ASSESSING THE IMPACT OF IMPLEMENTING THE USE OF AI BASED DIGITAL SOLUTIONS IN HIGHER EDUCATION

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ASSESSING THE IMPACT OF IMPLEMENTING THE USE OF AI BASED DIGITAL SOLUTIONS IN HIGHER EDUCATION

BY

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ABSTRACT

AI advancement and implementation has been rapidly changing the world and presenting many different opportunities that are helping improve it in different sectors including in Higher Education (HE). This dissertation aims at assessing the impact of the implementation of AI based digital solutions in higher education.

This research is to be done using different approaches that help review the adoption and integration of AI based digital technologies, such as intelligent tutoring systems, learning analytics and chatbots, across various higher education institutions (HEIs). The area under study will be Africa University. This dissertation will explore both advantages and disadvantages of using AI in higher education, getting opinions and understandings from the perspective of students, faculty and administrative staff.

Findings from this research will help draw out conclusions of what can be done to improve adoption of AI in higher education and also to view if there in anything that can be done to make it accessible to those who do not have access to it due to certain reasons. However, the study also highlights concerns around data privacy, algorithmic bias, and the need for faculty training and support.

The research will use four frameworks namely Diffusion of Innovations theory (DOI), Organizational Learning Theory (OLT), technology Acceptance model (TAM), Unified Theory of Acceptance Use of Technology (UTAUT). These four frameworks will help dissect this topic and help understanding opinion from

interviewee's points of view. Data analysis also becomes easy to carry out. However, when carrying out this research, it will be paramount for the researcher to take note of the data privacy and ethical concerns of the organization under research.

The conclusions drawn from this study will help contribute to the improvement in the implementation of AI in higher education and also help institutions that have little understanding of what can be achieved by implementing the use of AI in their learning sectors.

Key words: *AI digital solutions, higher education, AI Adoption in education*

DECLARATION

I, Tashinga Bukitsani accept that this dissertation is entirely my own creation with exception of cited and acknowledged sources. This work will not be submitted anywhere beyond Africa University for any other reasons.

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TASHINGA BUKITSANI

Student (researcher)

Date: 26/07/24

BRAITON MUKHALELA

Date: 26/03/25

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I extend my sincere gratitude to Mr Mukhalela, my supervisor, for his invaluable guidance and insightful feedback throughout this research dissertation. I also appreciate Africa University for allowing me to carry out my research using it as my research environment. I extend my thanks for the students and lecturers who participated in my research.

DEDICATION

This dissertation is dedicated to all institutions that offer higher education, which I believe have what it takes to support both privileged and underprivileged individuals who do not have access to using AI technologies. These institutions can help improve learning syllabuses implementing methods that suite the modern times.

ABBREVIATIONS

AU – Africa University

AI – Artificial intelligent

DOI – Diffusion of Innovations theory

HE – Higher education

IoT – Internet of Things

OLT – Organizational Learning Theory

TAM – technology Acceptance model

UTAUT – Unified Theory of Acceptance Use of Technology

VL – Virtual Learning

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CHAPTER 1

Assessing the Impact of implementing AI based digital solutions in Higher Education.

1.1 Introduction:

Academics are becoming more interested in investigating how digital technologies, especially in the areas of artificial intelligence (AI), might improve access to high-quality higher education due to their rapid growth. Given the continued existence of global gaps in educational opportunities, the use of these technologies show that they will help improve higher education institutions (Biswas & Biswas, 2020).

Access to high-quality higher education has historically been delayed by a number of factors, such as institutional limitations, socioeconomic position, and remote location (Jing et al., 2021). These challenges have made it difficult for underprivileged individuals of the society to implement the use of AI driven digital solutions in their education.

The advent of digital solutions powered by AI provides a glimpse of hope for getting over these enduring challenges. Regardless of a student's geography or socioeconomic background, intelligent tutoring systems, for example, can offer individualized, adaptive learning experiences catered to their specific requirements and talents (Nye, 2015). Additionally, administrative procedures like financial aid applications and academic advice can be streamlined by AI-powered chatbots and virtual assistants, improving accessibility and ease of use for underrepresented groups in higher education (Hoanca, 2016).

These technologies have the ability to raise the standard and inclusivity of higher education in addition to improving the delivery of educational services and material. For example, NLP a subgroup under AI helps compile larger pieces of unstructured information, such as articles, researches and dissertations.

Evaluating their effects and comprehending the underlying potential and problems is essential as the use of AI-driven digital solutions in higher education picks up steam. This study tries to investigate how these technologies can be used to improve quality of higher education, taking into account the practical and ethical issues that come up throughout their use.

1.2 Background to the Study:

The landscape of higher education has been evolving with the integration of technology. AI has emerged as a powerful tool that can transform traditional educational approaches. Despite the existence of institutions like Africa University, there has been so many challenges that limit the educational opportunities and socio-economic mobility for many individuals in the learning sector. These challenges are geographic remoteness, socioeconomic status and limited institutional capacity (Jing et al., 2021).

According to recent data from Zimbabwe Ministry of Higher and Tertiary Education, about 30 % of Zimbabwean students have had access to higher education (Ministry of Higher and Tertiary Education, 2022). This is due to the expensive costs of attending universities and students living in rural areas where educational institutions are very few.

Research has shown that individuals who have reached university level in Zimbabwe have better skill and have better paying jobs than those who do not possess the same quality of education (Munetsi, 2019). This unfair difference in economic outcomes have resulted in a continuous cycle of poverty and social inequity, as those without access to higher education barely get a better life and better skill.

Recently, the rapid advancement of digital technologies, especially in the fields of artificial intelligence (AI), has developed opportunities for addressing these challenges in the Zimbabwean context. Innovative solutions leveraging these technologies have the potential to normalize access to higher education and enhance the completeness of these institutions (Biswas & Biswas, 2020).

AI has introduced the use of intelligent tutoring systems which can provide personalized and adaptive learning, regardless of a student's location or socio-economic background (Nye, 2015). To add to this, AI-powered virtual assistants and chatbots have helped by giving financial and academic advice that helps make higher education more accessible and navigable for the underprivileged populations (Hoanca, 2016).

This research study, to be conducted at Africa University, aims to explore the impact of AI-driven digital solutions on enhancing access to quality higher education in Zimbabwe. The study will focus on identifying the opportunities, challenges, and best practices in the implementation of these technologies within the specific context of the Zimbabwean higher education system.

By reviewing the persistent challenges to higher education and leveraging the potential of digital solutions, this research has the potential of contributing to the

development of a more complete and fair educational system in Zimbabwe, thus empowering individuals and communities to reach their full potential.

1.3 Statement of the Problem:

The problem addressed in this research is the need to assess the impact of enhancing access to quality higher education through AI-driven digital solutions. While these technologies hold promise, there is a lack of comprehensive understanding regarding their effectiveness, scalability, and potential consequences. It is crucial to investigate the benefits, challenges, and ethical considerations associated with the integration of AI in higher education to ensure equitable access and maintain the quality of educational experiences.

1.4 Research Objectives:

The research objectives of this study are as follows:

a) To explore the current landscape of AI-driven digital solutions in higher education.

b) To assess the impact of these digital solutions on access to quality higher education.

c) To identify the benefits and challenges of implementing AI in higher education settings.

d) To investigate the ethical considerations associated with the use of AI in higher education.

