A CRITICAL ANALYSIS OF HOW DIGITAL LIBRARIES/E-RESOURCES CAN SUPPORT LEARNING AT RURAL BOARDING SCHOOLS' DORMITORIES IN ZIMBABWE

BY

SIMON CHIGEZA

[R181266Q]

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTER DEGREE IN BUSINESS ADMINISTRATION (MBA)

GRADUATE SCHOOL OF MANAGEMENT

FACULTY OF COMMERCE

2020

SUPERVISOR: PROFESSOR GABRIEL KABANDA

APPROVAL FORM

The undersigned certify that they have supervised the student **Simon Chigeza**dissertation entitled, '**A critical analysis of how digital libraries/e-resources can support learning at rural boarding schools' dormitories in Zimbabwe'**, submitted in partial fulfilment of the requirements for the Master degree in Business Administration (MBA).

…… **……/……./…….**

Student **Date**

…… **……../……./…….**

Supervisor **Date**

…… **……./……./…….**

Chairperson **Date**

RELEASE FORM

Name of Author : **Simon Chigeza**

Dissertation title : **A critical analysis of how digital libraries/e-resources can support learning at rural boarding schools' dormitories in Zimbabwe**

Master degree in Business Administration (MBA), Graduate School of Management

Year Submitted : July 2020

Signed …….

Date July 2020

Permanent Address

DECLARATION FORM

I,**Simon Chigeza**, solemnly declare that the information of this dissertation, prepared in partial fulfilment for the Master degree in Business Administration and submitted to the Graduate School of Management, Faculty of Commerce at University of Zimbabwe has not been presented, submitted or published in this nature or part. Previous works have been duly accredited and acknowledged properly.

_____ _____

(Signature of Student) (Date)

DEDICATION

Dedicated to my Wife, an inspiration to my kids.

ACKNOWLEDGEMENTS

I wish to acknowledge the effort of my Supervisor in making sure the study becomes a success. I also want to extent my gratitude to my fellow students for the encouragement and the entire education community of Mashonaland East in Zimbabwe for their cooperation in the research. May God bless you all.

ABSTRACT

The study was aimed at exploring how digital libraries can support learning in boarding schools at secondary level in rural areas of Zimbabwe. It was motivated by the desire to proffer a solution to the unending degradation of learning efficiency in these institutions as noted by UNICEF (2018). The study was carried out under the main hypothesis that, "The use of Digital Library (DL) positively impacts on learner performance output" and five sub-hypotheses which: H1. There is a relationship between challenges being faced by boarding schools in setting up digital library and learner performance. H2. Availability of technological devices influences learner performance output. H3. Administrative issues influences adoptions of digital library. H4. ICT interventions on digital library has appositive influence on learner performance output. H5. Local administrative support influences digital implementation and learner performance output. Quantitative research was adopted to explore the study using a case study approach in which rural boarding schools and Ministry of Education staff in Mashonaland East Province was the case of interest. The research employed the positivism approach due to its dependency on objective matters which enabled a non-biased quantification of the research findings through use of statistical techniques. The study employed questionnaire as the sole instrument for collecting primary data from a sample of 380 participants selected from a target population of 580 people using the stratified and simple random sampling techniques. The research sample was calculated using the Krejcie& Morgan (1970) table for determining sample size. The sample was comprise teachers, librarians, District Education Office Staff and Provincial Education Office Staff thereby fairly representing the target population. The Statistical Package for Social Sciences (SPSS) version 21 was used to quantitatively analyse the data. For the test of independence, the researcher carried out the Kruskal-Wallis (to see if product innovation is independent of educational level as well as type of industry) and Mann-Whitney tests (to see if product innovation is independent of gender and firm size) since it was for the non-parametric test. A hypothesis testing was done and main hypothesis, H1, H3 H4 and H5 were accepted while H2 was rejected.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

SERIAL	ABBREVIATION	MEANING
1	DL	Digital Library
2	DLMS	Digital Library Management System
3	USA	United States of America
4	SPSS	Statistical Package for Social Sciences

CHAPTER 1
GENERAL INTRODUCTION

1.0 INTRODUCTION

The study aims at exploring how digital libraries can support learning at the boarding schools at secondary level in rural areas of Zimbabwe. The degradation of learning efficiency in these institutions as noted by UNICEF (2018) has motivated the desire to explore the manner in which a technology-based way of providing and managing learning resources can support learning at the boarding schools' living facilities. This chapter seeks to provide a general introduction and background to the study as well as the problem statement. The chapter will also give a view of the research objectives and the corresponding questions. An outline of the research hypothesis will be provided and the significance of the study will also be discussed relative to the stakeholders of the study.

1.1 BACKGROUND

For centuries, the learners at secondary schools have been using printed information sources as reading material (Mulhern, 1959). In the United States of America, publishers have played a key role in the generation of printed information while distributors, booksellers and especially libraries have played a key role in the distribution of information (Gutek, 1991). This defines a form of education and learning resource provision in which the printed material played a key role in the traditional education system.

As technology evolved, the adoption of technology based libraries began to surface (Mulhern, 1959). These early stages of technology adoption in the reading environment saw the coming in of papers of foreseer scientists like Vannevar Bush and J.C.R. Licklider, identifying and pursuing the goal of innovative technologies and approaches toward knowledge sharing as fundamental instruments for progress. The innovations of Bush (1945) saw him develop "a device in which an individual could store all his/her books, records, and communications and which is mechanized so that it may be consulted with exceeding speed and flexibility."

Moreover, if the device had a transparent platen on which longhand notes, photographs, memoranda and other things could be placed. Lack of digital adequate digital support killed the potential of this innovation prompting Bush to innovate improved microfilm for content storage and exchange. Although the technology did not last long, it is recognised as a pioneer work in the birth of digital libraries (Gutek, 1991). This invoked Licklider's works (1965) in which he authored an approach in which computers could play a crucial role in support of digital libraries. In his literature, the computer provides a repository on which the data becomes resident while on the other end, it provides a front end through which the repository could be accessed. This research rests on the desire to improve the findings of these two pioneers and try to analyse the impact of such technology in boarding schools.

The rapid proliferation in the use of the Internet has facilitated the creation and use of electronic resources. The traditional approach whereby a tutor was the only source of information is quickly becoming obsolete as information continues to migrate to the cloud. Students nowadays are thus more empowered and capacitated to not only learn more but also study at their own pace by accessing these resources. Electronic resources, such as e-journals and online databases, now have an edge over the traditional print-based media as they are most likely to contain current information, offer advanced search capabilities, greater flexibility in storage and enable access of information without time and location constraints. DL are thus ideal for studying, learning and researching.

Our schools, community colleges, adult learning centres and universities should be incubators of exploration and invention. Educators should be collaborators in learning, seeking new knowledge and constantly acquiring new skills alongside their students. Education leaders should set a vision for creating learning experiences that provide the right tools and supports for all learners to thrive.

The term digital library, must not be seen as merely a digitized collection of information objects plus related management tools, but as an environment bringing together collections, services, and people to support the full cycle of creation, dissemination, discussion, collaboration, use, new authoring, and preservation of data, information, and knowledge. The major function of libraries,

irrespective of type, is to provide the right materials (resources in all formats) to meet the information needs of users.

Digital libraries should be an integral part of a country's general progress. It is one of the most efficient means of acquiring, organizing and making available on a democratic basis informational and educational materials. A digital library takes books to the people through a network of service points. It reaches the largest and smallest communities and it makes contact with the individual reader. Moreover, digital libraries are capable of bringing greatest riches to the developing mind and such a service has already proved its value in many African countries. Digital Libraries are an indispensable companion to formal education. The digital library must give persons of all ages the chance to keep abreast with their times in all matters.

An efficient and effective library service should be carefully prepared as part of our country's general educational development plan. Planning should be at a national level so as to provide equal standards throughout the country. In the fast- changing circumstances in which we live the desire for the creation of a truly national digital library service is, amongst other things, a primary concern. Nowadays, boarding school dormitories cannot be complete without the backing of digital libraries.

1.2 STATEMENT OF THE RESEARCH PROBLEM

Zimbabwe continues to face serious economic challenges with significant implications on the education system. While the percentage of the national budget allocated to the education sector continues to be high, a huge chunk of it goes towards human resources and very little and if none, goes into digital libraries (UNICEF, 2019). In Zimbabwe, there are serious shortages of textbooks and content for both students and teachers, which is negatively affecting the delivery of education for students (Ibid). This kind of scenario is not favourable to the learners also given the large numbers that the schools enrol. This research seeks to analyse the impact of digital libraries on supporting learning at boarding schools' dormitories in Zimbabwe's high schools. The problem under investigation owes its existence to the shortages of hard copy textbooks as well as the challenges of internet access and bandwidth consumption at these learning

institutions. This study is motivated by the observation that rural boarding schools are isolated from the knowledge economy and continue to operate with students learning with limited resources leading which compromise the quality of their performance.

1.3 RESEARCH OBJECTIVES

The objectives of the study are presented as main objective and sub-objectives which are the specific research objectives that the research seeks to satisfy.

1.3.1 Main objective

To provide a critical analysis of how digital libraries/e-resources can support learning at boarding schools in Zimbabwe's secondary schools.

1.3.2 Sub objectives

The objectives of the research are to:

a. Determine challenges being faced by boarding schools in setting-up and managing Digital Libraries.
b. Develop a conceptual framework for the successful implementation of DL at boarding schools in Zimbabwe's high schools.
c. Determine what policy makers can do about the need for Digital Libraries at boarding schools in Zimbabwe's high schools.

1.4 RESEARCH QUESTIONS

The research questions also fall into two categories namely the main research question and the sub-research questions as explained in the forthcoming sub-paragraphs.

1.4.1 Main research question

How can digital libraries/e-resources support learning at boarding schools in Zimbabwe's high schools?

1.4.2 Sub research questions

The following research questions will be used to guide the information collection process so as to satisfy the research objectives.

a. What are the challenges being faced by boarding schools in setting-up and managing DL?
b. What conceptual framework can be used for the successful implementation of DL at boarding schools in Zimbabwe?
c. How can policy makers establish Digital Libraries at boarding schools in Zimbabwe?

1.5 RESEARCH HYPOTHESIS

Main hypothesis: The use of DL positively impacts on learner performance output.

H_1. There is a relationship between challenges being faced by boarding schools in setting up digital library and learner performance.

H_2. Availability of technological devices influences learner performance output

H_3. Administrative issues influences adoptions of digital library

H_4. ICT interventions on digital library has appositive influence on learner performance output

H_5. Local administrative support influences digital implementation and learner performance output.

1.6 DELIMITATIONS OF THE STUDY

The delimitations of a study refer to the choices that the researcher describing the boundaries that have been set for the study (Leedy, 2010). This study is bound by the following delimitations:

1.6.1 Geographic delimitation

The geographical delimitation restricts the study to a specific physical boundary on the land (Creswell, 2014). This study will focus on schools in Mashonaland East Province. In setting this boundary, the researcher took into consideration the easiness with which the area can be accessed. The chosen area also presence the researcher with a blend of the required institutions of the study which makes it wholesome.

1.6.2 Theoretic delimitation

The research focused on the boarding school dormitories at institutions of learning and as such makes a visit on the theories of learning as well as the theories that guides the provision of digital learning facilities.

1.6.3 Data period delimitation

In the quest for employing data from the latest trends in the education sector and in particular the adoption of digitalised libraries in the learning environment, the research was based on the information from as recent 2015 to date. This therefore restricted the secondary data used in the research only to recent publications and articles.

1.6.4 Participants delimitation

The target population of the research was restricted to five hundred (500) participants comprised of individuals drawn from the various clusters which made the research study population. The study population have been drawn from the stakeholders of boarding schools in the rural areas surrounding Harare.

1.7 SIGNIFICANCE OF THE STUDY

As a new strategy to provide learning the remote communities of the country, it is hoped that the study is of much significance to the following stakeholders:

1.7.1 The learners

Learners are the main stakeholders whom the digital library is expected to benefit directly. This study will benefit the learners through facilitation of the adoption of such a technology at their learning facilities. Through the adoption of digital libraries at boarding schools especially in the rural areas, the learners will have reliable access to e-books which are portable enough and easy to browse through. The ultimate benefit is a diversion from the routine temptation of tending to abuse the internet thereby focusing on other non-academic issues at the expense of studying. Students are generally expected to improve in their pass rates if the findings of the study are effectively implemented.

1.7.2 The teaching staff

The teacher as the assumed body of knowledge is expected to be up to date with latest data on their subject areas of specialisation. In this regard, this research is expected to trigger the adoption of a platform on which the teachers can access latest sources of information which they can use to effectively deliver their lessons. Teachers can equally use the same platform to further their studies at a more convenient process than the traditional brick and mortar libraries.

1.7.3 Boarding schools

The boarding schools in this context, as the service providers are expected to harvest much rewards from the fruits of this research. With the expectation that the research will reveal the benefits of digital libraries as a technology to complement traditional learning systems, the schools will significantly benefit from implementing the technology. Given that boarding schools are also having problems in internet connectivity as well as managing bandwidth consumption

due to misuse of the scarce bandwidth by the students, the model for implementing digital libraries that the study will reveal is expected to provide a useful contribution to the problem at hand. The fact that hardcopy textbooks are expensive to acquire as well as stock will become a thing of the past if the findings of the study are to be implemented effectively given that digital libraries provide a portable manner in which study material can be stocked and managed. Additionally, the study is expected to provide an efficient and reliable way of managing learning resources in the era of new curriculum in which technology has become a mandatory tool for learning.

1.7.4 Policy makers

The Government of Zimbabwe through the Ministry of Primary and Secondary Education designs policies that are implemented to ensure the efficient and effective provision of education to the learners. The findings of this research are going to act as an eye opener to the policy makers given the just introduced new curriculum which is partially technology driven. Given the challenges that have been limiting the flexibility of policy makers in advancing the curriculum or introducing new subjects, the study is expected to bring in a new dimension of resource provision and management which will provide a solution to such challenges.

1.7.5 The researcher

The researcher as the key figure in the process of the research is expected to benefit much in terms of the scope of knowledge in as far as technology-based education resource systems are concerned. The researcher is expected to enrich their positive mentality towards the subject as well as satisfactorily contribute to the overall learning process in the country's education sector.

1.7.6 The publishers of textbooks

Publishers of textbooks are expected to benefit significantly from this research as it intends to invoke policies that encourages the adoption of digital libraries at schools. Through this concept, textbook publishers will increase their textbook distribution at a reduced cost considering the fact

that copies will be digital in nature and need not to be physically distributed to the consumers. Digital libraries provide data on copy usage through logging of downloads statistics which can be used to review and analyse the behaviour of the market for customer analytics purposes.

1.8 DISSERTATION OUTLINE

The research will have five chapters with each as explained in the following sub-paragraphs:

1.8.1 Chapter One

Chapter One is the first chapter of the research study which provided an introduction to the overall study. It covered a general overview of the background to the research problem which gave an account of the origins of the research problem up to its existence. The problem statement was given as well as the purpose of the study and its significance. The chapter also gave an account of the research objectives and the corresponding research questions which gave a basis around which the intention of the research evolved. The hypothesis of the research which confirms the statement that the research seeks to prove has been given in the chapter.

1.8.2 Chapter Two

Chapter Two will focus on the review of existing literature on the domain of learning and digital libraries as a technology in aiding learning. An in-depth analysis of the theories of learning and digital libraries in learning which will pave way for the design of the conceptual framework shall also be done. A focus on the related technologies have also been explored.

1.8.3 Chapter Three

Chapter Three shall focus on the research methodology of the study which will give an outline of the research philosophy and the research design adopted. An account of the instruments used to gather the information required to satisfy the research questions will also be provided. The researcher will also express the procedure used to reach the sample size as well as an insight into

the data analysis procedure. The chapter will wrap up with an explanation of the research ethics abided to during the conduct of the research.

1.8.4 Chapter Four

In Chapter Four, the researcher shall do an analysis of the results on the information collected in Chapter three. The data will be analysed using qualitative techniques while statistical techniques will be used to present the findings graphically. The analysis will be done in line with the research objectives and the hypothesis under testing.

1.8.5 Chapter Five

Chapter Five is the last Chapter of the research which will present the conclusions from the research as well as give a summary of the findings. A detailed analysis of the findings will be done at this stage as well as a proposition of the research findings. Additionally, the researcher will give an insight into the future works.

