the North-West University's Faculty of Economic and Management Sciences, Mafikeng Campus.

You are kindly requested to participate in the interview seeking answers to the state of ICT in the North West Department of Education. As you are aware, the world is in the process of migrating towards ICT-dominated administration systems. Thus, the researcher is concerned about the slow adoption of ICT in the Department of Education and hence, this research project. The researcher would like to establish facts around the slow adoption of ICT and suggest ways to improve the pace of adoption. The main research question is, what can be done to help increase the pace of ICT usage and what are the reasons behind the slow adoption?

The interview will, with your permission, be recorded and later transcribed into a word document after which the researcher will do the analysis. Please be informed that the information as acquired from you is completely confidential and may in no way be used against you. You may freely answer questions you feel are able to answer and leave those you cannot answer. If you need clarity, please feel free to ask for such.

This study is led by Professor N. Mavetera and the student is M.E. Tsolo
(tsoloellse@yahoo.com 084 508 9281)

Thank you in advance

Yours truly

.....

M.E. Tsolo
(PhD Student)

APPENDIX C

Eethical Clearance Certificate



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 Resource Research Ethics Committee (HRREC)** on 18/08/2017, 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 framework to enhance information sharing in the North West Department of Education																												
Project Leader/Supervisor: Prof N Mavetera																												
Student: ME Tsolo																												
Ethics number:	<table border="1"> <tr> <td>N</td><td>W</td><td>U</td><td>-</td><td>0</td><td>6</td><td>6</td><td>2</td><td>-</td><td>1</td><td>7</td><td>-</td><td>A</td><td>9</td> </tr> <tr> <td colspan="3">Institution</td> <td colspan="4">Project Number</td> <td colspan="2">Year</td> <td colspan="4">Status</td> </tr> </table> Status: S = Submission; P = Re-Submission; P = Provisional Authorisation; A = Authorisation	N	W	U	-	0	6	6	2	-	1	7	-	A	9	Institution			Project Number				Year		Status			
N	W	U	-	0	6	6	2	-	1	7	-	A	9															
Institution			Project Number				Year		Status																			
Application Type: Single Study																												
Commencement date: 2017-08-18	Expiry date: 2020-08-18																											
Risk:	NA																											

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 deviation 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

Digitally signed by
Prof LA Du Plessis

Du Plessis

Date: 2017.09.01
09:55:42 +02'00'

Prof Linda du Plessis

Chair NWU Institutional Research Ethics Regulatory Committee (IRERC)

APPENDIX D

- Permission to Conduct the Study



NORTH-WEST UNIVERSITY
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14 August 2017

TO: The Regional Manager (Department of Education)

Permission to conduct research – Mr. ME Tsolo (PhD Student)

This letter serves to introduce Mr. Tsolo who is presently a registered student for Doctor of philosophy (PhD) programme at the North West University School of Business and Governance (Mafikeng Campus). He is conducting a research project on "A framework to enhance information sharing in the North West department of education" towards a partial fulfillment of his PhD programme.

Mr. Tsolo requires permission to access information, data or even to distribute questionnaires. The research unit of the NWU School of Business and Governance do request your office for assistance to this regard.

Your cooperation will be highly appreciated.

Dr. JN Lekunze
Research Manager
NWU School of Business and Governance





Education and Sport Development

Department of Education and Sport Development
Departement van Onderwys en Sport Ontwikkeling
Lefapha la Thuto le Tlhabololo ya Motshameko

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OFFICE OF THE SUPERINTENDENT-GENERAL

Msgr. M. L. J. Modisane
Tel no. 018 388 3429

To: **Dr JN Lekunze**
North West University Mafikeng Campus
Faculty: School of Business & Governance

15 August 2017

From: **Ms S Semaswe**
Acting Superintendent General

REQUEST TO CONDUCT RESEARCH: MR ME TSOLO

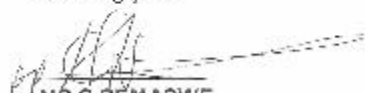
Reference is made to your letter regarding the above matter. The content is noted and accordingly, approval is granted to your kind self to conduct research as per your request, subject to the following provisions: -

- That you contact the relevant District Managers of your target schools about your request and this letter of permission. In this regard you have my consent to contact

M. B. Moria at: 018 388 3383	Ngaka Modiri Molema District
Ms P Mokhele at: 014 590 4802	Bojanala District
Ms M Thejane at: 053 928 0200	Dr Ruth Segomotsi Mompati District
Mr H Motara at: 018 289 6264	Dr Kenneth Kaunda District
- Considering that your research will involve both Educators and Learners, the general functionality of the school should not be compromised by the research process.
- That participation in your project will be voluntary.
- That the findings of your research will be made available to the NW Department of Education & Sports Development upon request.
- That the principle of confidentiality will be observed in its strictest terms in relation to information sourced from such research.

With my best wishes

Thanking you,


MS S SEMASWE
ACTING SUPERINTENDENT-GENERAL



"Towards Excellence in Education and Sport Development"

APPENDIX E

Certificate of Language Editing

29 November 2018

TO WHOM IT MAY CONCERN

CERTIFICATE OF LANGUAGE EDITING

I, Paul Nepapleh Nkamta, confirm and certify that I have read through and edited the PhD thesis entitled: **“A framework for enhancing information sharing in the North West Department of Education, South Africa”** by **M. E. Tsolo**, student number: **16125045**.

M. E. Tsolo was supervised by **Professor Nehemia Mavetera** of the North-West University.

I hold a PhD in English Language and I am qualified to edit academic work of such nature for cohesion and coherence.

The views and research procedures detailed and expressed in the thesis remain those of the researcher/s.

Yours sincerely



Paul Nepapleh Nkamta (PhD; MA; PGCE; BA Hons)

Tel: 018 389 2895

Cell: 073 970 7514

MAFIKENG CAMPUS

Private Bag X2046 Mmabatho South Africa 2735 Tel: (018) 389-2895