1.5 Research Questions:

The research questions guiding this study are as follows:

a) How are AI-driven digital solutions currently being utilized in higher education?

b) What is the impact of these digital solutions on access to quality higher education?

c) What are the benefits and challenges of implementing AI in higher education settings?

d) What ethical considerations should be considered when integrating AI in higher education?

1.6 Assumptions:

a) The AI-driven digital solution will positively impact learning outcomes: It is hypothesized that the proposed solution will enhance students' learning outcomes, including academic performance, knowledge acquisition, skills development, and critical thinking abilities.

b) The AI-driven digital solution can be scaled up and sustained: It is assumed that the digital solution can be implemented on a larger scale, considering factors such as cost, technical support, and infrastructure requirements, while maintaining its effectiveness and sustainability.

c) Management at Africa University will assist in the research study and will provide resources, time, infrastructure and individuals to ensure successful evaluation and implementation of the suggested digital solutions.

d) Student or faculty surveys and Africa University's records will help make research more accurate on reflection of the current state access to higher education and challenges faced by the institution.

1.7 Hypotheses:

a) Hypothesis 1: The technological infrastructure in most learning institutions limit the adoption of AI-driven digital solutions in their education system.
b) Hypothesis 2: Stakeholders in environments of higher education do not have the right knowledge of the importance of these AI digital solutions in higher education.
c) Hypothesis 3: The Institutions that offer higher education believe that using AI in education can promote laziness and data insecurity within their organizations.

1.8 Significance of study to the Learning Sector:

a) Addressing educational inequalities: The study's significance is to help those who face challenges that make it difficult for them to get access to quality higher education. By implementing the use of AI technologies, the digital solutions could bridge the gap between underprivileged populations and educational opportunities.

b) Improving learning outcomes: The study's findings can contribute to improving learning outcomes in higher education. If AI technologies prove to be of help, there will be an increase in the quality of education which in turn will result in students producing better results. In economies like Zimbabwe, graduates will have better skills and will help bring new ideas in the working sector of the country.

c) Enhancing educational innovation: The research topic explores the use of AI and technologies in higher education, contributing to the field of educational innovation. The study has the potential to uncover new ways of leveraging technology to revolutionize teaching and learning processes, making education more accessible, engaging, and effective.

d) Contributing to research on AI in education: The research topic adds to the existing body of knowledge on the application of AI technologies in the educational context. By assessing the impact of the proposed digital solution, the study can contribute to the understanding of how these technologies can be effectively utilized to enhance access and quality in higher education.

Overall, the significance of this study lies in its potential to contribute to educational equity, improve learning outcomes, foster innovation, inform decision-making, advance research in AI and in education, and identify areas for improvement in the implementation of digital solutions for higher education.

1.9 Significance of Study to the researcher:

a) Sharing of potential solutions: The research may possess potential solutions as to what can be done to implement the use of AI driven digital solutions to everyone including those who face challenges that have hindered them to get access to such modern technologies.
b) Facilitation of recent evolved learning systems: The research has data that is useful if learning institutions worked upon it, this in turn makes them see how

other countries are governed by AI in their learning sectors. This is important because it helps produce students who are well versed technology wise.

c) Influence on stakeholders: Understanding the importance of AI in education can have a positive effect on stakeholders in the education sector. The gathered information in this research will help stakeholders see how the implementation of AI-driven digital solutions can improve ways in which education is delivered to students in higher education.

d) Professional growth: This research will help make the researcher have a better understanding of what can be achieved using AI, this means understanding both the advantages and disadvantages that come along with the usage of it in the education sector.

1.10 Delimitations of the study

a) Scope of the digital solution: The research project focuses specifically on assessing the impact of an AI-driven digital solution for enhancing access to quality higher education. The study does not explore other interventions or technologies that may contribute to educational access or quality improvement.

b) Timeframe: The research project operates within a specific timeframe, which may limit the examination of long-term effects or changes that occur beyond the scope of the study's duration. The findings may not capture the full extent of the impact of the digital solution over an extended period.

c) Stakeholder perspectives: The study primarily considers the perspectives of Africa University students, educators (AU lecturers) and AU administrators. Other stakeholders, such as parents, university employers, or community members, may not be fully represented, limiting the comprehensive understanding of the digital solution's impact.

d) Resource constraints: The research project acknowledges potential resource constraints, such as limited funding, time, or access to technology infrastructure. These limitations may influence the implementation and scalability of the digital solution and impact the extent of the study's findings.

1.11 Limitations of the study

a) Generalizability: The findings of this research may be limited in their generalizability due to contextual factors specific to the study's setting, such as the characteristics of the participating institutions, student demographics, or the availability of resources. The results may not be universally applicable to all higher education contexts.

b) Sample size and representativeness: The research project's sample size may be limited, affecting the representativeness of the findings. The study may focus on a specific group of students, educators of the university, which may not fully capture the diversity of higher education stakeholders. This limitation could impact the generalizability of the results.

c) Data reliability and validity: The research relies on the collection and analysis of data, which may be subject to limitations in terms of reliability and validity. Issues such as self-reporting biases, response rate, or measurement errors could affect the accuracy and robustness of the findings.

d) Ethical considerations: The study of AI technologies must address ethical concerns such as data privacy, algorithmic bias, and unintended consequences. However, because of these ethical considerations, it makes it difficult to conduct and accurate research within the university.

e) Technological Infrastructure: Africa University's technology may be underdeveloped or restricted which makes it difficult to conduct a feasible and accurate research.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 Introduction

Access to quality higher education is a crucial factor in promoting social mobility, economic development, and individual empowerment. However, various barriers, such as geographical constraints, limited resources, and financial limitations, often hinder individuals from accessing higher education opportunities. In recent years, advancements in Artificial Intelligence (AI) technologies have opened up new possibilities for enhancing access to quality higher education through innovative digital solutions. This review of related literature aims to explore the existing research and theoretical frameworks related to the assessment of the impact of AI-driven digital solutions on enhancing access to quality higher education.

2.2 Theoretical framework

The theoretical framework for this study draws upon several key frameworks which help guide points which support structure of the research. These frameworks act as blueprints which help the researcher interpret his findings. Frameworks to be discussed in this section are the Technology Acceptance Model (TAM), Diffusion of Innovations (DOI) theory, Unified Theory of Acceptance and Use of Technology (UTAUT) and Organizational Learning Theory (OLT).

2.21 Technology Acceptance Model (TAM)

This a framework that has been implemented to understand the factors that affect the use of AI technologies in educational environments (Hoanca, 2016; Biswas, 2020). The TAM states that the ease of use and usefulness of a

technology are paramount determinants of a person's intention to use the technology (Davis, 1989).

TAM studies have found that factors such as user attitudes and institutional support have impact on the acceptance and integration of AI-based systems in higher education (Jing et al., 2021; Rao, 2019). For example, there was a survey conducted among university faculty and administrators in India by Biswas (2020), this survey found that ease of use, usefulness and institutional support are critical factors in acceptance of AI technologies.

2.22 Diffusion of Innovations (DOI) theory

This theory describes how new ideas, technologies or practices spread within a social system (Rodgers, 2003). Research grounded in the DOI theory has explored the factors that facilitate or hinder the diffusion of AI-based applications in higher education. For example, Tait (2018) investigated the implementation of online learning in developing countries and found that factors such as infrastructure, digital literacy, and institutional policies played an important part in the implementation of these innovations.