1.9 CHAPTER CONCLUSION

This chapter discussed the background to the topic which identified and pointed to the origins of the research problem as well as highlighted on the existing efforts to address the identified problem in digital libraries at institutions of learning. The hypothesis which guides the research was spelt out as well as the conceptual framework which defines the variables characterising the research was developed. An account of the crucial components of the research such as the research problem, objectives and research questions, significance of the study as well as its limitations and delimitations were given. Chapter 2 which is the next Chapter will focus on Literature review which provides the theoretical framework and the conceptual framework in details.

CHAPTER TWO
LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter gave a general introduction to the study in which the background of the problem and the problem statement were discussed as well as a brief account of the overall research structure. This chapter focuses on literature review in which the researcher refreshes on work by past researchers as well as articles and journals on the same research topic. The review took a special consideration on the theories of learning and library information usage. The theories are explained in detail with the view of ascertaining how they influence the adoption of digital libraries in schools. The chapter also examined how the technology is being adopted in other countries to improve delivery of education services. A summary of arguments detailing areas of agreement, differences, gaps that characterises the reviewed researches and eventually the empirical cases that have been included are also provided.

2.2 DEFINITION OF PHENOMENON

The key concepts characterising the phenomenon are defined as follows:

2.2.1 Boarding school

Linden Educational Services (2016) defines a boarding school as a college preparatory institution where students and teachers live and study together in a safe and secure campus environment. It is such that the environment provides both learning and accommodation facilities (Gutek, 1991)..

2.2.2 Digital library

A digital library also known as a digital repository or digital collection refers to an online repository containing digital objects of various formats such as text, still images, audio and video as well as digital documents and any other digital media formats (Gutek, 1991). Additionally, digital libraries have the capacity to provide means for organising, searching and retrieving the content they store (Gutek, 1991). Lemon et al (2020) posits that digital libraries can vary immensely in size and scope and are such that the digital content can be stored locally or can be accessed remotely through computerised networks. It is this special connection facility that drives the desire to adopt the digital library at high schools in Zimbabwe.

2.2.3 Electronic resource

An electronic resource is defined as a form of resource which requires the access to a computer or any electronic device that has the capability to deliver a collection of data as a commercially available tittle that has been published with an aim to `being marketed (Hiekkanen, 2010). Electronic resources also known as e-resources are the resources that the digital library will provide to the consumers with the view of improving education quality delivery.

2.2.4 Learner

The learner refers to the child who enrols at a school for the purpose of acquiring knowledge in preparation for college education or post high school life (Hiekkanen, 2010). The success of the learner partially thrives on the availability of learning material which gives him or her adequate sources from which the knowledge base can be enriched.

2.2.5 Ministry

Lexico (2012) defines a Ministry as a department of a Government headed by a Minister with the responsibility of manning a specific arm of the government. This study is sanctioned by the dictate of the Ministry of Primary and Secondary Education.

2.3 UNDERPINNING THEORIES

A theory is a conceptual framework that gives an explanation of the particular occurrences or a given phenomenon (Hiekkanen, 2010). The study considered two categories of theories which are namely, the theories of learning and the theories in library and information systems. These are presented in the subsequent paragraphs.

2.3.1 Theories of learning

The study took to consideration the five main theories of learning which are as indicated in Figure 2.1.

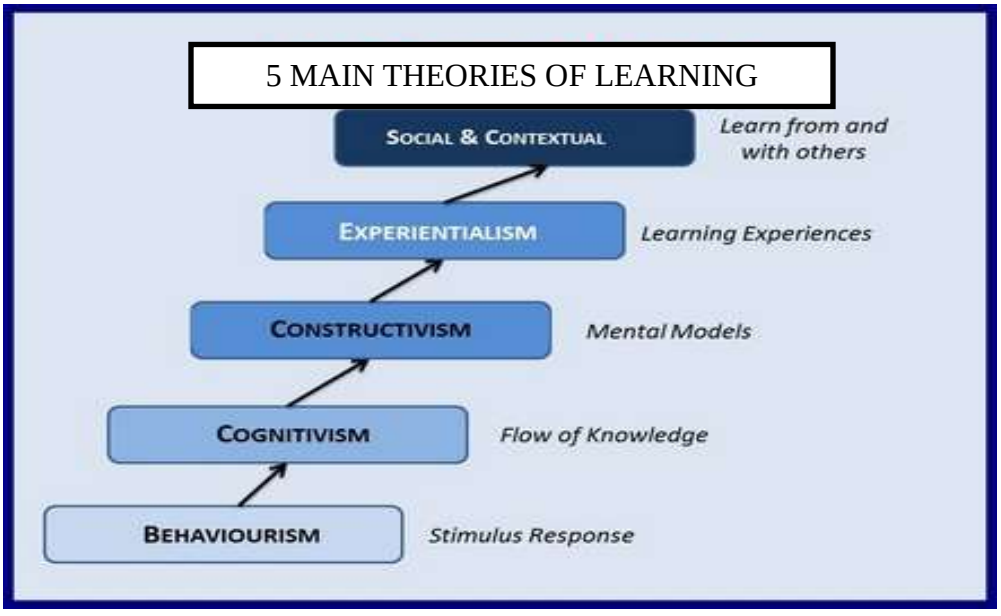

Fig 2.1: Theories of learning

2.3.1.1 Social and Contextual

The Social and Contextual theory of learning entails that, learning does not occur solely within the learner but rather occurs in the group and community in which they reside. It views learning as a shared process which takes place through observing, working together and participating in a larger group comprising of fellow learners with different levels of exposure and experience such that they influence and stimulate each other's development (Gutek, 1991).. Unlike is the case in the cognitivism theory of learning, the theory is designed on the premise that learners only learn from more competent others but puts emphasis on the aspect of belonging to a larger system. As the theory states, the system of learning in this context is made up of the learner, other surrounding learners, the equipment in use, the technologies in use, the procedures that they work with and the overall culture of the workplace.

In his Social Development Theory, Vygotsky (2000) introduced the term 'scaffolding' which served to describe the different forms of support which education service providers can offer learners. Vygotsky's theory stresses that, learning from others with appropriate skills and technologies is critical in the success of a child. As suggested, the use of technology can provide a platform on which students can be guided through explanation, demonstration, work and can attain higher levels of thinking provided they are guided by someone who have a higher skill and competence in the field of study.

The Social and Contextual learning theory emphasises the role of technology in the progress of education provision. The learners who are exposed to technology have a higher probability of succeeding in their studies. The use of digital libraries is expected therefore to improve the learning environment through the provision of a technology that the students can harness in harvesting the data necessary to fulfil the curriculum requirements.

2.3.1.2 Constructivism

The constructivism theory of learning stresses that, learning is not a stimulus-response phenomenon but rather thrives on self-regulation and the development of conceptual structures

through reflection and abstraction. The theory states that, the learner plays an active role in developing his own knowledge base rather than receiving inheriting it from someone with the knowledge. Constructivists therefore state that, the learner interprets information from a unique personal perspective hence requires an opportunity to practice such. It is crucial to recognise the cognitive aspects of learning whose major emphasis of constructivist theory is situated learning which infers to contextual learning. Contextual learning requires that, material be placed in a recognised situation and takes account of the learner's beliefs and conceptions of knowledge. As outlined by Boethel and Dimock (2000), constructivism thrives on six assumptions which are as follows:

a. Learning is an adaptive activity
b. Learning is situated in the context where it occurs
c. Knowledge is constructed by the learner
d. There is resistance to change
e. Experience and prior understanding play a role in learning
f. Social interaction plays a role in learning

The use of digital libraries in the high school learning institutions prepares a learning environment for the learners on which they can construct their knowledge base from their own understanding. It provides a platform on which learners will explore their own potential through navigating past the technology remotely. The use of digital technology also extents time for students to research and construct additional knowledge to the one they acquire during formal classes.

2.3.1.3 Cognitivism

Tolman (1920) conducted a study with rats that suggested that rats knew how to navigate a maze in which they were put because they had a mental map of it. Accordingly, Tolman asserted that behavior was not an automatic response but it had purpose and direction and occurred without reinforcement. He was of the opinion that motivation was key in transmuting expectations into behavior. It was for these reasons that, "Tolman's system was often justly treated as a precursor of contemporary cognitive psychology" (Greenwood 1999, 9).

“The dominant aspects of cognitive theory involve the interaction between mental components and the information that is processed through this complex network.” (Neisser, 1967, p.23). As people learn, they actively create cognitive structures which determine their concepts of self and the environment (McEntire, 1992). “Cognitive theorists believe that learning involves the integration of events into an active storage system comprising organizational structures termed schemata” (Baron & Byrne, 1987). Schemata has various functions in human cognition. They store information in long-term memory, they formulate frameworks into which new information should fit into in order to be understood. Schemata also control attention, organise searches of the environment, and "fill in the gaps" during information processing (Bell-Gredler, 1986, p. 160). According to Baron & Byrne (1987). the mind uses schemata to selectively organize and process all the information individuals receive from the world.

2.3.1.5 Behaviourism

Behaviourism is a teacher-centred instructional framework which has dominated educational settings, shaping every aspect of curriculum and instruction. The behaviourism theory is one of the oldest learning theories and according to Watson (1913) behaviourism is a function of external interactions whereby a stimulus leads to a response. Skinner (1990) is of the opinion that that aim of behaviourism is to modify the environment so as to reinforce the kind of behavior that benefits everyone.

2.4 IMPORTANCE OF THE SUBJECT

2.4.1 The concept of a library

According to Edehart (2010), "A library is a collection of resources in a variety of formats that is (1) organized by information professionals or other experts who (2) provide convenient physical, digital, bibliographic, or intellectual access and (3) offer targeted services and programs (4) with the mission of educating, informing, or entertaining a variety of audiences (5) and the goal of stimulating individual learning and advancing society as a whole." (p.1)

2.4.2 The traditional view of a library

Traditionally, libraries are a collection of books, journals, manuscripts, other sources of recorded information. The collection of the traditional libraries consists mostly of print media.

2.4.3 Digital library

Following the advancement of science and technology, the education sector has experienced an accelerated growth of information leading to an explosion in the volume of learning information being generated. The information is such that it comes in various formats but still requires the learner to conceptualise and grasp so as to excel in their studies. The large volumes of information have created the challenges of space in the traditional libraries such that the virtual library has become an effective alternative. The digital library technology that serves to relieve the traditional library of the pressure for space comes with the following features:

- CD-ROMs and Digital Video Disk Read Only Memory (DVDROMs)
- Networking of Computers
- Image/Text compression
- Multimedia technology
- Powerful processors

The revolution in the technology sector such as the use of the internet of things backed by cloud computing has enabled the creation of digital library information centres. The digital library is such that it functions through the use of multimedia information databases that provides easy retrieval and access of digital information using computers or any other compatible device that is connected on a network. It is through this, that the concept of a digital library came to existence. The problem of textbook loss as well as pressure on the limited reading material is solved while the portable searching of information is made effective and efficient through the use of global indexing and search engines.

A digital library as a collection of textual, numeric data, scanned images, graphics, audio and video recordings that provides access to digital collection for easy of retrieval of information to the users is characterised by the following:

- access to information is facilitated by digital means
- reading material is digitised, compressed and stored in textual/numeric, audio, video or graphic form.
- it is time saving as viewed from the learner's perspective.
- Computers play a pivotal role in driving the search and access process.
- it is geographically distributed through creating the concept of world as a global village
- it has a facility of alerting users based on their subject interests.
- It has four major components as illustrated in Figure 2.2.

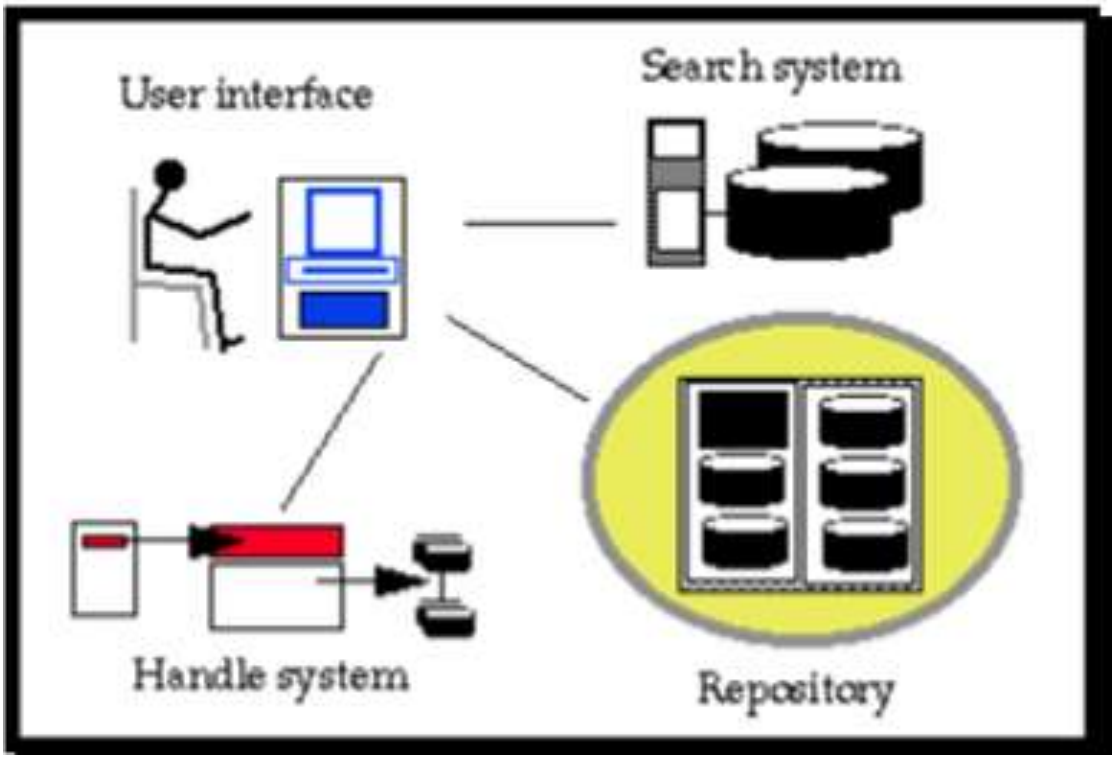

Figure 2.2: Major components of a digital library

a. User Interface

The user interface provides a panel through which the user manipulates the underlying instructions of the system. It also provides a platform on which the user can visualise the extracted digital files.

b. Handle system

The handle system is like a manager which manages the digital library system. It saves the same purpose like physical librarian. It allocates and de-allocates the digital library resources. It ensures access is granted to those who have legitimate access rights and denies those who are not authorised accordingly.

c. Repository

A repository is a storage system also known as a database which provides space on which the digital material is resident. It saves the same purpose as the traditional brick and mortar library in which the hard copy textbooks were housed. In this context, the repository provides digital shelves on which to store the digital textbooks.

d. Search system

The search system is a software through which the users access the stored information in the data repository. It makes use of digital addresses to search the digital information.

2.5.4 Digital libraries in high schools in developed countries

2.5.4.1 Digital library in the United States of America

A study by UNESCO (2007) shows many initiatives towards the development of digital libraries to assist in teaching and learning. In 2014, a digital library program was rolled out in the state of

Florida in the United States of America which saw a number of schools. Similar programs were also carried out in since then. According to the Washington Post (2019), some new schools in that are being built in the United States have no library facilities but just computer rooms that learners can use to access digital resources.

2.5.4.2 Digital library in the Australia

The National Library of Australia and Cool Australia are Organisations offering digital library services to Australian learners of different grades and on different subject areas. According to Cathro (2007), "The libraries of Australia have been active in recent years in planning and implementing major digitization projects."

2.5.5 Digital library in high schools in developing countries

The Government of Uganda through the Ministry of Education launched its pioneer digital library through a joint effort with Cyber School. The project saw the provision of computers to the country's government schools. Cyber School provided the technology as well as train and implement the digital science products. The project however, came with a limitation on the number of subjects it covered. Only four science subjects were enrolled to the digital library system which only existed at only five of the schools in the country. The major challenges to the spread of the technology across the country were internet connectivity, electricity, knowledge and the availability of compatible devices on the user side which limited their ability to access the digital resources. As Lating (2009) noted, the schools which managed to employ this technology were Muni, Ediofe and Makerere College for Advanced Level Physics and Mathematics; Sibatya for English and Gayaza in many subjects. However, Norton et al (2010) highlighted that these learning institutions did not make their learning material open for copying, re-use or even allow users to download them making it difficult for learners to access the material off the net. This lack of portability in accessing the material characterises the e-learning environment of most learning institutions in the developing countries and needs to be addressed if the technology based library system is to be used as a solution to the textbook challenges in schools (ibid).