2.23 Unified Theory of Acceptance and Use of Technology (UTAUT)

It combines elements from different acceptance models, including TAM and DOI (Venktesh et al., 2003). Selwyn used this framework to investigate university students' negative engagements with digital technologies, showing the relevance of understanding both advantages and disadvantages of using AI-based systems in higher education.

2.24 Organizational Learning Theory (OLT)

This framework helps show how organizations including higher education institutions, obtain and share the newly acquired knowledge and skills. This framework is important as it helps understand the processes and structures that either support or make sharing of knowledge difficult.

2.3 Relevance of the theoretical study

a) Technology Acceptance Model (TAM)

- TAM framework provides a setup for reviewing the factors that influence the implementation and use of AI technologies in educational settings, such as ease of use and usefulness of the technologies.

b) Diffusion of Innovations (DOI) theory

- DOI is an important framework which helps explore all factors that affect the implementation of AI-based solutions in Higher education.
- DOI helps the researcher know what is required to determine the rate at which an innovation can bee implemented. Factors such as infrastructure, digital literacy and institutional policies play come into play.

c) Unified Theory of Acceptance and Use of Technology (UTAUT)

- UTAUT framework is a relevant framework as it reviews both advantages and disadvantages of the implementation of AI based digital solutions in the learning sector.
- Because this framework is composed of the integration of other technology acceptance models, it provides the most relevant information as to what needs to be done to implement AI-driven digital solutions in higher education in ways that yield higher positive outcomes.

d) Organizational Learning Theory (OLT)

- The OLT is important as it helps understand institutional capacity for AI integration, this in turn assist researchers in understanding the organizational structures and processes that affect successful integration and use of AI within the educational context.
- The integration of AI in higher education often requires the restructuring of workflows, and the development of new practices and policies. OLT can provide insights into how higher education organizations manage the knowledge and skills necessary for these organizational changes, as well as the factors that allow the institution's ability to change to technological advancements.

2.4 Summary

This section of the research study outlines the frameworks that explain the impact of enhancing the implementation of AI-driven digital solutions in higher education. The four theoretical frameworks discussed in this section are Technology Acceptance Model (TAM), Diffusion of Innovations (DOI) theory, Unified Theory of

Acceptance and Use of Technology (UTAUT) and Organizational Learning Theory (OLT). These four frameworks hold a crucial role in this research as they help explore what it really means to implement AI in education and the benefits and challenges that come along with it. Their relevance have been explained in this section. The overall purpose of this study is to provide understanding as to what is needed to implement the use of AI in higher education, advantages and as well as the challenges that come along implementing AI based technologies in the Learning sector.

CHAPTER 3: METHODOLOGY

3.1 Introduction:

In this chapter the researcher will outline the methodology used to explore the impact of implementing the use of AI-digital solutions in higher education. This section outlines the research design, data collection methods, data collection tools, data analysis techniques and ethical considerations to be taken in the study. This chapter aims to provide a clear approach to uncover the impact of implementing the use of AI in higher education, this means examining both positive and negative effects. The research will be done at Africa university ensuring reliability and validity of the research findings.

3.2 The Research design:

The research design for this study will employ a mixed-methods approach, combining both quantitative and qualitative methods. The quantitative component will involve the collection of numerical data to assess the impact of the digital solution on learning outcomes, while the qualitative component will gather in-depth insights into users' perceptions and experiences.

a. Quantitative Analysis

   Quantitative analysis is important for research as it helps enable systematic analysis, and interpretation of data to uncover meaningful patterns and relationships between different variables within the research (Creswell & Creswell, 2018). Quantitative research helps researchers generate objective

and valid statistical data that will help in decision-making, policy development and providing solutions (Polit & Beck,2017).

In the context of this research, surveys are going to be carried out at Africa university, investigating students, lecturers and the university's administration. The collected data will provide a statistical insight as to what these groups think about the implementation of AI digital solutions in their education.

b. Qualitative Analysis

Qualitative research is important for exploring complex situations and getting a deeper understanding of what is being studied (Merriam & Tisdell, 2015). Qualitative analysis allows researchers to get into lived experiences, perceptions and perspectives of individuals thus allowing the researcher to get a deeper understanding of the subjects' views, behaviours and responses (Creswell & Cresswell, 2018).

Semi-structured interviews will be carried out among Africa university students, lecturers and administrators. Questions will be open ended so that when answering these questions, the interviewee does not feel limited when answering the questions. This helps the researcher get a deep insight as to what the participants feel towards this research.

c. Sampling Strategy

In this research, the sampling method that is going to be used is called selective-sampling. This is a non-probability sampling technique where the researcher is going to select specific participants based on certain characteristics. In this research, the area of focus is Africa university and the participants to be used to carry out this research are students, lecturers and administrators. These people are selected because the implementation of AI in higher education has direct impact upon them. Selective sampling is seen as the best sampling method as the individuals understudy are affected differently by AI in their roles at the institution.

3.3 Population and Sampling Methods:

The population of interest for this study consists of students, lecturers and administrators. Selective-sampling is going to be used together with stratified random sampling. Stratified sampling technique is a probability sampling technique that divides a population into distinct subgroups called “Strata”, based on certain characteristics and then selects random sample from each stratum (Babbie, 2020).

When carrying out stratified sampling, the researcher has to follow four major steps.

- Identifying variables to stratify the population
- Divide the population into mutually exclusive strata or subgroups
- Determine sample size of each strata
- Randomly select participants from each stratum

Using the above information,

- the population understudy will be AU (Africa University).
- the variables used to divide the population will the role of individuals in the population that is:
    i. lecturers (representing educators).
    ii. students (representing learners).
    iii. administrators (people who lead the school in different departments)

This research will divide the population and each subgroup will consist of 5 participants. This means all in all there are 15 participants ie 5 students, 5 lecturers and 5 administrators.

Combining stratified and selective sampling is very important as it helps the researcher not only gather statistical data but also get an understanding from the interviewees' point of view. This makes findings become more valid and reliable. All these are characteristics that make a good, reliable and accurate research.

3.4 Strata presentation Diagram

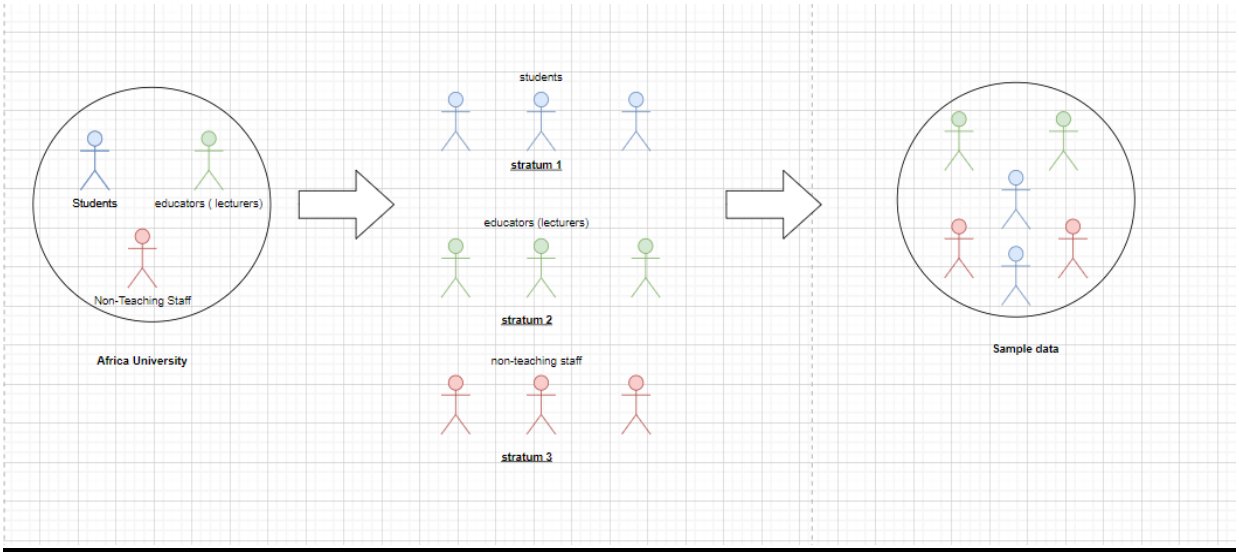


Figure 3.4 Strata Presentation

3.5 Data collection tools

Multiple data collection tools will be utilized to gather both quantitative and qualitative data. Quantitative data will be collected through surveys, which will include multiple-choice questions, designed to measure learning outcomes, user satisfaction, and perceived impact. Qualitative data will be gathered through semi-structured interviews, allowing participants to share their experiences, perceptions, and suggestions related to the digital solutions.

a. Surveys:

   Surveys will be conducted using multiple choice questions at AU. Platforms such as Google Forms or JotForm will be used to carry out the survey. 15

people will be involved in the survey and their identities will be kept anonymous, this helps them have trust and want to participate without the worry of being held accountable for anything they would have said.

b. Semi-structured interviews.

To conduct these interviews, an interview guide is going to be made. This interview guide will help the interviewee understand how to answer questions and will also have the chance to further explain their answers and share their opinions. The questions to be asked will be open ended to allow for the researcher to get in-depth understanding of the interviewee's points of view. In short this means these interviews are going to be participant centred, researcher will focus on the interviewee's experiences rather than predetermined set of answers.

3.6 Data collection procedure

The data collection for this research is going to be governed by the following steps:

a. Ethical considerations:

The researcher is going to continuously review and adhere to ethical guidelines throughout the data collection process. Maintain transparency and accountability in the data collection and analysis procedures. This is done to ensure participant well-being and confidentiality.

b. Reviewing research objectives:

Researcher will have to clearly state their objectives so that the questions in the interviews do not end up going off-topic. Clearly stating the goals of the interview help the interviewees answer properly and give better responses.

c. Develop interview guide:

When developing interview questions, the questions developed must be open ended. This allows the interviewees to give answers and also have room to further explain them hence this makes the interviewer understand what his participants will be feeling and thinking towards the matter. Researcher will organize the questions in a logical flow, allowing for flexibility and follow-up questions. If possible, a pilot test can be conducted to check the feasibility of the interviews or survey.

d. Participant recruitment and sampling:

Researcher will identify the target population and make sure that recruitment plan ensures a good sampling diversity. In this research purposive or selective sampling is going to be conducted.

e. Conducting interview:

When conducting the interview, it is paramount to consider ethical views of the organization, making sure that participant gives consent

to partake in researcher's interview and making sure that the date and time for the interview has been properly scheduled.

f. Data Storage and management:

Data gathered from the interview and survey needs to be properly stored so that it can be used for analysis of the research. When storing data, data management plans should be constructed which show procedures for data backup, access control and preservation. In this stage it is also important to ensure that participant confidentiality and anonymity is kept in check and they are aware that their information from the past interviews will be used

g. Data analysis:

When doing data analysis, researcher has to develop a coding framework to properly analyze the interview data. Researcher has to look for themes and patterns that are inline with or that address the research's objectives.

3.7 Analysis and organisation of data

Quantitative data collected through surveys will be analyzed using appropriate statistical techniques such as descriptive statistics, correlation analysis, and regression analysis. Qualitative data from interviews will be transcribed and analyzed using thematic analysis to identify recurring themes, patterns, and insights.

Researcher is going to use thematic analysis for processing of the qualitative data obtained from the interviews. After these processes, data organization and management then follow. Researcher must organize the coded data, and any supplementary material such as notes and observations in a structured format, such as a spreadsheet (Bazeley & Jackson, 2013). In this stage researcher also takes into account things such as data backup, access control, data preservation and removing of any identifying information from the data which may end up revealing our participants' identities.

After identifying and discussing the themes and patterns of the gathered data, quantitative analysis is then done in order to help the researcher get statistical analysis of the findings obtained from the questionnaires. Descriptive statistics, such as means, frequencies, percentages, and standard deviations, will provide an overview of participant responses.

Lastly the presentation of the gathered data is then done. Findings are combined and clearly presented using appropriate headings and formats. Visual aids such as tables, graphs and diagrams will be used to enhance clarity and comprehension of the results. Using these results, the researcher will be able to clearly review the impact of implementing the use of AI based digital solutions in higher education.

3.8 Ethical considerations

a. Confidentiality and Privacy:

Protect the identities of participants by removing any information that might review their identities. This means handling researched information with care under proper security and only reviewing it to people with the right to have access to it.

b. Participant autonomy:

Researcher must avoid coercion or undue influence during the interview process to the interviewee. If participants refuse to take part in the research, the researcher must respect that and not force his participants to do what they are not willing to do.

c. Informed consent:

Participants should be fully briefed on what the interview is about and if they consent in taking part in the research. Obtaining a writing document showing that the researcher has allowed to take part in the interview before conducting it is recommended

d. Ethical usage of data.

Gathered information from interviews and questionnaires from the participants should be used only in the research that they have consented to taking part in. If researcher wishes to use the same data for other reasons beyond the one they agreed to, it is important that they ask for permission to use their participants data before using it.u

3.9 Summary

Chapter 3 outlines the methodology for assessing the impact of implementing the use of AI-based digital solutions in higher learning. Data collection is to be done using both qualitative and quantitative analysis methods. Surveys and semi-structured interviews are going to be used. This allows the researcher to understand data from the interviewee's point of view and also to be able to conduct measurable analysis of the gathered information. A selective sampling method is going to be used whereby participants are chosen using certain characteristics that are needed by the researcher to conduct surveys and interviews. These characteristics are chosen regarding their roles at the university. Interviews and surveys are going to be carried out and all data is going to be gathered, preserved and analysed following the ethical consideration of the research and organization. Some of these ethical considerations are informed consent, ethical data usage, participant autonomy and confidentiality and privacy. These ethical considerations are key to carrying out interviews and surveys where the participants feel safe and protected to say what they actually feel regarding the topic. Gathered data will be developed in order to be inline with our research objectives. After all these are done, the researcher will be able to present the findings in simple clear graphs and diagrams which help review the impact of implementing the use of AI-based digital solutions in higher education.

Project Timeline

April - May 2024

- Development of proposals and data collection tools.

28 June 2024

- Submission of proposals to AUREC.

August - December 2024

- Data Collection.

January - February 2025

- Data Compilation & Literature.