2.5.6 Digital libraries in Zimbabwe's high schools

Digital libraries are most common in institutions of higher learning in Zimbabwe. Part of this research is to determine whether there are any high schools that have adopted digital libraries, determine the model upon which the libraries were built and improve on any shortcomings of these implementations.

2.6 DISCUSSION OF EXISTING MODELS

2.6.1 Digital library models

The existing models for digital libraries are as discussed in the following paragraphs:

2.6.1.1 Delos Digital Libraries Reference Model

The DELOS Digital Library Reference Model is a conceptual framework which was designed to identify crucial entities in digital libraries and how they relate to each other. The objectives of DELOS are to "define unifying and comprehensive theories and frameworks over the life-cycle of DL information and to build interoperable multimodal/multilingual services and integrated content management ranging from the personal to the global for the specialist and general population" Casarosa (2007).

The DELOS model comprises six domains which are described below.

i. **Content**. This domain represents the information stored and managed in the digital library. Content can be documents or multi-media files.
ii. **User**. These are the people who interact with the system.
iii. **Functionality.** This domain defines the facilities which will be made available to ensure that the DL offers the services required of it.

iv. **Policy.** These are the rules that govern the operation of the digital library. Examples of policies include acceptable, access rights and privacy.

v. **Quality** – represents the aspects of digital library systems to be considered from a quality point of view and general functionality of the system.

vi. **Architecture**. This domain represents how software and hardware elements will be implemented to tie up the whole system. The DELOS model makes use of a three tiered framework.

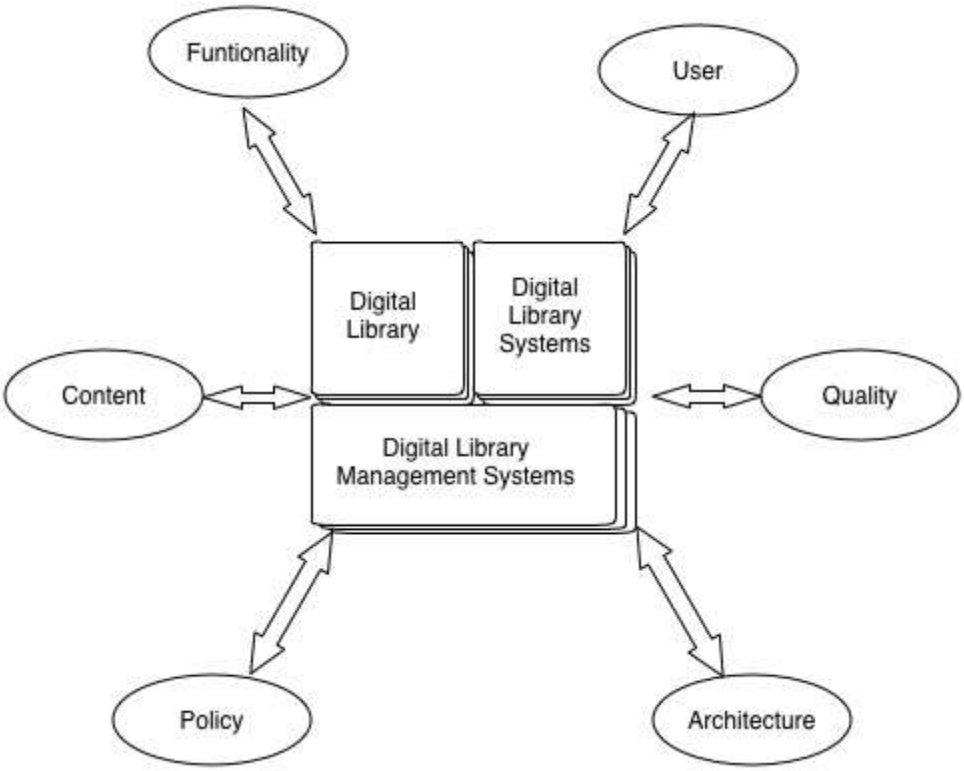

Figure 2.1 DELOS Reference Model

The Digital Library Management System (DLMS) is software that provides the basic functionality of the digital library. The, Digital Library System (DLS) provides specific functionality to the digital library. The Digital Library (DL) according to Murthy (2010), "is understood as an organization collecting and preserving digital content and giving access to it". Candela (2007) is of the opinion that since its conception DELOS Reference Model has made significant contributions in the defining of essential Digital Library concepts and relationships

2.6.1.2 The 5S Theory

The 5S Theory is "a product of efforts aimed at providing theoretical and practical unification of digital libraries" (Abdulmumin, 2003, p.17). It provides a basis for defining a digital library through five l abstractions namely Streams, Structures, Spaces, Scenarios, and Societies. According to Murthy (2007), the 5S theory defines a "core or a minimal DL, i.e., the minimal set of components that make a DL, without which a system/application cannot be considered a DL".Table 2.1 shows how the 5S theory can be used to describe key components of a digital library.

Table 2.1 The 5S Theory

5S	*Examples*	*Objectives*
Streams	Text; video; audio; image	Describes all types of content, as well as communications and flows over networks. Streams describe properties of DL content such as encoding and language for textual material or particular forms of multimedia data.
Structures	Collection; catalog; hypertext; document; metadata	Specifies organizational aspects of the DL content, that is, the way in which parts of a whole are arranged or organized. Structures can represent hypertexts, taxonomies, system connections, user relationships, and so on.
Spaces	Measurable distance; spatial, topological, vector etc.	A space is a set of objects together with operations on those objects that obey certain constraints. Spaces define logical and presentational views of several DL components, and can be of type measurable, measure, probability, topological, metric, or vector space.
Scenarios	Searching, browsing, recommending	A scenario is a sequence of events that also can have a number of parameters. Events represent changes in computational states; parameters represent specific variables defining a state and their respective values. Scenarios detail the behavior of DL services.
Societies	Service managers, learners, teachers, archaeologists, etc.	A society is "a set of entities and the relationships between them" and can include both human users of a system as well as automatic software entities which have a certain role in system operation. Describes managers, responsible for running DL services; actors, that use the services; and relationships among them.

According to Doerr (2007), "abstractions provide a formal foundation to define, relate, and unify concepts in the DLs. They are used to define other DL constructs such as digital objects, metadata specification, collection, repository, and services". Scenarios, according to Gonçalves (2004), consist of "sequences of events or actions that modify the states of a computation in order to accomplish a functional requirement" (p. 2

2.6.2 Comparison of DELOS Reference Model and 5s Theory

The DELOS Reference Model was designed to be a guide enabling digital library communities to use the same guidelines in dealing with the entities of the digital library universe (Innocenti et al. 2011). The 5S Theory was built on principles of the DELOS model so as to provide a basis for defining digital libraries thereby achieving theoretical and practical unification. The two models have similar objectives which are to provide a standardised framework for digital library projects. "The methods employed in the presentation of DL frameworks are quite different, though their concepts still address the core components of DLs. While 5S Theory applies a rigorous definition of various concepts to DLs, the DELOS model focuses on identifying the main concepts and relationships encompassing the entire digital library. This is opposed to the 5S definition of individual DL aspects in terms of abstract entities, and these five levels of abstraction and their associated formalisms also render it difficult to adopt due to the complexities involved" (Phiri, n.d.). According to Fox et al (2003), the DELOS model lacks "strong emphasis on social aspects of digital libraries compared to 5S Theory". The six domains in the DELOS model cover certain aspects that are not clearly described in the 5S main constructs. The 5S theory provides a separate framework for quality and policy management.

2.6.3 Current model of library in Zimbabwe's High Schools

Most high schools in Zimbabwe are using the traditional library system. Physical copies of books are organised using a classification system whereby books on the same topic are shelved together and each book has a unique identifier. Every student in the school is issued a library card which they use to borrow books. Every time a student borrows a book, the information regarding to the book title, its identifier borrows and return date are logged on the student's library card. Upon return of borrowed books, librarians need to log that the books have been returned and return the books in the proper position by making use of the identifiers of the book based on the classification system used.

2.7 Discussion of the key variables

The factors that influence the adoption and successful implementation of an effective digital library in high schools are as discussed in the following sub-paragraphs:

2.7.1 Availability of funds

Implementation of a digital library for schools will require funding for the development of the system.This cost can however be borne by the government and or by private players. Schools however would need to make sure that they have the requisite infrastructure to make use of the digital library. Availability of funds to procure computers, networking equipment and Internet services will determine adoption of digital library facilities.

2.7.2 Technical expertise

The implementation of a digital library requires experts in the fields of software development and databases. Zimbabwe has a large pool of experts that are capable of rolling out such projects. From research, educational institutions that have adopted digital libraries are mostly intuitions of higher learning. This makes it evident that the same can be adopted for use in rural high schools.

2.7.3 Students resource challenges

The biggest challenge that students will likely face is lack of resources. Most rural boarding schools in Zimbabwe are inadequately equipped with ICT infrastructure for students thus there may not be enough computers for students to make use of the digital library.

2.7.4 Knowledge

In a study conducted by Zainab (2010) on Digital Libraries and the classroom in the USA, the researchers' objectives were to investigate secondary school teachers' understanding of digital libraries and their relationship with learning. The study revealed that teachers did not understand the concept of digital libraries therefore were not in a position to encourage the adoption of such systems for their learners. Such is likely to be the case with Zimbabwe. Teachers may not be ready to embrace and adopt digital libraries because of lack of knowledge.

2.7.5 Law

There are laws that govern the use and publication of Intellectual Property. Navigating the landscape of proper use of IP may pose challenges in adopting digital libraries. "Digitization projects are commonly scoped with a view to avoiding potential infringement of copyright, or avoiding the complexities that arise from uncertainties in this area. For example, libraries may seek to avoid copyright issues with future digitization projects by negotiating permissions at the time of acquisition" Cathro (2007, p.9).

2.8 LITERATURE SYNTHESIS AND CONCEPTUAL FRAMEWORK/MODEL

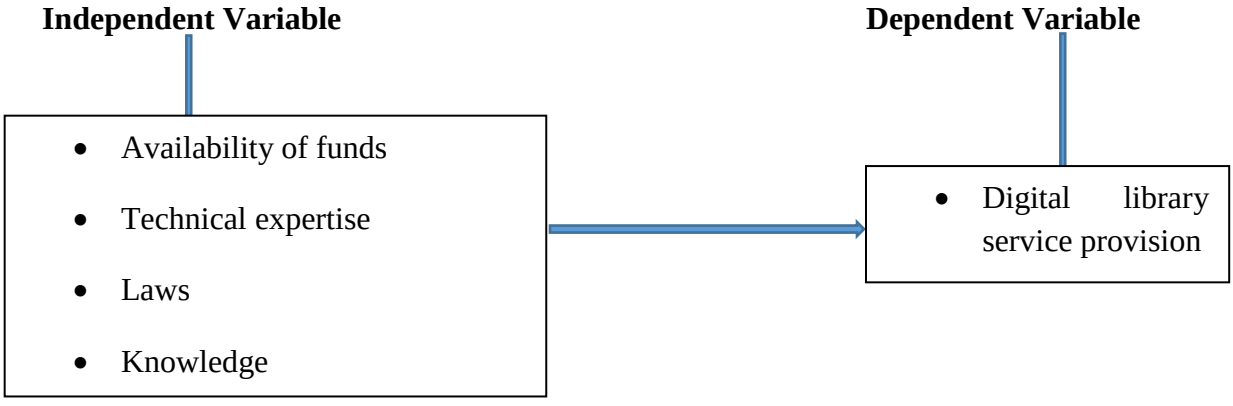

Figure 2.2: Literature synthesis and conceptual framework.

2.9 RESEARCH PROPOSITIONS/HYPOTHESIS

Main hypothesis: The use of DL positively impacts on learner performance output.

H1. There is a relationship between challenges being faced by boarding schools in setting up digital library and learner performance.

H2. Availability of technological devices influences learner performance output

H3. Administrative issues influences adoptions of digital library

H4. ICT interventions on digital library has appositive influence on learner performance output

H5. Local administrative support influences digital implementation and learner performance output.

2.10 CRYSTALLISATION OF RESEARCH QUESTIONS

The review of related works aided in answering some of the research questions. Sub research question (a.) which seeks to determine the challenges being faced by boarding schools in setting-up and managing DL in Zimbabwe was not adequately addressed by the review of literature. Data collection tools in the form of interviews and questionnaires will be use go gain more insights on the challenges faced by boarding schools in setting-up and managing digital libraries.

Sub-research question (b.) of this study is to determine the conceptual framework that can be used for the successful implementation of DLs at boarding schools in Zimbabwe. The literature review uncovered two frameworks that are used in the development of DL which are the DELOS and the 5S theory frameworks. Some knowledge gaps were also revealed during the literature review there this study will be designed in order to fill in those gaps.

Sub-research question (c.) which seeks to determine what policy makers can do regarding the need for Digital Libraries at boarding schools in Zimbabwe. In order to address this research question, questionnaires and interviews need to be conducted.

2.11 INDICATIONS OF RESEARCH METHODOLOGY

McMillan and Schumacher (2010) describe research methodology as “a systematic, purposeful and planned to yield data on a particular research problem” (p.34). William (2011) also defines research methodology as “a range of tools that are used for different types of enquiry” (p.7). To yield fine results, the nature of the research has to be considered when coming up with a methodology. And abductive approach which makes use of quantitative and qualitative methods will be used in this study. Research instruments that will be used to gather data are interviews and surveys.

2.12 CHAPTER CONCLUSION

This chapter examined the works of other researchers relating to the use of digital libraries in high schools. The various theories that relate to learning where explored. The DELOS and 5S frameworks for the development of digital libraries were examined. The findings in the review of literature point to the low adaptation of digital libraries in Africa compared to America and Australia. The following chapter, chapter 3 will detail the methodological approach taken in this study.

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 INTRODUCTION

Chapter Two focused on the review of existing literature on the concept of learning as proposed by various theories as well as the aspect of libraries with a particular focus on digital libraries as a modern technology in the library services. This chapter chronicles the procedure taken by the researcher in carrying out the research. It gives an account of the research design, the research philosophy, research strategy, research approach as well as the justification to the research design and approaches adopted. Additionally, the chapter gives a detailed explanation on the population of the study, the methods used in sampling, research instruments used, procedures for data processing and data analysis coupled by a justification for their adoption. The validity and reliability of the study and the ethical issues considered in carrying out the research are also outlined.

3.1 RECAP OF MAIN RESEARCH AIMS, OBJECTIVES AND QUESTIONS

The study is guided by the following objectives and questions:

3.1.1 Main objective

To provide a critical analysis of how digital libraries/e-resources can support learning at boarding schools in Zimbabwe's secondary schools.

3.1.2 Sub objectives

The study's main objective was supported by the following sub-objectives:

a. Determine challenges being faced by boarding schools in setting-up and managing Digital Libraries.
b. Develop a conceptual framework for the successful implementation of DL at boarding schools in Zimbabwe's high schools.
c. Determine what policy makers can do about the need for Digital Libraries at boarding schools in Zimbabwe's high schools.

3.1.3 Main research question

How can digital libraries/e-resources support learning at boarding schools in Zimbabwe's high schools?

3.1.4 Sub research questions

The study's sub research questions are as follows:

a. What are the challenges being faced by boarding schools in setting-up and managing DL?
b. What conceptual framework can be used for the successful implementation of DL at boarding schools in Zimbabwe?
c. How can policy makers establish Digital Libraries at boarding schools in Zimbabwe?

3.1.5 Research hypothesis

Main hypothesis: The use of DL positively impacts on learner performance output.
H1. There is a relationship between challenges being faced by boarding schools in setting up digital library and learner performance.
H2. Availability of technological devices influences leaner performance output
H3. Administrative issues influences adoptions of digital library
H4. ICT interventions on digital library has appositive influence on learner performance output
H5. Local administrative support influences digital implementation and learner performance output.