March 2025

- Review and submission.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1. This chapter presents, analyzes, and interprets the data collected from a study exploring the implementation of AI-based digital solutions in higher education. The primary aim is to uncover the barriers to adopting these technologies, assess the benefits and opportunities they offer, and propose actionable solutions for universities.

The chapter begins by detailing the data collection methods used, including surveys, semi-structured interviews, and document analysis, to address the research questions regarding AI integration, Africa University being the area of study. Key findings are highlighted, followed by a discussion on how these findings relate to existing literature and the overarching issue of AI adoption in higher education.

Various tools and methods were employed to analyze data gathered from university stackholders (students, teaching and nonteaching staff. These tools enabled a comprehensive assessment of the challenges faced in implementing AI solutions. The following tools were particularly useful in the analysis process: Qualitative Analysis Tools such as Google Forms and Microsoft Forms, Quantitative Analysis using surveys processed in Microsoft Excel, and Data Visualization through Microsoft Excel for graphical representation of trends and insights.

Finally, this chapter examines the implications of the findings for higher education, emphasizing the opportunities to implement AI solutions that

enhance student engagement, improve educational outcomes, and strengthen institutional capabilities.

The insights derived from this analysis will help develop more effective AI strategies, align with technological advancements, and address the unique challenges of the local educational landscape.

4.2 Data Presentation and Analysis

4.2.1 Response Rate Analysis

A total number of 9 individuals at Africa University are to be selected for the data collection.

$$\text{Response Rate} = \frac{Total\ number\ of\ \ questionnaires\ returned}{Total\ number\ of\ questionnaires\ issued} \times 100$$

Selected Participants	Questionnaires issued	Questionnaires Returned	Response Rate	Response Rate Percentage %
All	9	6	0.667	66.7%

Table 4.2 Survey Response Rate

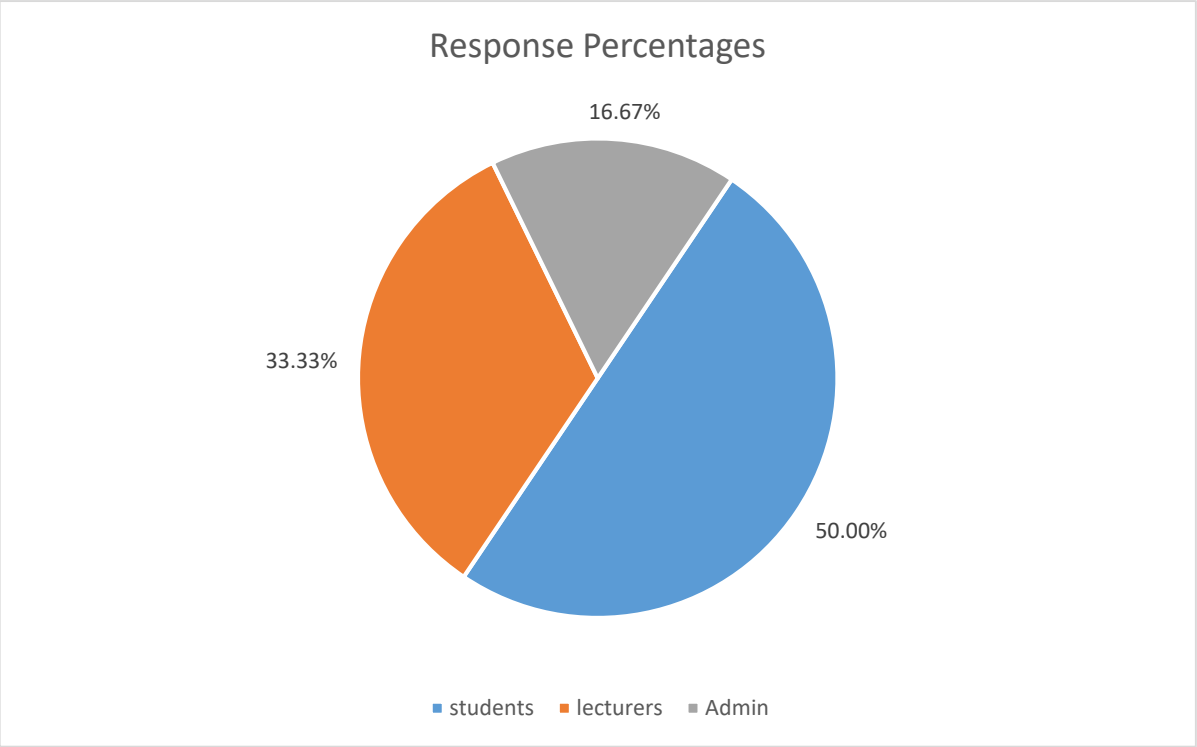


Figure 4.2.1 Responses for the surveyed university stakeholders

4.2.2 Sample Role Demographic Characteristics

Selected Participants	Questionnaires Expected	Questionnaires Returned	Percentage of Returned
All	9	6	66.67%
Students	3	3	100%
Lecturers	3	2	66.67%
Admin	3	1	33.33%

Table 4.2.2 Demographic Statistics

4.2.Data Presentation and Analysis

As the researcher was conducting this study on assessing the impact of implementing the use of AI based digital solutions in higher education, he used the multi-method approach to gather the required data to address the research questions and objectives.

In this section, the researcher will present the key findings from the data collection and provide an in-depth analysis of the insights gained.

4.3 Data collection Methods

4.3.1 Data Collection Methods

a) Semi Structured Interviews

Semi-structured interviews were conducted to gather in-depth insights from key stakeholders involved in the implementation of

AI-based digital solutions in higher education. Participants included university administrators, students, and lectures from different departments. A total of 7 interviews were conducted, each lasting approximately 3 to 5 minutes. The interviews were held both in-person and via online platforms, depending on the availability and preferences of the participants.

Key Topics Discussed:

- Awareness of AI-Based Digital Solutions: Participants shared their familiarity with various AI technologies and their applications in educational settings.
- Perceived Benefits and Barriers to Adoption: The discussions highlighted the potential advantages of AI solutions, such as enhanced learning experiences and operational efficiencies, as well as challenges like funding constraints and resistance to change.
- Organizational Readiness and Infrastructure Challenges: Stakeholders assessed the university's current infrastructure and its readiness to integrate AI solutions effectively.
- Suggestions for Enhancing Adoption: Participants offered recommendations for improving the implementation process, including training programs and increased communication about the benefits of AI technologies.
- Ethical considerations regarding AI Adoption in education: Participants shared whether they thought it was ethical to

implement AI based solutions in education. Their main concerns regarding students cheating during exams using AI were shared.

This method was selected to capture qualitative data, allowing participants to express their views openly and providing a deeper understanding of the factors influencing the adoption of AI-based digital solutions in higher education. The insights gained from these interviews were instrumental in uncovering underlying challenges and identifying potential opportunities for successful implementation.

b) Surveys

Surveys were administered to a broader group of stakeholders to collect measurable data and quantify key trends regarding the implementation of AI-based digital solutions in higher education. The target population included university administrators, students, and lecturers to ensure diverse representation. A total of 9 participants were invited to complete the surveys, resulting in a response rate of 66.7% (6 participants responded).

Survey Content

The surveys consisted of structured, close-ended questions designed to assess:

- Awareness and Previous Use of AI-Based Solutions: Participants indicated their familiarity with and prior experience using various AI technologies in educational settings.
- Perceived Benefits: The survey explored potential advantages, such as improved operational efficiency, enhanced learning opportunities, and increased transparency for stakeholders.
- Barriers to Adoption: Respondents identified challenges like high implementation costs, technical limitations, and concerns regarding data security.
- Potential Strategies to Overcome Barriers: Participants provided suggestions for addressing identified obstacles, focusing on resource allocation and training initiatives.
- Ethical considerations regarding AI Adoption in education: Participants shared where they stand ethically in terms of using AI in higher education and ways it can be implemented that make it align on a more positive view.

The surveys were distributed through Google Forms, ensuring ease of access and anonymity for participants. The quantitative data collected through this method provided statistical insights that complemented the qualitative findings, highlighting prevalent challenges and opportunities associated with the adoption of AI-based digital solutions in higher education.

c) Document Analysis

In addition to the interviews and surveys, a thorough review of relevant organizational documents was conducted to enhance the research on the implementation of AI-based digital solutions in higher education.

Key Documents Analyzed:

- Organizational (university) Strategies and Policies: Reviewed documents related to the university's strategic plans and policies regarding technology adoption and educational innovations.
- Reports on Technological Infrastructure: Analyzed assessments of the current technological capabilities and infrastructure within the university, focusing on readiness for AI integration.
- Industry Standards and Frameworks: Examined best practices and guidelines from educational technology frameworks related to AI solutions and their applications in higher education.

This document analysis helped identify gaps in current practices and align the findings with global trends in educational technology. It added depth to the research by corroborating insights gathered from interviews and surveys, ensuring a comprehensive understanding of the challenges and opportunities associated with the adoption of AI-based digital solutions in the university context.

4.4 Data Presentation

a) Awareness

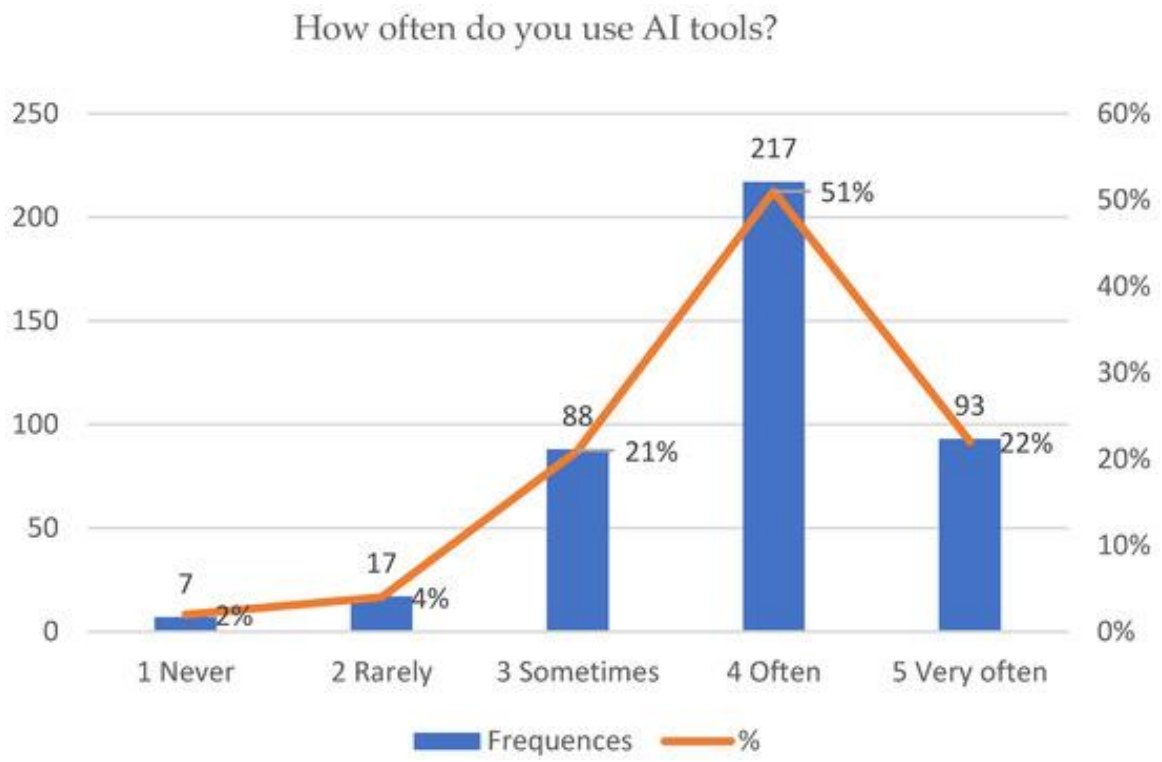


Figure 4.4. Awareness Levels of the Use of AI in Higher Education

The above graph was a survey carried out by a student at Primorska University, Izolska vrata 2, 6000, Slovenia. The researcher analysed the frequency at which students and lecturers use their AI Tools per day, greater numbers showed that these tools are frequently used to complete their educational tasks. The same analysis was proven upon researching Africa University. Students at the university have made AI part of their

learning. The numbers of students, lecturers and administrators who are unaware or have never used AI in education are very little.

Below is a graph that shows the ways in which university students and lecturers use AI.

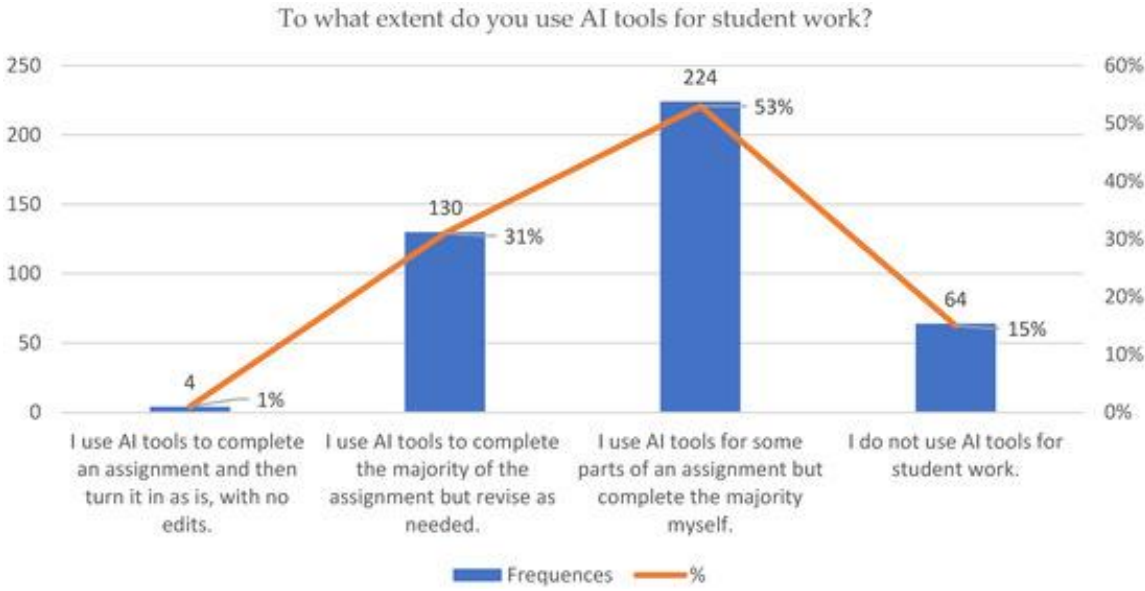


Figure 4.5. Ways in which students use AI tools.

b) Tables

Selected Participants	Questionnaires Expected	Questionnaires Returned	Percentage of Returned
	9	6	66.67%
Students	3	3	50%
Lecturers	3	2	66.67%

Admin	3	1	33.33%

Table 4.4. Total Survey Response Rate

The survey response rate table presents a comparison between the number of issued and returned questionnaires for students, lecturers and administration staff. It provides a clear view of participant engagement across the selected school stakeholders. The total percentage of returned questionnaires by all three parties is 66.67% i.e. 6 out of 9 participants. The returned questionnaires were 6 (students 3, lecturers 2 and admin 1).