3.2 RESEARCH DESIGN

Research design refers to a systematic conceptual structure which provides an outline of how a research would be conducted (Sunders, 2016). Leedy (2010) posits that, research design can either be exploratory, explanatory or descriptive. In the case of an exploratory research design, the researcher seeks to understand a problem that has not been studied or explored before or is such that, it has been explored by not as much to provide enough details on its nature and existence (ibid). On the other hand, descriptive research describes the variables under study without giving insights into the causes of the situation because the researcher has past knowledge of the variables under study (Creswell, 2012). It therefore provides an answer to the research questions excluding the hypothesis testing while the explanatory research intends to investigate the cause-effect relationship between variables under scrutiny (ibid). Leedy (2010) infers that, the explanatory research design is centred on confirming or disconfirming a given theory and is carried out in an environment where the variables are clearly defined. This study therefore, adopted the explanatory research design with the motive of providing a framework for the adoption of digital libraries in high schools as well as giving an account of how the independent variables are influencing the adoption of digital libraries in the schools.

3.3 RESEARCH PHILOSOPHY

Saunders (2019) defines research philosophy as a system of beliefs and assumptions that relate to the development of knowledge on a particular phenomenon. It marks a procedural sequence of thought that guides the researcher as they build knowledge about on the research topic under study (ibid). Creswell (2012) stresses that, despite carrying out a study on a topic that has already been researched on, the researcher is still bound to develop a new set of knowledge, hence the need to adopt an appropriate research philosophy that is guided by the area of study.

Research philosophy can be viewed as a basic belief system which gives a world view guideline to researchers as they investigate the issues characterising the phenomenon under research (Flick, 2011). In this regards, research philosophy does not only provide guidelines to

investigations with respect to choices but also in ontological and epistemological fundamental ways (ibid).

3.3.1 Ontological Beliefs

Ontological research can be defined as the science or study of being, which deals with the nature of reality (Bryman, 2011). It is a system of belief that reflects an interpretation by a researcher with regards to what makes up a given fact under investigation. Saunders (2019) posits that, ontology is associated with a central question of whether social entities should be perceived as objective or subjective; hence, objectivism and subjectivism are important aspects of ontology (Creswell, 2014).

Objectivism depicts the position that social entities exist in reality external to social actors concerned with their being (Flick, 2011). It is also argued that, objectivism is an ontological position that proclaims that social phenomena and their meanings have an existence that is divorced from social actors. While this is the position of ontology, subjectivism on the other hand, perceives that social phenomena are developed from the perceptions and consequent actions of those social actors concerned with their existence (ibid). Subjectivism is also known as constructionism or interpretivism. Blaikie (2010) posits that, constructionism can be defined as the ontological position which avows that social occurrences and their significances are persistently being accomplished by social actors.

3.3.2 Epistemological Belief

Epistemology research philosophy is a branch of philosophy that deals with the sources of knowledge (Kumar, 2009). Saunders (2019) further asserts that, epistemology is concerned with the possibilities, nature, sources and limitations of knowledge in the field of study. Therefore, epistemology can be viewed as a way of thinking opposite ontology. The adoption of epistemology is driven by the desire to establish one truth about the subject under investigation (ibid).

It is this desire to establish the single source of truth with regards to the ways through which digital libraries can support learning at rural boarding schools that this research has employed the epistemological philosophy of research. The researcher has therefore employed scientific research mechanisms to collect information that satisfies the research questions. To this effect, the study made use of structured questionnaires characterised by close-ended questions that required the respondents to express their response by selecting an appropriate response out of the given. This eliminated opinions from the respondents which have room for subjectivity while providing responses that can be analysed statistically in a bid to prove the hypothesis of the study.

3.4 RESEARCH PARADIGMS

A research paradigm is a set of commonly held beliefs and assumptions within a research community about ontological, epistemological, and methodological concerns (Johannesson P, 2014). There are three main types of research paradigms namely positivism, pragmatism and interpretivism (ibid). Saunders (2019) asserts that, the positivism paradigm is based on a belief in objectivism and is as such fact dependent. Interpretivism on the other hand, is subjective in nature and relies on opinions, attitudes and feelings of respondents which make it inductive in reasoning. The pragmatism paradigm also known as the realism adopts a mixed approach in that complementarily applies both positivism and interpretivism approaches. It as such is both quantitative and qualitative in nature. This research employed the positivism approach due to its dependency on objective matters. This enables a non-biased quantification of the research findings through use of statistical techniques.

3.5 RESEARCH APPROACH

Research approach defines the logic of reasoning as well as using existing knowledge to draw conclusions, make predictions as well as construct explanations about a research phenomenon (Bryman, 2011). Saunders (2019) identifies three methods of reasoning which are, the deductive approach, inductive approach and the abductive approach. Deductive reasoning is an approach which moves from the general rule to the specific application. It is such that, if the initial

assertions are true, then transitively, the conclusion should also be the same. Inductive reasoning on the other hand is driven by specific observations that are limited in terms of scope, hence, proceeds to a generalized conclusion that is functionally driven by accumulated evidence. Inductive reasoning therefore moves from the specific to the general (ibid). The third approach which is the abductive reasoning is characterized by an incomplete set of observations and thrives to reach the most possible explanation for the observations under review. This research adopted an abductive approach in which the researcher made observations that were analyzed to come up with the best possible explanation to the impact of implementing digital libraries at boarding schools in rural areas.

3.6 RESEARCH STRATEGY

Saunders (2019) defines a research strategy as methodologies that aids the researcher in investigating the research problem as well as develop a research plan that systematically satisfies the research questions. A research strategy could be either quantitative or qualitative (ibid). Creswell (2012) identifies quantitative research strategies which includes experiments, surveys and case studies. This research applies the use of rural boarding schools as a case study to satisfy the research objectives. The case study focused on evaluating the current library system being implemented in the rural boarding schools so as to create an understanding of the current situation. It also collected the information regarding the challenges being faced by schools in adopting technology based library systems in their premises as well as elicited for information that aid in the adoption of e-libraries at the rural schools.

3.7 RESEARCH INSTRUMENT

Research instruments refer to a set of tools used to obtain; measure and analyse data from subjects of a topic under study (Saunders *et al*., 2019). The selection of a research instrument is largely dependent on the research method adopted as it will affect the reliability and validity of the research findings (ibid). While there are various instruments that can be used to collect information about a research topic under investigation, this research employed the questionnaire as the sole instrument for collecting primary data from the subjects of the research.

3.7.1 QUESTIONNAIRE

Creswell (2014) defines a questionnaire as a research instrument that consist of a collection of questions and other related prompts specifically designed to elicit for responses from the respondents in a bid to satisfy a given research objective.

3.7.1.1 Questionnaire design

The questionnaire was designed in a structured manner which according to Creswell (2014), is one with a rigid set of responses from which the respondent ticks off a 'Yes' or 'No' answer or select the one appropriate from a list of provided options. The questionnaire therefore restricted the respondents to the responses provided on the questionnaire which produces a finite set of responses that can be quantitatively analysed.

3.7.1.2 Questionnaire distribution

Distribution of questionnaire relates to the way through which the questionnaire reaches the desired respondents(Saunders *et al*., 2019). Questionnaires can be distributed either physically or electronically through technologies such as electronic mails as well as over the telephone (ibid). The questionnaires for this research were distributed to the targeted respondents through electronic mails and over the WhatsApp. This was mainly facilitated by the desire to comply with the regulations gazetted by the Government to contain the spread of the COVID-19 pandemic, among which includes restriction on movement.

3.7.1.3 Advantages of questionnaire

Employing the questionnaire research instrument provided the following advantages to the research process:

a. The use of questionnaires allowed the researcher to collect information from a large number of respondents within a short period of time which could have been possible by employing other instruments such as interviews.
b. Given the fact that respondents were given time to respond to the questionnaires according to their own schedules, the instrument provided a convenient and effective way of eliciting responses by not hurrying the respondents. This also ensured that respondents took their time to fill in the questionnaires at their own pace.

c. The use of questionnaires also helped in eliminating the element of subjectivity that could have arisen from the influence of the researcher as the respondents were allowed to express their objective opinions independent of the researcher. This helped in assuring that the results were valid and solely a function of the respondents' own thoughts.

3.7.1.4 Disadvantages of questionnaire

Despite having enjoyed the previously identified advantages from the questionnaire, the instrument also had also a disadvantage in the sense that, it did not allow the respondents to justify their answers. This is so due to the fact that the respondent only chooses the responses from a given set of predefined answers. The researcher therefore had to use statistical analysis to address the element of passive subjectivity that might arise as a result.

3.8 DATA COLLECTION METHODS

Saunders (2009) identifies two sources of research information namely, primary and secondary sources. The research used information collected from both primary and secondary sources.

3.8.1 Primary data collection

Primary data is a type data that researchers collect directly from the main sources through use of appropriate research instruments. It is such that the data is collected from the source where the data originally originates from and is regarded as the best kind of data in research (Bryman, 2011). Creswell (2012) stresses that; primary data is mainly gathered through interviews,

questionnaires and focus groups. This research solely employed questionnaires to collect the primary data required to satisfy the research questions.

3.8.2 Secondary data collection

Secondary data is the data that has already been collected through primary sources and made readily available for researchers to use for their own research (Flick, 2011). It is a type of data that has already been collected in the past. Such type of data can be collected from books, online publications, journal articles, magazines, newspapers and any other form of related literature that existed before the topic under study from which a researcher can take reference material. This research used secondary literature drawn from newspapers, books on digital libraries, online journals as well as white paper publications related to implementation of digital libraries in schools.

3.9 POPULATION AND SAMPLING TECHNIQUES

The study is quantitative in nature which narrows its crucial objective on generalizing the findings of the study to the whole population from a given sample. To this effect, the population and sample of the study are as explained in the subsequent paragraphs.

3.9.1 Target population

Target population refers to the entire set of entities for which the survey data are to be used to make inferences; hence, it defines those units for which the findings of the survey are meant to generalize (Lavrakas, 2008). Saunders (2019) emphasizes that; target population should be expressed in terms sampling units, extent, time and the elements involved. These key components are as follows:

a. Element

This entails the object from which the required information is collected. Thus, for this research, the respondents are made up of all the members of staff in Ministry of Education in high schools and district administrations in Mashonaland East province of Zimbabwe.

b. Extent

The extent is functionally defined by the geographical boundaries of the study, which in this case are the physical boundaries of the area serviced by Mashonaland East Education Provincial Offices.

c. Sampling unit

This defines the elements that are present for selection into the set of the participants at a given stage of the process of sampling.

d. Time

The time factor functionally defines the period under consideration. This research took into consideration members of the staff and leaners who have been at sampled schools for at least two consecutive academic years.

The composition of the study population is as indicated in Table 3.1.

Table 3.1: Composition of the study population (*Source: Researcher compilation*)

SERIAL	**Respondents description**	**Target population**
1	Librarians	30
2	Teachers in public schools in Mashonaland East	500

3	Members of staff at the Provincial Education Offices	40
4	Members of staff at the District Education Offices	20

3.9.2 Sampling methods and techniques

The research used probabilistic sampling method in which each element had an equal opportunity of being selected (Creswell, 2014). Stratified sampling was used to subdivide the target population into heterogeneous strata with homogenous characteristics from which elements for the sample population were selected. The stratified sampling method produced five segments as indicated in Table 3.2.

Table 3.2: Target population stratum using stratified sampling

STRATA	**BRIEF DESCRIPTION**
Librarians	Those charged with the responsibility of managing the school libraries
Teachers in public high schools in Mashonaland East	School teachers at the high schools in Mashonaland East Province
Members of staff at the Provincial Education Offices	Education officers at Province level who coordinate and manage school programs within the district reporting to the Ministry of Education
Members of staff at the District Education Offices	Education officers at District level who coordinate and manage school programs within the district reporting to the Provincial Education offices

The simple random sampling method was used to select the individual elements for each category of the respondents. In this case, the researcher initially allocated numbers to the

individuals in the target population while numbers in school registers were used for identifying elements. After this allocation of numbers, the researcher used Microsoft Excel to generate random numbers which match the size required per each category of the respondents. The random numbers were then matched against those in the registers and the allocation list for specific individual identification.

3.9.3 Sample size determination

Saunders (2019) defines a sample as a representative subset of a population from which data about a research phenomenon is collected and then generalised across the whole population from which they were drawn. Creswell (2012) identifies four factors as the key determinants of sample size, which are, the extent to which the sampling error can be tolerated, size of the population, the degree to which the population is varied relative to the characteristics of interest and finally, the smallest sub-group within the population for which the estimates are required. This research took into coginicense the identified four key determinants and as such, Krejcie and Morgan's (1979) table for determining sample size was used. The table provides an easy reference for determining sample sizes for a given population, as such, the researcher took sample sizes (S) from the corresponding population size (N) as provided in the table.

3.9.4 Sample size

The researcher was guided by Krejcie and Morgan (1970), who came up with a table for determining the sample size for a given population for easy reference. In accordance to Krejcie and Morgan, the respective sample sizes of the respondents are as indicated in Table 3.2.

Table 3.2: Respective sample sizes of the respondents using the sample table by Krejcie and Morgan (1970)

SERIAL	Respondents description	Sample (S)
1	Librarians	28
2	Teachers in public high schools in	217

	Mashonaland East	
3	Members of staff at the Provincial Education Offices	36
4	Members of staff at the District Education Offices	19

3.10 METHODS OF DATA ANALYSIS

The researcher used the Statistical Package for Social Sciences (SPSS) version 21 to statistically analyse the data. The data was first cleaned, coded then tabulated and loaded into the statistical software for analysis. Descriptive statistics was then used to analyse the quantitative data as well the use of statistics and inferential analysis. The relationship between the independent and dependent variables will be tested using multiple regression analysis and correlation analysis.

3.11 RESEARCH CREDIBILITY

Credibility refers to the extent to which a research account is believable and appropriate, with particular reference to the level of agreement between participants and the researcher (Bryman, 2011). This study ensured credibility through validity and reliability.

3.11.1 Validity

Bryman (2011) defines validity as the extent to which the results really measure what they are supposed to measure. Validity seeks to prove the key components of the research instrument which are face validity, content validity and criterion validity and construct validity. The researcher ensured the research instrument complies with validity requirements through the use of a pilot study in which the questionnaire was tested using a sample that was not part of the study population and the results were cross checked against the requirement to evaluate their fitness for the purpose.

3.11.2 Reliability

Reliability refers to the consistency of an instrument with regards to the results it produces (M., 2009). It is such that it seeks to confirm that the same results can be reproduced when the research is repeated under the sameconditions. The research reliability was ensured through the use of a structured questionnaire which eliminated the likelihood of bias on the responses collected.

3.12 ETHICAL ISSUES

Ethics in research refers to the set of guidelines characterised by acceptable rules of conduct that serve to regulate the conduct of research process (Resnik, 2007). This research complied with anonymity, beneficence and informed consent as the ethics of interest.

3.12.1 Beneficence

This is an ethic which enforces that the research should benefit the participants, as such; the researcher ensured the research brings a tangible benefit to the participants. This is in the form of improved library services which also increases the level of pass rate at the rural schools in the country.

3.12.2 Anonymity

Anonymity requires that the participants' identity should not be made public, thus, should remain private. The researcher made use of numbers on questionnaires to identify respondents other than using their names. This helped in ensuring that the responses were not linked to any specific individual other than the number.

3.12.3 Informed consent

Informed consent requires that the participants of any research should be informed and their consent be sought before they take part (ibid). The researcher ensured compliance to this ethic by making sure that each respondent signed the consent form before taking part in the research. The form served to inform the participants of the nature of the research and its intentions. It also outlined the conditions of the research.

3.13 CHAPTER CONCLUSION

This chapter gave a recap of the aim, objectives and the research questions which define the purpose of the study. It also provided the research philosophy in which the epistemological belief was adopted. This was facilitated by the desire to establish a single source of truth. The research used the abductive research approach in which the researcher made observations that were analyzed to come up with the best possible explanation to the impact of implementing digital libraries at boarding schools in rural areas. The research is quantitative in nature which therefore required the use of numerical instruments to measure the responses of the respondents. To this effect, the research employed the questionnaire as the data collection instrument. Stratified sampling and the random sampling techniques were used to determine the elements to fit into the sample size. The research also considered ethical issues so as to ensure research compliance with respect to beneficence, anonymity and informed consent. The next chapter will focus on the presentation and analysis of the data collected using the questionnaires with a view of addressing the identified research objectives.

CHAPTER 4: DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 INTRODUCTION

This chapter presents the outcome of the quantitative data analysis together with the findings and detailed discussion thereof. These data analyses, findings and discussion are used to critically analyse how digital libraries/e-resources can support learning at rural boarding schools in Zimbabwe as per the objectives of the study. To begin with, the chapter reports on the response rate to the survey and descriptive statistics which helps to evaluate the representativeness of the effective sample and the quality of data received. Descriptive analysis is used to summarise the data and evaluate the quality of data based on the characteristics of the respondents such as years of experience, position and qualifications. The chapter proceeds to factor analysis, validity tests, reliability tests and normality tests to pave the way for detailed inferential analysis that follow. The Inferential analysis covers correlations analysis, multivariate regression analysis, hypothesis tests and cross tabulations tests. The chapter then presents a discussion of the findings in relation to extant literature before concluding with a chapter summary.