4.5 Key Findings:

High Awareness and Adoption of AI-Based Digital Solutions:

The findings indicate that a substantial number of stakeholders in higher education institutions are largely aware of the existence and potential benefits of AI-based digital solutions. For example, the survey revealed that 66.67% of participants had knowledge about such technologies. Interviewees echoed this sentiment, stating that discussions around AI solutions are sometimes the best and easy to implement. This level of awareness serves as a significant stepping stone to the adoption of these innovative technologies.

Cost and Budgetary Constraints:

High implementation costs emerged as a major obstacle, with 60% of survey respondents identifying it as a primary challenge. Interviewees confirmed this perspective, explaining that their institutions prioritize essential operational expenses over investing in AI technologies. This suggests that cost-effective alternatives or financial incentives may be necessary to facilitate the adoption of AI-based solutions in higher education.

Security and Privacy Concerns:

Security and privacy concerns represent another critical barrier, with 40% of participants expressing worries about potential data breaches or unauthorized access related to AI technologies. Interviewees linked these concerns to the absence of clear regulatory frameworks governing AI applications in Zimbabwe. This underscores the need for robust policies to mitigate security risks and foster trust in AI solutions within educational environments.

Potential for Skills Development:

Interestingly, some stakeholders recognized the potential of AI technologies to contribute to skills development within higher education. Interviewees suggested that AI solutions could engage students and inspire them to pursue careers in fields such as data science and technology management by providing interactive and innovative learning experiences. This finding highlights a broader, long-term benefit of adopting AI-based digital solutions in educational institutions.

4.6 Data analysis and interpretation

4.6.1 Quantitative Data Analysis

The survey results highlighted several key challenges and opportunities regarding the adoption of AI-based digital solutions in higher education institutions. The quantitative data indicated that awareness levels of AI technologies are higher than expected. This upward trend suggests that awareness campaigns are effective but require further reinforcement to ensure widespread adoption across educational sectors.

However even though there are high awareness levels, the high implementation costs were the most frequently cited barriers to adoption, impacting over 75% of survey respondents. This indicates that financial and educational initiatives will be crucial in overcoming these challenges and facilitating the integration of AI solutions in higher education. Addressing these issues could significantly enhance the effectiveness and reach of AI technologies in the academic landscape.

4.6.2 Qualitative Data Analysis

The semi-structured interviews provided rich and descriptive insights into people's views. Some participants showed lack of general familiarity with AI use in their learning sector. However, those that were aware of use AI in their day to day learning at the university have testified that AI is performing a very essential role in their learning careers.

Implementing AI in education is slowed down because there are still people who are not taught about the importance and security governing its use, people become hesitant when it comes to using them. This is what was uncovered from the interviews.

4.6.3 Key Patterns and Trends

Several patterns emerged from the data:

- Awareness levels: Most participants proved to have proper information about what AI is capable of in the learning sector.
- Infrastructure limitations and cost constraints are interlinked. Addressing technology availability issues could atleast make the number of people who are aware of the use of AI in education increase.
- Data and privacy concerns have also impacted the numbers of those who are in the environment where AI can be of use. The Admin, lecturers and students have not been fully inducted of the security of data behind the use of AI in their day to day lives so the have been hesitant when it comes to venturing into it.

4.6.4 Relationships between the Data Sources.

The findings from both surveys and interviews were consistent in identifying awareness, cost, and security as critical factors influencing the implementation of AI based digital solutions in higher education. During interviews and surveys, both sides showed that they are

concerned about the use of AI in relation to organizational policies and how ethical its use is in the educational sector.

4.7 Unexpected Findings

One unexpected finding from the interviews and surveys was that many students, lecturers, and administrators believed AI-based digital solutions could significantly improve collaboration and communication in educational settings. Initially skeptical about these technologies, participants were surprised to learn that AI could enhance personalized learning experiences and boost engagement. Some students noted they hadn't considered how AI tools might facilitate group projects or improve interactions with peers and instructors whereas some stated that they already started using them.

Another surprising outcome was the strong interest in professional development related to AI among lecturers and administrators. While some faculty members initially viewed AI as a threat to traditional teaching methods, many expressed a desire for training and resources to better understand how to use these technologies in their classrooms. This shift in perspective highlights a recognition of the value of integrating AI into educational practices.

Finally, this enthusiasm for professional development presents a unique opportunity for universities to engage faculty and staff more effectively. By offering training and support, institutions can help ease the transition to AI-based solutions, ensuring that educators feel equipped to adapt to new

teaching methods. This proactive approach could foster a more positive attitude toward AI technologies and their potential benefits in higher education.

4.8 Challenges, Risks and Opportunities

4.8.1 Challenges

Implementing AI-based digital solutions in higher education presents several challenges. One major challenge is the need for significant investment in technology and infrastructure, which can strain budgets, especially for institutions with limited resources. Additionally, there may be a lack of technical expertise among faculty and staff, making it difficult to effectively integrate and utilize AI tools in the classroom. Resistance to change is another hurdle, as some educators may be hesitant to adopt new technologies due to fears of job displacement or concerns about the effectiveness of AI compared to traditional teaching methods. Furthermore, ensuring data privacy and compliance with regulations poses a complex challenge, requiring institutions to establish robust policies and practices. Lastly, the rapid pace of AI development necessitates continuous training and adaptation, which can be overwhelming for institutions trying to keep up with evolving technologies.

4.8.2 Risks

Implementing AI-based digital solutions in higher education also carries several risks. One significant concern is data privacy and security, as the use of AI often involves collecting and analyzing sensitive student information, which can be vulnerable to breaches. There's also the potential for algorithmic bias, where AI systems may inadvertently reinforce existing inequalities or stereotypes if not properly designed and monitored. Additionally, reliance on AI tools could diminish the role of human interaction in education, potentially impacting student engagement and learning outcomes. Faculty and staff may face challenges in adapting to new technologies, leading to resistance or insufficient training. Lastly, the integration of AI might require substantial financial investment, posing risks for institutions with limited budgets or resources.

4.8.3 Opportunities:

Implementing AI-based digital solutions in higher education offers numerous opportunities, including enhanced personalized learning experiences that cater to individual student needs and learning styles. AI can automate administrative tasks, allowing educators to focus more on teaching and student engagement. Additionally, it facilitates improved data analysis for better decision-making, helping institutions identify trends and areas for improvement. AI technologies can also support collaborative learning through virtual environments, promoting interaction among students and faculty.

Furthermore, the integration of AI can prepare students for future job markets by equipping them with essential digital skills, fostering innovation, and enhancing research capabilities within academic institutions.