4.2 RESPONSE RATE

The researcher sent online and self-administered telephonic survey questionnaires to a random sample of educationists from the 9 districts in Mashonaland east province. The randomness of sample selection helped the researcher to get better responses. A total of 300 survey questionnaires were distributed to various institutions in the districts that were identified. From the total distributed questionnaires 282 were returned back and found useful by the researcher

giving response rate of 94% which is very good enough to ensure the reliability of research findings. These responses were then analyzed thoroughly in the following sections. The research target Librarians, Teachers in public high schools in Mashonaland East, Members of staff at the Provincial Education Offices and Members of staff at the District Education Office.

Table 4.1: Response rate

Respondents	**Questionnaires circulated**	**Questionnaires returned**	**Unusable questionnaires**	**Response rate %**
Mudzi	30	27	3	90%
Goromonzi	30	29	1	96.7%
Hwedza	44	40	4	91%
Marondera	50	45	5	90%
Kotwa	28	25	3	89.2%
Murehwa	30	30		100%
Mutoko	30	29	1	96.7%
UMP	28	27	1	96.4%
Makaha	30	30		100%
TOTAL	**300**	**282**	**18**	**94%**

4.3 DESCRIPTIVE ANALYSIS

4.3.1 Demographic Descriptive Statistics

This section focuses on the characteristics of respondents which answers Section A of the survey questionnaire. This part of the research instrument required respondents to provide information on their gender, age education qualifications, position and years in that position.

Table 4.2 Demographic Descriptive Statistics

Statistics

	N			
	Valid	Missing	Mean	Std. Deviation
Gender	282	18	1.51	.501
Age	282	18	3.19	1.067
Qualifications	282	18	3.35	.742
Position	282	18	3.08	1.097
Years in Position	282	18	3.01	1.087

4.3.2 Independent Variables Descriptive Statistics

The independent variables of this study comprised five determinants which are challenges in setting up e-library, device in use, administration issues, ICT interventions, local administrative support. The table 4.3 below presents the descriptive statistics that helps to understand characteristics of these variables with regards to the mean and the standard deviations.

Table 4.3 Independent Variables Descriptive Statistics

Statistics

	N		Mean	Std. Deviation
	Valid	Missing		
Challenges in setting up e-library	282	18	1.39	.543
Devices in use	282	18	1.18	.386
Admin issues	282	18	1.42	.727
ICT interventions	282	18	1.26	.527
Local Admin Support	282	18	1.08	.274
Policy Making on e-library	282	18	1.04	.202

The table above illustrates that challenges in setting up e-library variable has a mean figure of 1.39 with a standard deviation is 0.543 which is less than the mean thus meaning that there are relatively small variations in the data. Device in use in supporting e learning in rural boarding schools have the average mean value of 1.18 and standard deviation of 0.386. The mean value indicates that the impact of device to be used for e-learning high but the data deviations are relatively small as shown by the standard deviation value less than its mean value. Administrative issues as a variable has the average mean value of 1.42 and Standard deviation of 0.727 which is lower than the mean hence, the variations in data are small. ICT interventions has an average mean value of 1.26 and standard deviation of 0.527 that is smaller than the mean which means that deviations in data are relatively small. Local administration support as a variable has an average mean value of 1.08 and a standard deviation value of 0.274 which is also less than the mean value indicating that variations are relatively small.

4.3.3 Gender composition

By asking gender of respondents, the researcher was keen to determine gender distribution of participants.

Table 4.4: Gender Statistics

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	138	46.0	48.9	48.9
	Female	144	48.0	51.1	100.0
	Total	282	94.0	100.0	
Missing	System	18	6.0		
Total		300	100.0		

Table 4.4 above demonstrates that from the survey 51.1% of respondents were females whilst 48.9% were males. This implies that the education department in Mashonaland East is mostly dominated by females but however the 48.9% of males indicates that males are also employed within the education department.

4.3.2 Age composition

The researcher asked the respondents to indicate their age range because the researcher wanted to find out their age group distribution.

Table 4.5: Age composition

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-30 years	95	31.7	33.7	33.7
	31-40 years	81	27.0	28.7	62.4
	41-50 years	63	21.0	22.3	84.8
	51 and above	43	14.3	15.2	100.0
	Total	282	94.0	100.0	
Missing	System	18	6.0		
Total		300	100.0		

Results of age group distribution above indicate that the employees within the education department were predominately within 21-30 (33.7%) and 31-40 (28.7%) age range. Lowest number of participants came from the age group of 51 years and above with 15.2% then followed by 41-50 years with 22.3%. The highest percentages came from the 21-34 and 35-44 age groups because these are the economically active groups who are in the teaching and other education service provision. Age matters when it comes to innovation and adoption and applicability of up to date technological acceptance because between the age group of 21-34 and 35-44 are regarded as innovative and ready to try implement new digital way of doing things copying from other developed worlds since they are fresh from colleges and universities and have the ability to think outside the box and bring new ideas. These age groups are mostly risk takers and experimenters because they still have the chance to do other developments if their innovations did not succeed unlike those above 55 of age.

4.3.3 Level of education

The researcher asked the respondents to indicate their highest educational qualifications and results are as shown in Table 4.6 below:

Table 4.6: Level of Education

Qualifications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Certificate	4	1.3	1.4	1.4
	Diploma	22	7.3	7.8	9.2
	Bachelor's degree	137	45.7	48.6	57.8
	Master's degree	108	36.0	38.3	96.1
	Others	11	3.7	3.9	100.0
	Total	282	94.0	100.0	
Missing	System	18	6.0		
Total		300	100.0		

Results indicate that 1.4% of respondents had certificates, 7.8% had diplomas, 48.6% had bachelor's degrees, 38.3% had master's qualifications and 3.9% had other qualifications. The biggest number of respondents had bachelors and master's degrees which indicates that the education department in Mashonaland east have high education levels. Education and innovating and shifting to the digital world usually go hand in hand i.e. the most educated people are also highly innovative because they now the rules of the game in knowledge dissemination and reading material distribution, in order to match standards of other schools within the region and world at large.

4.3.4 Position held

Respondents were asked to indicate their position in the education department for the researcher to determine distribution of the respondents involved in the research.

Table 4.7: Position held

Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	School Teacher	117	39.0	41.5	41.5
	Librarian	68	22.7	24.1	65.6
	District Education Office Staff	55	18.3	19.5	85.1
	Provincial Education Office Staff	42	14.0	14.9	100.0
	Total	282	94.0	100.0	
Missing	System	18	6.0		
Total		300	100.0		

Table 4.7 above demonstrates that 41.5% of the respondents were teachers, 24.1% were librarians, 19.5% from the district education staff and 14.9% were from the provincial education staff. The results show that in the study highest percentage of the respondents were the ones who deals with learners thus will provide high quality information as they will give information they experience in their day to day as they do their duties and as they research on how to provide best education to the learners.

4.3.5 Duration in position held

Respondents were asked to indicate the years they have in the said position for the researcher to determine the duration of service for the respondent involved in the research.

Table 4.8 Duration in Position held

Years in Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 5 years	16	5.3	5.7	5.7
	5-10 years	81	27.0	28.7	34.4
	11-15 years	103	34.3	36.5	70.9
	16-20 years	47	15.7	16.7	87.6
	21 and above	35	11.7	12.4	100.0
	Total	282	94.0	100.0	
Missing	System	18	6.0		
Total		300	100.0		

Results indicate that 5.7% of respondents had been in the indicated position for less than 5 years, 28.7% between 5-10 years, 436.5% between 11-15 years, 16.7% between 15-20 years and 12.4% had more than 21 years. The biggest number of respondents had between 5-15 year in the position indicated meaning they have seen and experience and eager to learn new digital transformation so that they can provide high quality education to the learners.

4.4 FACTOR ANALYSIS

4.4.1 Suitability of data for factor analysis

According to Rattray and Jones (2007), a sample size of at least of 100 respondents is required for a good enough for factor analysis while Hutcheson and Sofroniou (1999) recommended a sample size of at least 150. In this study, the response of 161 meets the minimum sample sizes of 30, 100 and 150 as suggested by Stutley (2003), Rattray and Jones (2007) and Hutcherson and Sofroniou (1999) respectively. Furthermore, the data set contains several high factor loadings (r >0.8) and is thus suitable for factor analysis as recommended by Guadagnoli and Velicer (1988) as cited in Yong and Pearce (2013). The results reveals 4 variables with correlation greater than 0.8 supporting the suitability of the data for factor analysis.

The extracted KMO measure for this study was 0.946, which accordingly to Kaizer's criteria is superbly suitable for factor analysis. As recommended by Hair et al (2014), the Bartlett's Test of Sphericity was used to augment the KMO measure. The Bartlett's Test of Sphericity tests whether the correlation matrix has significant correlations among the variables that is, the correlation matrix not an identity matrix with diagonal correlations of 1 and 0 off-diagonal correlations. To reject the hypothesis that the variables are independent, The Bartlett's Test of Sphericity requires that the Chi-square value to be large and the significance level to be small P<0.05. For this study the Bartlett's Test of Sphericity is significant (χ^2 = 4883, df =595 and P=0.000) confirming that suitability of the data for factor analysis. Table 4.7 below shows the KMO and Bartlett's tests for this study.

Table 0.9: KMO and Bartlett's Test Sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.946
Bartlett's Test of Sphericity	Approx. Chi-Square	4883.893
	df	595
	Sig.	.000

In summary, the three requirements of (size, correlation and sampling adequacy) were met and therefore factor analysis was appropriate.

4.4.2 Factor extraction

The first step in carrying out factor analysis was to choose the extraction method to use. Although there are several extraction methods which includes; the unweighted least-squares, generalized least-squares, maximum-likelihood, alpha factoring, and image factoring, the major extraction methods are the Principal Component Analysis and Principal Axis Factoring. According to Yong and Pearce (2013), principal component analysis is best employed on the ground that the components to be extracted doesn't have any theoretical validity and therefore being suitable extraction method if the objective is to simply reduce data to a manageable size that represent original data. Yong and Pearce (2013) alluded that where researcher's primary objective is to identify theoretically meaningful dimensions from the original data and if the data violate the multivariate normality assumption as in this case, principal axis factoring should be the preferred factor extraction methods. Therefore, confirmatory factor analysis with principal

axis factoring rotation was employed to investigate if the 29 statements in the instrument conforms to the five predetermined digital library dimensions (independent variables) as per the conceptual framework detailed in Chapter 2.

To assess the suitability of the data for factor analysis, an evaluation of the sample size, inter-item correlation and sampling adequacy. While there is a general agreement among authors that factor analysis works well with large sample which reduce errors in building factors, there is no consensus on the minimum sample size required to conduct a valid factor analysis. Stutely (2003) as cited in Saunders et al (2009) suggest 30 as a minimum number required for statistical analysis. On the other hand, Rattray and Jones (2007) proposes a sample size of at least of 100 respondents for a good factor analysis while Hutcheson and Sofroniou (1999) recommended a sample size of at least 150. However, Yong and Pearce (2013), recommend even bigger sample of at least 300 participants.

The second prerequisite of factor analysis is that inter-item correlations be moderate or higher ($r > 0.3$) as any correlations lower than 0.3 suggest weak relationships and poor loading (Tabachnick and Fidell, 2007; Field, 2009).

To assess sampling adequacy, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett Test of Sphericity were extracted from SPSS and analysed to evaluate if the data met the third prerequisite of sampling adequacy. According to Field (2009), KMO ranges from 0 to 1, and the closer the value of KMO to 1, the more appropriate the data is for factor analysis. The table below summarises the evaluation criteria proposed by Kaizer (1974) as cited in Parsian and Dunning (2009).

Table 4.10: Evaluation criteria for the Kaiser-Meyer-Olkin (KMO) measure

KMO value range	**Suitability**

<0.5	Unacceptable
0.5<=KMO<0.7	Mediocre
0.7<=KMO<0.8	Good
0.8<=KMO<0.9	Great
>=0.9	Superb

The study used the Kaiser's criteria (eigenvalue>1) and the scree plot to Scree test to decide how many factors to extract. The use of multiple factor extraction criteria is recommended by authors (Costello and Osborne, 2005; Hair *et al*., 2014; Thompson, 2004; Williams *et al.*, 2010) who argue that a single criterion is not desirable due to the confusing nature of factor analysis. The study retained as factors those with Kaizer's eigenvalue values above the cut-off of 1 as suggested by literature (Field, 2009; Parsian and Dunning, 2009; Rattray and Jones, 2007).

The Kaiser's eignevalues were augmented by the use of the screen test and as suggested by many authors (Cattell, 1978; Costello and Osborne, 2005; Hair *et al*. 2014; Yong and Pearce, 2013) factors above the point of inflexion of the graph were retained. The scree plot is a graphical exhibition of eigenvalues plotted on the Y-axis against the number of factors on the X-axis. The extraction of factor was followed by direct oblimin rotation with Kaiser Normalization in order to see how the factors load. Variable with factor loadings above 0.3 were considered significant and therefore retained as suggested by (Yong and Pearce, 2013). The latent factors extracted from the fact analysis were built as averages of the items in line with the methodology adopted by Isaksson and Lantz (2015).

Table 4.11: KMO and Bartlett's Test Sphericity

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.898
Bartlett's Test of Sphericity	Approx. Chi-Square	4434.54
	Df	630
	Sig.	.000

The extracted KMO measure for this study was 0.898, which accordingly to Kaizer's criteria is greatly suitable for factor analysis. As recommended by Hair et al (2014), the Bartlett's Test of Sphericity was used to augment the KMO measure. The Bartlett's Test of Sphericity tests whether the correlation matrix has significant correlations among the variables that is, the correlation matrix not an identity matrix with diagonal correlations of 1 and 0 off-diagonal correlations. For the hypothesis to be rejected that the variables are independent, The Bartlett's Test of Sphericity requires that the Chi-square value to be large and the significance level to be small $P<0.05$. For this study the Bartlett's Test of Sphericity is significant (= 4434, df =630 and P=0.000) confirming that suitability of the data for factor analysis. Table 4.9above shows the KMO and Bartlett's tests for this research study.Thus therefore, the three most important requirements of sample size, correlation and sampling adequacy were all met and therefore factor analysis was appropriate for this research study.

4.4.3 Factor analysis output

The table below presents the truncated output of the results of the principal axis factor analysis. Four factors, accounting for 64.8% of the total variance explained, were extracted using the cut-off of 1 for Kaizer's eigenvalue values as suggested by literature (Rattray and Jones, 2007; Field, 2009; Parsian and Dunning, 2009). Each of the four factor, Factor 1, 2, 3 and 4 account for 39.3%, 10.2%, 8.07% and 7.3% respectively of the total variance explained.

Table 4.12 Factor analysis output

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	11.396	39.295	39.295	11.396	39.295	39.295	9.898
2	2.963	10.218	49.514	2.963	10.218	49.514	2.566
3	2.339	8.067	57.580	2.339	8.067	57.580	2.851
4	2.106	7.261	64.841	2.106	7.261	64.841	2.063
5	1.838	6.337	71.178	1.838	6.337	71.178	4.072
6	1.374	4.738	75.916	1.374	4.738	75.916	3.677
7	1.238	4.268	80.184	1.238	4.268	80.184	3.006
8	1.166	4.021	84.205	1.166	4.021	84.205	5.061
9	1.004	3.463	87.668	1.004	3.463	87.668	1.772
.....							
29	-6.186E-15	-2.133E-14	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

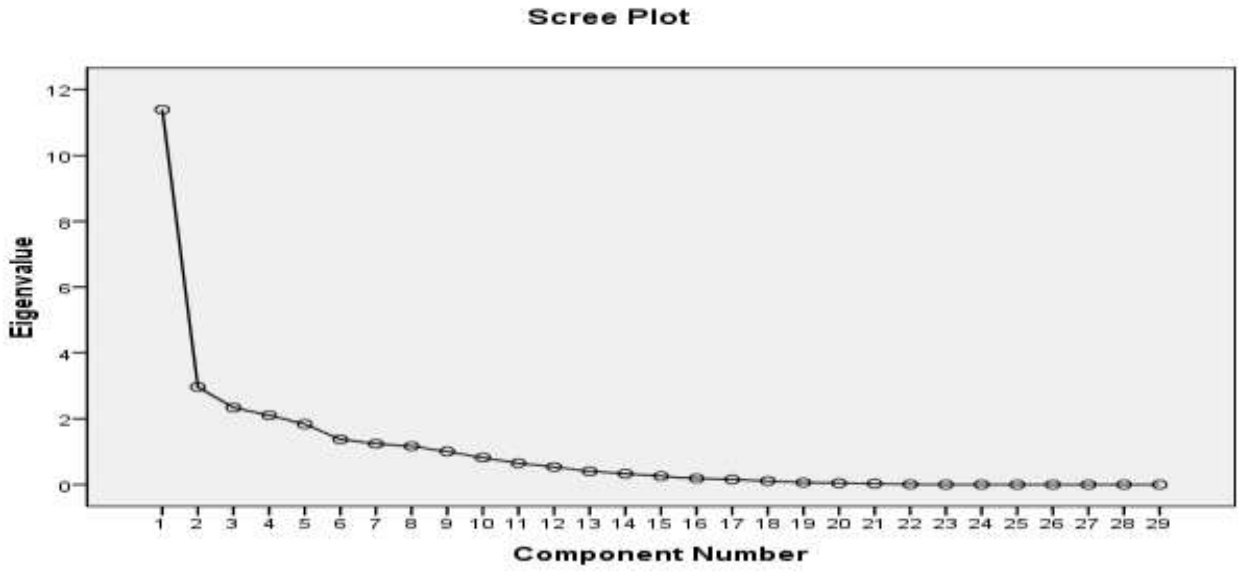

Figure 4.1 Scree plot

4.5 RELIABILITY TESTS

The researcher carried out a reliability test to see the internal consistency of the research instrument. Reliability is a measurement procedure with stable results or consistency of the measurement. All research has error to some extent because respondents may not complete the task or not completing it correctly, the amount of error establishes amount of reliability. If the amount of error is high reliability becomes low and if amount of error is low reliability is high. Reliability test was important for this study in order to determine if the research was actually enough evidence to suggest that the hypothesis have been found significant. Reliability was also important in this study because it tests if the present study fulfills its predicted objectives and hypotheses and ensures that results are due to the study not any other possible extraneous variables. Cronbach's Alpha is the reliability coefficient which indicates how good the study items are positively correlated to each other and the closer Cronbach's alpha is to 1; the higher the internal consistency. The Reliability Statistics table below shows the actual Cronbach's Alpha value.

Table 4.13: Reliability Statistics

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.858	.836	29

The recommended Cronbach's Alpha value should be 0.70 or higher for the instrument to be reliable and be acceptable. The table 4.10 above indicates a Cronbach's alpha value of 0.858, which indicates a good internal consistency for the instrument with the study sample.

4.6 NORMALITY TESTS

The researcher carried out a normality test to establish how the data were distributed. Normality test was significant in order to determine whether to carry out parametric or non-parametric test for correlation analysis. Simply put testing how data is distributed helps the researcher to know

the set of tools to use and not to use for analysis. For parametric tests Pearson's correlation will be appropriate and for non-parametric it will be Pearson's correlation. For test of independence, parametric tests use the t-tests and non-parametric uses Mann-Whitney or Kruskal-Wallis tests. To undertake this test, the researcher used Shapiro – Wilk which is used for sample sizes less than 2000. The "p" value was less than less than 0.05 which means the data was unevenly distributed so non-parametric tests were performed as shown by the table below;

Table 4. 14 Normality test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
CGP	.166	200	.000	.973	200	.001
CF	.144	200	.000	.955	200	.000
ADM	.132	200	.000	.967	200	.000
ICTI	.096	200	.000	.954	200	.000
LADS	.142	200	.000	.950	200	.000
PM	.152	200	.000	.963	200	.000

a. Lilliefors Significance Correction

The table shows the Shapiro-Wilk test results and since the significance values of the test are all less than 0.05 it means the data was not normally distributed therefore, non-parametric test was done for Correlation using the Pearson correlation test and for the tests of independence Mann-Whitney and Kruskal-Wallis were used to test the differences.

4.8 CORRELATION TESTS

Correlation measures strength of relationships between variables whereby high correlation shows that variables have a strong relationship with each other and low or weak correlation indicates that variables are hardly related (Visagie, 2010). Correlation analysis allows the researcher to do data analysis from many subjects simultaneously and can study many variables and their

interrelations. Correlation can therefore quantify the strength of relationship between variables. However, correlation findings do not indicate causations (the cause-and-effect relationships). Correlation analysis was important in answering research questions since the existence of linear relationship between variables was tested using the t-test for testing the population correlation coefficient. The p-value of correlation helped the researcher to make decisions i.e. where p-value was less than 0.05 the null hypothesis was accepted concluding that there is sufficient evidence at 0.05 level of significance; indicating that there is linear relationship in the population between the dependent and independent variable. Where p-value was greater than 0.05 the researcher rejected null hypothesis. The research hypotheses that were tested wereH0. The use of DL positively impacts on learner performance output.

H1. The use of DL does not have an impact on learner performance output. The table below demonstrates the correlations between the environmental turbulence factors and product innovation.

Table 4.15: Correlations between the environmental turbulence factors and product innovation

Table 4.15: Correlations between the environmental turbulence factors and product innovation

Correlations

		CGP	CF	ADM	ICTI	LADS	PM
CGP	Pearson Correlation	1	.345**	.391**	.482**	-.117*	.239**
	Sig. (2-tailed)		.000	.000	.000	.050	.000
	N	282	282	282	282	282	282
CF	Pearson Correlation	.345**	1	.592**	.382**	-.005	.084
	Sig. (2-tailed)	.000		.000	.000	.928	.162
	N	282	282	282	282	282	282
ADM	Pearson Correlation	.391**	.592**	1	.737**	-.029	.362**
	Sig. (2-tailed)	.000	.000		.000	.628	.000
	N	282	282	282	282	282	282
ICTI	Pearson Correlation	.482**	.382**	.737**	1	-.147*	.297**
	Sig. (2-tailed)	.000	.000	.000		.014	.000
	N	282	282	282	282	282	282
LADS	Pearson Correlation	-.117*	-.005	-.029	-.147*	1	.194**
	Sig. (2-tailed)	.050	.928	.628	.014		.001
	N	282	282	282	282	282	282
PM	Pearson Correlation	.239**	.084	.362**	.297**	.194**	1
	Sig. (2-tailed)	.000	.162	.000	.000	.001	
	N	282	282	282	282	282	282

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Pearson's correlation was used; it is used to assess how strong the relationship between the variables is. The relationship of variables is seen by looking at the significance, direction and strength on the correlation coefficient and sig. (2 tailed) value. If the correlation coefficient value is closer to **-1** it means, there is a strong negative relationship; if the value is closer to **+1** it means there is a strong positive relationship and if the value is **0** it means there is no relationship between the dependent and the independent variables. A positive relationship implies that as the independent variable increases the dependent variable also increases. If the significance value is

less than 0.05 ($p<0.05$) it means the relationship is statistically significant. For correlation strength, if the coefficient lies between ($0<0.299$) the relationship is weak, if ($0.3<0.499$) the relationship is moderate and if (>0.5) the relationship is strong.

The results illustrated by the table above indicate that there is a weak positive but statistically significant relationship between challenges in setting up digital resource center and learner performance output measure ($r = 0.239$; $p = 0.000$). There is a weak positive and statistically significant relationship between device to be used and learner performance output measure ($r = 0.084$; $p = 0.162$). This means that the use of a particular device does not necessarily lead to an improve in learner performance output measure. There is a moderate positive but statistically significant relationship between administrative support and learner performance output measure ($r = 0.362$; $p = 0.000$). This implies that a change in administrative support in adopting digital library can significantly affect learner performance output measure. There is a weak positive and statistically significant relationship between ICT interventions and learner performance output measure ($r = 0.297$; $p = 0.000$) which means that ICT interventions changes impact learner performance output measure. The results also indicate that there is a weak positive and statistically significant relationship between local authority support and learner performance output measure ($r = 0.194$; $p = 0.001$). This indicates that the intensity of local authority support to the adoption of digital library in the boarding schools significantly impact learner performance output measure, as if support goes up, performance also increases at much faster rate than other factors.

4.9 REGRESSION TESTS

Regression analysis as defined by Visagie (2010) is a set of statistical processes used to estimate relationships among independent variables and dependent variable. The regression test helps researcher to clearly understand how the dependent variable value change when any one of independent variables change holding other independent variables constant. This analysis is also important to the researcher because it is used to determine which one among the independent variables is related to dependent variable and also to explore forms of the relationships. The

model summary gives the whole picture of all independent variables against the dependent variable.

Table 4.6: Regression analysis

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.475[a]	.226	.212	.180

a. Predictors: (Constant), LADS, CF, CGP, ICTI, ADM

b. Dependent Variable: PM

Table 4.13 above provides the R, R^2 and adjusted R^2 values. The *R* value shows the correlation of variables at 0.475 ("**R**" Column), and this indicates a strong degree of correlation. The R^2 ("**R Square**" column) value indicates the percentage contribution of the factors studied to the dependent variable and the remaining percentage is explained by other factors not studied. As shown by the table the percentage contribution of the study factors is 22.6% which is a bit low and 77.4% is explained by other factors. The adjusted R^2 (**Adjusted R square** column) gives the percentage variance explained by all the independent variables on the dependent variable after removing the sampling errors and bias which might compromise the accurateness of estimates. When making business decisions the adjusted R^2 is more accurate and is usually lower than R^2. This is because the adjusted R^2 would have taken into account sampling error and bias. The value of 0.212 adjusted R^2 means the model is not a strong predictor of learner performance measure since only 23% of the variance in learner performance output measure is explained by the predictors in the study and the 77% remaining is explained by other factors not examined in this study.

After the model summary, regression analysis produces the **ANOVA** table also known as the **model fit** which reports whether the regression equation fits data of the study. It explains whether the model can be relied on to predict the dependent variable (learner performance output measure).

Table 4. 17 Anova output analysis

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.593	5	.519	16.092	.000[a]
	Residual	8.896	276	.032		
	Total	11.489	281			

a. Predictors: (Constant), LADS, CF, CGP, ICTI, ADM

b. Dependent Variable: PM

The F value is the model fit which indicates how much variability the model can explain. This F value should be positive because if it is negative it implies that the model is not fit to explain how the independent variables affect the dependent variable and the significance value should be less than 0.05 ($p<0.05$). If ($p<0.05$) the model is statistically significant and if ($p>0.05$) the model is statistically insignificant and it cannot be relied on. Table 4.14 above shows ($F = 16.092$; $p = 0.000$) which means that the regression model is statistically significant, it predicts learner performance output measure significantly well (good fit for the data).

The third table produced by the regression analysis is the **Coefficients** table which provides necessary information to predict product innovation from environmental turbulence, as well as to determine whether environmental turbulence contributes statistically significantly to the study model by looking at "**Sig.**" column ($p<0.05$). The researcher used the **standardized beta coefficients** to see the impact of each digital library factor on learner performance output measure; this was chosen because it removes bias and errors. For regression it is either a positive or a negative impact on the dependent variable. The VIF and Tolerance measures the collinearity of factors to see if the independent variables are independent of each other. VIF should be less than 10 ($VIF<10$) and Tolerance greater than 0.1 ($T>0.1$), if these rules are violated it means

there is a problem of multi-collinearity and this can only be solved by either combining the factors or dropping off one of the factors because they are the same.

Table 4.18: Coefficients results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.738	.062		11.828	.000	.615	.861					
	CGP	.062	.023	.167	2.707	.007	.017	.108	.239	.161	.143	.733	1.364
	CF	-.122	.035	-.233	-3.457	.001	-.192	-.053	.084	-.204	-.183	.618	1.617
	ADM	.117	.025	.421	4.623	.000	.067	.167	.362	.268	.245	.339	2.951
	ICTI	.011	.032	.028	.335	.738	-.053	.075	.297	.020	.018	.392	2.552
	LADS	.169	.040	.229	4.231	.000	.090	.247	.194	.247	.224	.961	1.040

a. Dependent Variable: PM

Results displayed in table 4.15 above indicate that there was a negative impact of device to be used (CF) on learner performance output measure but a statistically significant predictor (Beta = -0.233; p = 0.001). Challenges in setting up digital library (CGP) showed a positive impact on learner performance output measure and statistically significant (Beta = 0.167; p < 0.050). Administrative issues in influencing adoption of digital library(ADM) showed a positive impact and statistically significant predictor of product innovation (Beta = 0.421; p = 0.000). There was a positive impact of ICT intervention (ICTI) in digital library adoption on learner output performance measure and statistically insignificant predictor (Beta = 0.028; p = 0.738). Local administrative support (LADS) showed a positive impact and statistically significant predictor of product innovation (Beta = 0.229; p = 0.000). As shown by the table all VIF values were less than 10 and Tolerance values greater than 0.1 which means there was no problem of multi-collinearity all the independent variables were independent of each other. The constant in the table has a **t value** of 11.828 which is positive and high indicating that there are other factors that affect learner performance output measure which have not been included in this model and they are statistically significant in predicting learner performance output measure (p = 0.000). The

unstandardized Beta constant was also positive and high (2.722) implying that these factors not included in the model will positively impact learner performance output measure.

4.10 TESTS OF INDEPENDENCE

Independence test is done to establish whether or not the study variables are independent. Independence implies that the outcomes of one variable in no way influence outcomes of another variable. Knowing that the variables are dependent of each other or not have implications in many business applications. To test the significant differences for non-parametric test, the researcher used Mann-Whitney U and Kruskal-Wallis H which are equivalent to independent samples t-test used for parametric test.

4.10.1 Mann-Whitney U test for challenges faced by boarding schools in setting-up digital libraries

For test of significance using Mann-Whitney U test, the assumption is that with large sample size, the U-value distribution approximates normal distribution. U-value indicates number of times the observations in one group precede observations in another group in ranking. The **ranks table** provides information of the Mann-Whitney U test which shows the mean ranks and the sum of ranks for the two tested groups (those who strongly agreed and those who agreed).

Table 4.19 Mann-Whitney U test challenges faced by boarding schools in setting-up digital libraries

Ranks

	CGP	N	Mean Rank	Sum of Ranks
PM	Strongly Agree	205	136.17	27915.50
	Agree	69	141.44	9759.50
	Total	274		

The table is useful because it shows the group that highlighted that boarding schools have challenges in setting up digital library as they want to improve their learner performance.

The **test statistic table** shows the actual significance value of the test. It provides test statistic, U statistic and asymptotic significance (2-tailed) p-value.

Test Statistics

	PM
Mann-Whitney U	6.8003
Wilcoxon W	2.7924
Z	-1.638
Asymp. Sig. (2-tailed)	.001

a. Grouping Variable: CGP

The null hypothesis for this test was that there is no relationship between challenges faced by boarding school in setting up digital library and learner performance output and alternative hypothesis was there is a relationship between challenges faced by boarding school in setting up digital library and learner performance output gender. From the results shown it can be concluded that challenges faced by boarding school in setting up digital library was statistically significantly influencing learner performance output (U = 6.8003; Z = -1.638; p = 0.001). Therefore, there are significant influence on challenges being faced by boarding schools in setting up digital library in terms of learner performance output hence reject null hypothesis. This means that when boarding schools have challenges in setting up digital library their learners won't be able to access the e-Learning materials thus in turn affecting their performance output.

4.10.2 Mann-Whitney U test between technological devices availability

The researcher also carried out a test to see if there are any differences in perceptions in terms of availability of technological devices that can be used to access the digital learning platforms in the boarding school if they will have an influence on learner performance output. Number of device gadgets was used to differentiate which included laptops desktop and cellphones or tablets.

Table 4.20: Mann-Whitney U test for technological devices availability

Ranks

	CF	N	Mean Rank	Sum of Ranks
PM	Yes	231	140.38	32428.50
	No	51	146.56	7474.50
	Total	282		

The table of ranks above indicates that availability of technological devices in boarding schools influence learner performance output because they have a high mean rank.

Test Statistics[a]

	PM
Mann-Whitney U	5.6323
Wilcoxon W	3.2434
Z	-1.400
Asymp. Sig. (2-tailed)	.162

a. Grouping Variable: CF

The null hypothesis was that there is no relationship between technological device availability and learner performance output (they are independent) and alternative hypothesis was there is a relationship between technological device availability and learner performance output (they are not independent). There is a significant difference in learner performance output when technological devices are available and not hence accept alternative hypothesis (U = 5.6323; Z = -1.400; p = 0.162). This implies that learner performance output has equal appeal to both learners

and school authority as they adopt and implement digital learning platforms. Thus learner performance output measure is independent of device availability.

4.10.3 Kruskal-Wallis test for Administrative issues influencing the adoption of digital libraries

This test measures administrative issues influencing the adoption of digital libraries. The test produces two tables the ranks table and the test statistics table just like Mann-Whitney test.

Table 4. 1 Kruskal-Wallis H test for Administrative issues influencing the adoption of digital libraries

Ranks

	PM1	N	Mean Rank
ADM1	Strongly Agree	270	138.23
	Agree	12	215.17
	Total	282	
ADM2	Strongly Agree	270	138.54
	Agree	12	208.00
	Total	282	
ADM3	Strongly Agree	270	138.25
	Agree	8	181.75
	Total	278	
ADM4	Strongly Agree	270	138.84
	Agree	12	201.33
	Total	282	
ADM5	Strongly Agree	270	138.42
	Agree	12	210.83
	Total	282	

The **test statistics table** shows the significance of the differences indicated by the ranks table. If the p-value is less than 0.05 it means the differences are significant and if it greater than 0.05 it means the differences are insignificant.

Test Statistics[a,b]

	ADM1	ADM2	ADM3	ADM4	ADM5
Chi-Square	16.062	12.103	3.376	9.955	18.062
df	1	1	1	1	1
Asymp. Sig.	.000	.001	.006	.002	.000

a. Kruskal Wallis Test

b. Grouping Variable: PM

The table indicates Kruskal-Wallis significant difference test for learner performance output across Administrative issues influencing the adoption of digital libraries. It indicates that there are statistical differences in learner performance output measure considerations between the groups with p-value less than 0.05 which implies that people with different administrative positions perceive digital learning learner performance output measure differently.

4.10.4 Kruskal-Wallis test for ICT Intervention

The researcher also carried out a test to see if there are any differences in learner performance output between the various ICT intervention to enhance digital library in rural boarding schools.

Table 4.22: Kruskal-Wallis test for ICT Intervention

Ranks

	PM1	N	Mean Rank
ICTI1	Strongly Agree	270	140.40
	Agree	12	166.17
	Total	282	
ICTI2	Strongly Agree	270	139.02
	Agree	12	197.33
	Total	282	
ICTI3	Strongly Agree	270	138.82
	Agree	12	201.83
	Total	282	
ICTI4	Strongly Agree	270	138.49
	Agree	12	209.17
	Total	282	
ICTI5	Strongly Agree	270	143.52
	Agree	12	96.00
	Total	282	
ICTI6	Strongly Agree	270	140.01
	Agree	12	175.00
	Total	282	

Using the mean rank figures shown by the table above it can be concluded that Schools should be connected to the internet (ICTI5) and Curriculum should be reviewed (ICTI1) are more significant in ensuring that digital library achieve a better learner performance output than others with mean rank of 143.52 and 140.40 respectively followed by Librarians should be trained on ICT infrastructural integration (ICTI6) 140.01, Need for computer literacy for teachers (ICTI2) 139.02, ICTs should be used for lesson delivery (ICTI3) 138.82 and Government should computerize schools (ICTI4) 138.49 mean ranks.

Test Statistics[a,b]

	ICTI1	ICTI2	ICTI3	ICTI4	ICTI5	ICTI6
Chi-Square	2.146	10.485	12.134	17.396	5.732	3.892
df	1	1	1	1	1	1
Asymp. Sig.	.003	.001	.000	.000	.010	.004

a. Kruskal Wallis Test

b. Grouping Variable: PM

The table reveals that p values indicated are less than 0.05 indicating that there are statistically significant differences in perceptions of ICT interventions on improving digital learning in rural boarding schools. This means that there is likely to high ICT interventions in rural boarding schools as a way of achieving better learner performance output.

4.10.5 Kruskal-Wallis test for Local Administrative Support

The researcher also carried out a test to see if there are any differences in local administrative support between the various boarding schools as the adopt and set up digital library facilities at the various rural boarding schools.

Table 4.23 Kruskal-Wallis H test for Local Administrative Support 69

Ranks

	PM1	N	Mean Rank
LADS1	Strongly Agree	270	139.92
	Agree	12	177.00
	Total	282	
LADS2	Strongly Agree	270	143.99
	Agree	12	85.50
	Total	282	
LADS3	Strongly Agree	270	138.66
	Agree	12	205.50
	Total	282	

Using the mean rank figures shown by the table above it can be concluded that Local community should support the digital resource implementation (LADS2) for the eLearning to achieve a better learner performance output 143.99,Local education offices should source for ICT donations (LADS1) 139.92 and the need for technical support from the industry (LADS3) with mean rank of 138.66.

Test Statistics[a,b]

	LADS1	LADS2	LADS3
Chi-Square	10.568	8.228	15.362
df	1	1	1
Asymp. Sig.	.001	.004	.000

a. Kruskal Wallis Test

b. Grouping Variable: PM1

The table reveals that p=0.001, p=0.004 and p=0.000 which are all less than 0.05 indicating that there are statistically significant differences in perceptions of local administrative support in different boarding schools. This means that there is likely to high local support in the various boarding schools as a way of achieving better learner performance output.

4.13 DISCUSSION OF FINDINGS

This study sought to enhance understanding of how digital libraries/e-resources can support learning at rural boarding schools' dormitories in Zimbabwe. Specifically, the research sought to determine if digital library can influence learner output performance.

4.5.1 Hypotheses Testing and Comparing findings to literature

The main hypothesis of the study was that*The use of DL positively impacts on learner performance output*. As shown by the F value of 16.092 and p=0.000 which is less than 0.05 it means that digital library impacts learner performance output thus therefore the hypothesis was accepted. This was in line with the research done by Fox et al. (2003) which indicated that digital learning platforms positively impact the performance of learners. Another research carried out by Zainab (2010) also support these results, as their findings indicated that e-learning platforms increases the availability of learning resources which will make accessibility of reading material easy which can ultimately impact positively to performance of learners. The first specific hypothesis (H1) of the study was there is a relationship between challenges being faced by boarding schools in setting up digital library and learner performance output. The results indicated that there is a positive and statistically significant impact of challenges being faced by boarding schools in setting up digital library on learner performance output with a beta value of 0.0169, r= 0.239; p = 0.000. These results support the hypothesis statement; therefore, the hypothesis was accepted. The results indicate that when schools are facing challenges in setting up digital library it will affect its learner performance as the students won't be able to access the reading material unless they visit school library. Since there are limited previous studies on the impact of digital library on learner performance, this research provides the pioneering evidence hence; the findings of this study have implications for school heads, librarians, educators and future researchers.

The second hypothesis (H2) was that *availability of technological devices influences learner performance.* Availability of technological device had a beta value of -0.233 and a p-value of 0.162 r=0.084. This shows a negative and insignificant impact on learner performance output which supports the hypothesis, so it was accepted. Carasora (2007) alluded that availability of

technological gadgets only improves learner performance output if they are used for the reading purposes thus therefore if not used for its intended purposes will not yield results wanted. Administrative issues were tested as (H3) of the study and the results revealed that there is a positive significant impact of administrative issues that influence adoption of digital library (Beta = 0.420; r=0.362 and p = 0.000). Murthy (2007) carried out a study in a Turkey and their results revealed when the school administrators plays a pivotal role in implementing digital learning platforms which in turn positively influence the learner performance of the students that are at that school.

The fourth hypothesis (H4) of the study assumed that ICT interventions on digital library impacts learner performance in boarding schools. When correlation analysis was done ICT interventions revealed a weak positive and statistically significant impact on product innovation (r = 0.297; p = 0.000) which indicated significance on product innovation. However, when regression analysis was done it had contrasting results showing no significance on learner performance output (Beta = 0.028; p = 0.706) and a t-value of 0.378 which is less than t=2 at 95% level of significance. These results revealed that ICT interventions in our study sample has no significant impact on learner performance therefore, H4 hypothesis statement was rejected. This is in contrast with results of the study by Fox et al (2003) which indicated that ICT interventions positively affect the implementation of digital library and ultimately learner performance output in developing countries because the governments should provide regulation ICT to rural schools which is conducive for the schools to set up digital libraries. The last hypothesis (H5) assumed that local administration support has a significant positive impact on the implementation and adoption of digital library. The correlation results were r = 0.194 and p = 0.001. When regression analysis was done beta value (Beta=0.229; p=0.000). Local administration supports the implementation of the digital library and to be more innovative not only due to pressures from other schools in the region and urban centers but also through the knowledge achieved from seeing the innovative products from foreign schools, (Doer 2007). This was in support with the hypothesis statement (H5) and therefore H5 was accepted.

4.14 CHAPTER CONCLUSION

In this chapter, the researcher analyzed the data using SPSS, presented and interpreted it showing the methods used. The distribution of demographical data and the impact of the independent variables on product innovation were explored. Pearson correlation test was done since the data was unevenly distributed and it qualified for non-parametric tests. Correlation analysis was done to test the relationship strength between variables and regression analysis was done to test the cause-and-effect relationship between environmental turbulence and product innovation. For the test of independence, the researcher carried out the Kruskal-Wallis (to see if product innovation is independent of educational level as well as type of industry) and Mann-Whitney tests (to see if product innovation is independent of gender and firm size) since it was for the non-parametric test. A hypothesis testing was done and hypothesis main hypothesis, H1, H3 H4 and H5were accepted while H2 was rejected. After analysis the data, the findings were compared with previous studies results to see if there were any similarities or differences in the results.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

Chapter four focused on the presentation of the research findings as well as the analysis of the findings using quantitative techniques. This chapter provides a summary of the study and draws conclusions based on the findings of the research coupled by a full discussion of the conclusions. The chapter also provides an assessment of the extent to which the research objectives have been met through exploring whether the research provided answers for the research questions or not. Additionally, this chapter gives an account of the research contributions with regards to theoretical contribution, methodological contribution and also the study's empirical contribution. Finally, the study provides recommendations about the research study as well as an insight to future works.

5.2 ACHIEVEMENT OF RESEARCH AIM AND OBJECTIVES

The aim and objectives of the study critically analysed how digital libraries/e-resources can support learning at boarding schools in Zimbabwe's secondary schools by exploring the factors that influence the adoption of such technology in the rural boarding schools and their impact on the quality of library services at schools. The study was carried out with five hypotheses, Main hypothesis: The use of DL positively impacts on learner performance output for which the study discovered that the DL have a positive impact on the performance of learners. H_1: There is a relationship between challenges being faced by boarding schools in setting up digital library and learner performance. H_2. Availability of technological devices influences learner performance output. H_3. Administrative issues influences adoptions of digital library. H_4. ICT interventions on digital library has appositive influence on learner performance output. H_5. Local administrative support influences digital implementation and learner performance output. Hypothesis testing was done basing on the results of correlation testing as well as ***Mann-Whitney U test*** and **Kruskal-Wallis** testing. Of all the hypothesis only H2 was not supported thereby rejected. The

researcher also used existing literature on the subject as discovered by previous academic researchers to support the position.

5.3 CONCLUSION

Based on the findings which the researcher tried to summarize in the preceding section, the following conclusions are made.

- The government through the education department and policy makers must adopt and set up e-Learning facilities so as to improve learner performance output. Education trainers must well equipped and trained so that they can properly guide learners on the use of digital resource centres
- Local administrators for the rural boarding schools must support the initiative of setting up digital resource centres as it will produce positive results. Without funding the project will be a futile hence there must be sourcing of funds and donations to implement the digital resource initiative and also seeking information to other schools and technical gurus on digital library.
- There is little commitment from the policy makers in coming up with lasting solutions to ensure that rural schools are electrified and internet connected so that learners can easily access the digital library platform.
- There is evidence of lack of financial support, lack of policy monitoring and evaluation and lack of resources support to the policy implementation stage.
- Serious challenges are being faced in trying to aligning the curricula and the me old mentality of visiting library and reading from textbooks but learners should be educated on how times had change so that they will engage in more modern way of extracting reading materials for their academic use.

5.4 ANSWER TO RESEARCH QUESTIONS

From the results shown it can be concluded that challenges faced by boarding school in setting up digital library was statistically significantly influencing learner performance output (U =

6.8003; Z = -1.638; p = 0.001). Therefore, there are significant influence on challenges being faced by boarding schools in setting up digital library in terms of learner performance output hence reject null hypothesis. This means that when boarding schools have challenges in setting up digital library their learners won't be able to access the e-Learning materials thus in turn affecting their performance output. This means that challenges are there when boarding schools want to set up their digital libraries however, they need to be managed well so that it can be implemented and achieve the desired results.

5.5 CONTRIBUTION

The contributions of the findings of the study is presented with respect to theoretical contribution, methodological contribution and empirical contribution. The following sub-paragraphs provides a discussion of each of the contributions.

5.5.1 Theoretical contribution

The study contributed in a number of ways to the theoretical domain. The study identified that there was a positive relationship between technology adoption in the form of digital libraries and the quality of library service delivery which positively impacts on the students pass rate of students in rural schools. This contribution is of importance considering the fact that the previous researchers focused on the technology of digital libraries without a particular exploitation of how it can change the status quo of rural boarding schools. The study also unearthed the mechanisms through which the digital libraries can be implemented in the rural boarding schools. This is critical as it provides a model which the education sector can implement to improve the quality of education through adoption of digital libraries in the rural schools. Figure 5.1 shows the framework designed.

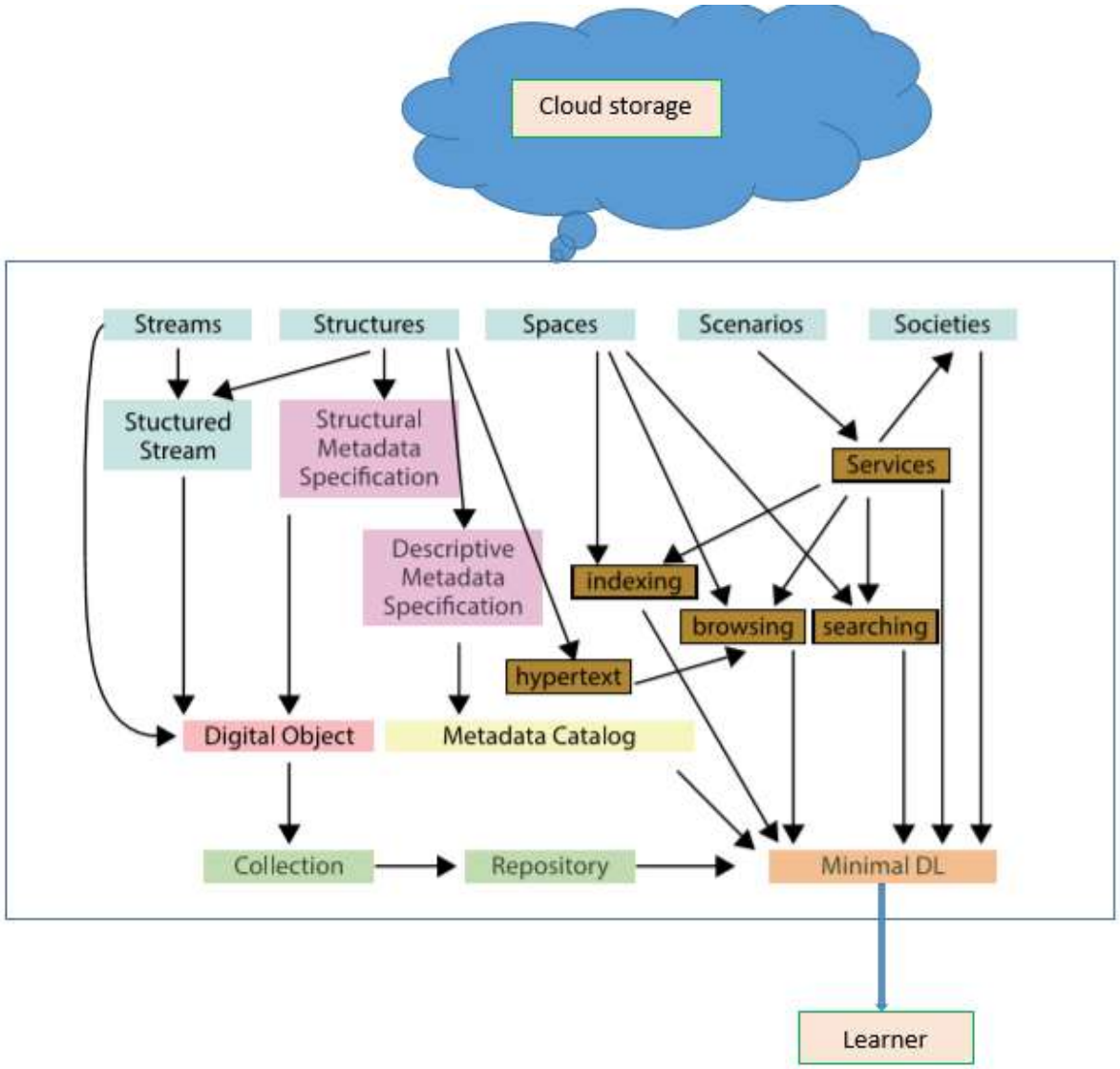

Figure 5.1: Modified conceptual framework for the adoption of digital libraries in rural boarding schools

5.5.2 Methodological contribution

The study varied significantly from the previous studies whose research philosophies were mainly based on interpretivism philosophy as well as inductive research approach, this study applied the positivism research paradigm which enabled an objective quantification of the research findings on how digital libraries can support learning at rural boarding schools in Zimbabwe. This was achieved through the use of statistical analysis techniques. The positivism

research philosophy was adopted for this research and data was collected using structured questionnaires. As opposed to previous researchers whose researches were qualitative in nature, this research used the quantitative research approach supported by the use of SPSS for data analysis.

5.5.3 Empirical contribution

The deliverables of the research have the capacity to influence the authorities particularly in the Ministry of Primary and Secondary Education in terms of shifting their policies from the traditional way of providing education services and adopt the modern technology driven ways among which includes the adoption of digital libraries. This will also pave way for the overall adoption of e-learning at a full scale especially in the face of natural disasters such as COVID-19 which requires that people should not gather so as to control the spread of the pandemic.

5.6 POLICY RECOMMENDATIONS

The government policy on the provision of education services among which includes the provision of library services and library facilities requires input from various stakeholders. The findings of this research will play a crucial role in the drafting and improvement of the government's national policy with respect to the adoption and implementation of digital resources in the education sector particularly the provision of e-library systems at rural boarding schools. This is so considering the fact that the findings of the study have been statistically proven, which implies that the results ca be relied upon in the decision making process.

5.7 MANAGERIAL RECOMMENDATIONS

The efficient and quality provision of education services in schools should be done basing on some pre-defined standards according to the categories of schools in the education sector. It is also important to note the importance of the technical knowledge as well as skills of the involved stakeholders which have an impact on the quality of decisions made with respect to the implementation of technology based solutions in the learning environment. This study provided

the necessary base upon which the management can craft the parameters governing the implementation of the e-libraries in the rural boarding schools of the country. These includes the knowledge, skill and infrastructure requirements as well as the qualifications necessary for the successful management of e-libraries.

5.8 GENERALISATION OF FINDINGS

The research study was undertaken for rural boarding schools in Mashonaland east in Zimbabwe. The research study was driven by the need to implement digital learning in Zimbabwe. The research topic for this study was "**A critical analysis of how digital libraries/e-resources can support learning at rural boarding schools' dormitories in Zimbabwe**". The literature was sourced from various related articles and journals in the areas of study including Zainab (2010), Doer (2007) Candela (2014) Fox et al. (2003), Murthy (2007) andCarasora (2017) moored this research study. The researcher collect data with the assistance of self-administered questionnaires and collected data was analysed using SPSS version 23.

Graphs, tables and figures coupled with descriptions were used un data presentation. The research research sample was 384 calculated using the Krejcie& Morgan (1970) table for determining sample size. The sample selected by the researcher fairly representing the total population and within the sample it included teachers, librarians, District Education Office Staff and Provincial Education Office Staff.

From the hypothesis testing all the hypothesis assumed by the researcher were accepted except for H2 which was rejected after they went under a rigorous and thorough analysis.

5.9 RESEARCH LIMITATIONS

Although the research was successfully completed, the researcher encountered some limitations with respect to data collection from the education officers as well as the teachers due to the restrictions they have on the type of information they are allowed to disclose. As government employees, they are sanctioned by law through the Official Secrecy Act to retain information regarding the disclosure of government policy and future plans expect in their capacity as spokespersons of the organisations they represent. The researcher compensated for the restricted

information using publications with relating information. Timely questionnaire distribution and collection was affected by the COVID-19 travel restrictions considering that the researcher had to distribute the questionnaires in Mashonaland East Province. The researcher had to counter this restriction using digital questionnaires which were easily distributed using electronic mails and WhatsApp.

5.10 AREAS OF FURTHER RESEARCH

While the study unearthed the impact of digital library on can support learning at rural boarding schools' dormitories in Zimbabwe, there is still a need to explore the adoption of cloud computing in enhancing the potential of e-learning in changing the learning approach in the face of disasters such as COVID-19. This will open the gap for cloud computing expansion through adoption if technologies such as Microsoft Cloud Azure as data repositories for the facilitation of e-learning especially in the remote communities.

References

Bryman, A. &. A. T., 2011. *Education Research Methods..* Oxford: : Oxford University Press..

Bryman, A., 2015. *Social Research Methods.* OXFORD: OXFORD UNIVERSITY PRESS.

BuiltIn, 2019. What is Artificial Intelligence? How Does AI Work?.

Bryman, A. &. A. T., 2011. *Education Research Methods..* Oxford: : Oxford University Press..

Bryman, A., 2015. *Social Research Methods.* OXFORD: OXFORD UNIVERSITY PRESS.

BuiltIn, 2019. What is Artificial Intelligence? How Does AI Work?.

Creswell, J. W., 2014. *Research Design: Qualitative, Quantitative and Mixed Methods.* California: Sage Publications.

Flick, U., 2011. *Introducing research methodology: A beginner's guide to doing a research project..* London: : Sage..

Gutek, G. L., 1991. *An historical introduction to American education, 2nd edition..* s.l.:s.n.

Hiekkanen, M., 2010. *The Impact of Information Technology Enabled Services on Value Co-Creation.* Espoo: AMCIS.

Johannesson P, P. E., 2014. Research Paradigms. *An Introduction to Design Science.,* pp. 167-179.

Keegan, B. B. K. J. R. a. J. R., 2017. Evaluation and decision making in social media marketing.. *Manage. Decision, 55: ,* pp. 15-31.

Kumar, R., 2009. *Research Methodology: A Step-by-Step Guide for Beginners.* Finland: SAGE Publications.

Lavrakas, P. J., 2008. Target Population. *Encyclopedia of Survey Research Methods.*

Leedy, P. a. O. J. (., 2010. *Practical research..* Upper Saddle River,: NJ: Merrill..

Keegan, B. B. K. J. R. a. J. R., 2017. Evaluation and decision making in social media marketing.. *Manage. Decision, 55: ,* pp. 15-31.

Kumar, R., 2009. *Research Methodology: A Step-by-Step Guide for Beginners.* Finland: SAGE Publications.

Lavrakas, P. J., 2008. Target Population. *Encyclopedia of Survey Research Methods.*

Leedy, P. a. O. J. (., 2010. *Practical research..* Upper Saddle River,: NJ: Merrill..

Liu, D., 2017. A Practical Guide to ReLU. *https://medium.com/@danqing/a-practical-guide-to-relu-b83ca804f1f7.*

M., L. P. a. T. A., 2009. *Research Methods for Business Students.* Pearson: New York..

Mount, M. a. M. M., 2014. Social media: A tool for open innovation.. *California Manage. Rev., 56: ,* pp. 124-143.

Mulhern, J., 1959. *A history of education: A social interpretation,.* 2nd edition.: s.n.

Myers, M., 2009. *Qualitative research in business & management.* Finland: Sage Publications,.

Pipyros K, M. L. G. D. A. T., 2014. *A cyber attack evaluation methodology.* Piraeus: University of Piraeus.

Resnik, D., 2007. What is Ethics in Research & Why Is It Important.

Riloff, E. a. W. J., 2003. “Learning extraction patterns for subjective expressions". *Empirical methods in natural language processing, Association for Computational Linguistics, ,* pp. pp. 105-112. .

Saunders, M. N. K. P. L. a. A. T., 2016. *Research methods for business students.15th ed.* England: Financial Times/Prentice Hall..

Bryman, A. &. A. T., 2011. *Education Research Methods..* Oxford: : Oxford University Press..

Bryman, A., 2015. *Social Research Methods.* OXFORD: OXFORD UNIVERSITY PRESS.

BuiltIn, 2019. What is Artificial Intelligence? How Does AI Work?.

Bryman, A. &. A. T., 2011. *Education Research Methods..* Oxford: : Oxford University Press..

Bryman, A., 2015. *Social Research Methods.* OXFORD: OXFORD UNIVERSITY PRESS.

BuiltIn, 2019. What is Artificial Intelligence? How Does AI Work?.

Creswell, J. W., 2014. *Research Design: Qualitative, Quantitative and Mixed Methods.* California: Sage Publications.

Flick, U., 2011. *Introducing research methodology: A beginner’s guide to doing a research project..* London: : Sage..

Gutek, G. L., 1991. *An historical introduction to American education, 2nd edition..* s.l.:s.n.

Hiekkanen, M., 2010. *The Impact of Information Technology Enabled Services on Value Co-Creation.* Espoo: AMCIS.

Johannesson P, P. E., 2014. Research Paradigms. *An Introduction to Design Science.,* pp. 167-179.

Keegan, B. B. K. J. R. a. J. R., 2017. Evaluation and decision making in social media marketing.. *Manage. Decision, 55: ,* pp. 15-31.

Kumar, R., 2009. *Research Methodology: A Step-by-Step Guide for Beginners.* Finland: SAGE Publications.

Lavrakas, P. J., 2008. Target Population. *Encyclopedia of Survey Research Methods.*

Leedy, P. a. O. J. (., 2010. *Practical research..* Upper Saddle River,: NJ: Merrill..

Keegan, B. B. K. J. R. a. J. R., 2017. Evaluation and decision making in social media marketing.. *Manage. Decision, 55: ,* pp. 15-31.

Kumar, R., 2009. *Research Methodology: A Step-by-Step Guide for Beginners.* Finland: SAGE Publications.

Lavrakas, P. J., 2008. Target Population. *Encyclopedia of Survey Research Methods.*

Leedy, P. a. O. J. (., 2010. *Practical research..* Upper Saddle River,: NJ: Merrill..

Liu, D., 2017. A Practical Guide to ReLU. *https://medium.com/@danqing/a-practical-guide-to-relu-b83ca804f1f7.*

M., L. P. a. T. A., 2009. *Research Methods for Business Students.* Pearson: New York..

Mount, M. a. M. M., 2014. Social media: A tool for open innovation.. *California Manage. Rev., 56: ,* pp. 124-143.

Mulhern, J., 1959. *A history of education: A social interpretation,.* 2nd edition.: s.n.

Myers, M., 2009. *Qualitative research in business & management.* Finland: Sage Publications,.

Pipyros K, M. L. G. D. A. T., 2014. *A cyber attack evaluation methodology.* Piraeus: University of Piraeus.

Resnik, D., 2007. What is Ethics in Research & Why Is It Important.

Riloff, E. a. W. J., 2003. “Learning extraction patterns for subjective expressions". *Empirical methods in natural language processing, Association for Computational Linguistics, ,* pp. pp. 105-112. .

Saunders, M. N. K. P. L. a. A. T., 2016. *Research methods for business students.15th ed.* England: Financial Times/Prentice Hall..

APPENDIX A: QUESTIONNAIRE

VIBABWE

GRADUATE SCHOOL OF MANAGEMENT

SURVEY QUESTIONNAIRE

Dear participant,

My name is **SIMON CHIGEZA;** I am a final year MBA student at the University of Zimbabwe. I am carrying out a study to conduct **a critical analysis of how digital libraries/e-resources can support learning at rural boarding schools in Zimbabwe**. The responses you are going to provide shall be used only for the academic purpose of satisfying this research requirement. Be assured that your identity shall be kept as private as is necessary. The questionnaire falls into categories with the first section seeking information regarding your demographic data, the second section seeks to gather information about the challenges being faced by boarding schools in setting-up and managing Digital Libraries, the third section seeks to collect information that might assist in the development of a Conceptual framework for the successful implementation of digital libraries at boarding schools while the last section requests for information on what policy makers can do about the need for digital libraries at boarding schools. Your commitment to this questionnaire is greatly appreciated.

PART A: DEMOGRAPHICS

A1: Indicate your gender

Male	
Female	

A2: Indicate the age range that correspond to your age

15-20 years	
21-30 years	
31-40 years	
41-50 years	
51+ years	

A3: Indicate the highest level of education attained

Certificate	Diploma	Bachelor's Degree	Master's Degree	Other

A4: Which position do you hold?

School child	
Teacher	
Librarian	
District Education Office Staff	
Provincial Education Office Staff	

A5: How many years have you been in that position?

1-5 years	

6-10 years	
11-15 years	
16-20 years	
21 years +	

SECTION B: CHALLENGES FACED BY BOARDING SCHOOLS IN SETTING-UP AN MANAGING DIGITAL LIBRARIES

This section seeks to establish the challenges being faced by boarding schools in setting-up and managing digital libraries. The following table carries a list of factors generally considered as challenges in the domain. Kindly show your level of agreement to each factor to show your opinion using the Likert scale provided where:

1= Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree and 5 = Strongly Disagree

Code	**Challenge**	**1**	**2**	**3**	**4**	**5**
CGP1	Lack of computers					
CGP2	Vandalism of equipment					
CGP3	Lack of specialist knowledge					
CGP4	Poor network coverage					
CGP5	There is no internet , Unreliable connectivity					
CGP6	Lack of funds to acquire technological equipment					

Indicate if you have any of the following devices by ticking in the appropriate box

Code	DEVICE	YES	NO
CF1	Laptop		
CF2	Desktop		
CF3	Smartphone or Tablet		

ADMINSTRATIVE ISSUES INFLUENCING THE ADOPTION OF DIGITAL LIBRARIES

Code	Statements	1	2	3	4	5
ADM1	Government policy inhibiting					
ADM2	Fear of the unknown					
ADM3	Lack of interest to adopt new technologies					
ADM4	Lack of qualified librarians					
ADM5	Lack of digital education content					

PART C: CONCEPTUAL FRAMEWORK FOR THE IMPLEMENTATION OF DIGITAL LIBRARIES AT BOARDING SCHOOLS

ICT INTERVENTION

The statements in the Table below suggest possible ICT interventions that can facilitate the implementation of Digital Libraries at boarding schools in Zimbabwe's high schools. Indicate your level of agreement to each statement using the provided a five-point Likert Scale where:

1= Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree and 5 = Strongly Disagree

Code	Intervention	1	2	3	4	5
ICTI1	Curriculum should be reviewed					
ICTI2	Need for computer literacy for teachers					
ICTI3	ICTs should be used for lesson delivery					
ICTI4	Government should computerize schools					
ICTI5	Schools should be connected to the internet					
ICTI6	Librarians should be trained on ICT infrastructural integration					

LOCAL ADMINISTRATIVE SUPPORT

The statements in the Table below suggest what local education administrative institutions can do to support adoption of digital libraries at boarding schools in Zimbabwe's high schools. Indicate your level of agreement to each statement using the provided a five-point Likert Scale where:

1= Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree and 5 = Strongly Disagree

Code	Statements	1	2	3	4	5
LADS1	Local education offices should source for ICT donations					
LADS2	Local community should support the initiative					
LADS3	There is need for technical support from the industry					

PART D: WHAT POLICY MAKERS CAN DO ABOUT THE NEED FOR DIGITAL LIBRARIES AT BOARDING SCHOOLS

The statements in the Table below suggest what policy makers can do about the need for Digital Libraries at boarding schools in Zimbabwe's high schools. Indicate your level of agreement to each statement using the provided a five-point Likert Scale where:

1= Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree and 5 = Strongly Disagree

Code	Statements	1	2	3	4	5
PM1	Introduce outcome based education					
PM2	Introduce an integrated approach to ICT in schools					
PM3	Implement an information literacy policy					
PM4	Adopt the incremental approach to library services provision					
PM5	Implement a phased-in or transitional approach to the library service provision					
PM6	Factor in resource-based learning in schools					

Thank you for your cooperation