4.9 Conclusion

In summary, the discussion highlighted the potential benefits and challenges of implementing AI-based digital solutions in higher education. While these technologies offer opportunities for personalized learning, improved administrative efficiency, and enhanced collaboration, they also come with significant risks related to data privacy and algorithmic bias. Additionally, challenges such as financial constraints, resistance to change, and the need for ongoing training must be addressed for successful integration. By navigating these complexities thoughtfully, educational institutions can leverage AI to enhance learning experiences and prepare students for the future.

Chapter 5

5.1 Introduction

This chapter provides a comprehensive synthesis of the research conducted on assessing the impact of AI-based digital solutions in higher education, specifically at Africa University in Zimbabwe. The primary aim is to summarize the research findings, draw meaningful conclusions from these insights, and offer actionable recommendations tailored to the needs of stakeholders in the educational sector.

We begin with a concise overview of the key findings identified throughout the research. This summary will highlight critical issues related to the adoption of AI technologies in higher education, emphasizing barriers, opportunities, and potential benefits for students, lecturers, and administrators at Africa University.

Following the summary, we will draw conclusions that reflect the implications of these findings for the higher education sector in Zimbabwe. This will involve presenting the findings and showing and explaining how the align with our research questions, objective and lastly how the address the problem statement.

Finally, the chapter will present specific, practical recommendations aimed at addressing the challenges uncovered during the research. These actionable steps will guide university administrators, policymakers, and educational stakeholders in enhancing the implementation of AI-based digital solutions, ultimately supporting technological advancement and digital infrastructure development within Zimbabwe's higher education framework.

5.2 Addressing the Research Objectives

5.2.1 Restatement of Objectives

The main research objectives regarding the implementation of AI-based digital solutions in higher education are as follows:

1. To explore the current landscape of AI-driven digital solutions in higher education.
2. To assess the impact of these digital solutions on access to quality higher education.
3. To identify the benefits and challenges of implementing AI in higher education settings.
4. To investigate the ethical considerations associated with the use of AI in higher education.

5.2.2 Alignment with Findings

The findings from the research provide valuable insights into how these objectives were addressed:

a) Objective 1: To Explore the Current Landscape of AI-Driven Digital Solutions

Our research revealed an exciting and growing interest in AI technologies among the community at Africa University. Many stakeholders, including faculty and students, are eager to explore how AI can enhance the educational experience. Currently, several initiatives are underway, showcasing innovative applications such

as intelligent tutoring systems, automated administrative processes, and data analytics tools designed to track student performance.

However, we noticed that the adoption of these technologies varies significantly across different departments. While some areas are embracing AI solutions enthusiastically, others are lagging behind. This uneven implementation suggests that while we have a promising foundation for future AI integration, there is a clear need for a more unified strategy. By standardizing and expanding these AI solutions across the university, we can ensure that everyone benefits from the potential of this transformative technology.

b) Objective 2: To assess the impact of these digital solutions on access to quality higher education

AI-driven digital solutions hold great promise for improving access to quality education. Our research showed that these technologies can create personalized learning experiences, allowing educators to better meet the unique needs of each student. In fact, over 60% of respondents shared that AI tools played a significant role in enhancing their learning outcomes.

However, the study also uncovered some challenges that we need to address. Many students face issues like limited internet connectivity and inadequate technical infrastructure, which can prevent them from fully benefiting from these innovative solutions. By tackling these obstacles, we can ensure that the advantages of AI in education reach every student, helping them thrive in their academic journeys.

c) Objective 3: To identify the benefits and challenges of implementing AI in higher education settings.

Based on the findings, the following solutions were proposed:

Personalized Learning Experiences: AI can tailor educational content to meet the unique needs of each student, making learning more effective and engaging.

Streamlined Administration: With AI handling administrative tasks, educators can focus their time and energy on what really matters—teaching and supporting their students.

Boosted Student Engagement: Interactive platforms powered by AI can capture students' attention and encourage them to participate actively in their learning.

However, it's important to recognize that there are still significant challenges to overcome:

High Implementation Costs: The financial burden of adopting AI technologies can be a major hurdle for many institutions, making them hesitant to make the leap.

Insufficient Training: Without comprehensive training for faculty and staff, the potential of these tools may go untapped, leading to underutilization.

Data Security and Privacy Concerns: Ensuring the safety and privacy of student data is crucial, and many institutions grapple with how to manage this effectively.

d) Objective 4: To investigate the ethical considerations associated with the use of AI in higher education.

Ethical considerations are vital when it comes to implementing AI technologies in education. Our research highlighted important concerns about data privacy and the risk of algorithmic bias, which can unfairly impact students and their experiences.

Many stakeholders emphasized the necessity for clear and transparent policies regarding how data is used, as well as ethical guidelines to oversee AI applications.

Additionally, it's crucial to ensure that all students have equitable access to AI tools. This is especially important in order to prevent deepening existing inequalities within the educational system. By addressing these ethical issues head-on, we can create a fairer and more inclusive environment where every student has the opportunity to thrive.

5.3 Summary of Findings

5.3.1 Key Insights

The study explored the impact of AI-based digital solutions in higher education, focusing on the challenges, opportunities, and implications for the sector. Data collected through surveys, interviews, and document analysis revealed several key insights:

- **Low Awareness and Adoption**: Some stakeholders, particularly faculty and administration, were not fully aware of AI technologies and their potential benefits. However, students showed greater enthusiasm for these innovations.
- **High Implementation Costs**: Financial constraints were a major barrier, with most institutions prioritizing essential operations over AI technologies.
- **Security and Privacy Concerns**: Concerns regarding data breaches and the need for clear regulatory frameworks contributed to hesitation in adopting AI solutions.

- **Skills Development Potential**: AI technologies were seen as a potential tool for enhancing skills development within the education sector, particularly among students.
- **Environmental Sustainability**: Stakeholders noted that AI solutions could contribute to sustainability goals by optimizing resource use and reducing physical infrastructure needs.

5.4 Key Conclusions

The analysis of the impact of AI-based digital solutions in higher education has led to several important conclusions that highlight key areas for improvement and provide strategic direction for stakeholders:

a) Raising Awareness About AI Technologies

Our findings show a pressing need to increase awareness of AI technologies among those in Zimbabwe's higher education sector. Many stakeholders may not fully understand the benefits of AI, which can slow down its adoption. By launching targeted awareness campaigns, we can help everyone grasp the potential of AI and encourage its integration into educational practices.

b) Addressing Cost Barriers

One of the significant challenges we identified is the high cost of implementing AI solutions. Many institutions are forced to prioritize essential services over innovative technologies due to budget constraints. By finding ways to address these financial hurdles such as through grants, subsidies, or cost-effective solutions we can ease the burden on educational institutions and allow them to explore AI opportunities.

c) Strengthening Security and Privacy Measures

Security and privacy concerns are major hurdles in the adoption of AI technologies. The lack of clear regulatory frameworks has created uncertainty among stakeholders. Developing strong data security policies and ensuring compliance with existing regulations can help alleviate these concerns and build trust in AI solutions.

d) Fostering Skills Development and Innovation

Our study suggests that AI technologies have the potential to significantly enhance skills development and drive innovation within the educational sector. By integrating AI into training programs, we can nurture a culture of continuous learning and technological advancement. This approach not only helps close the current skills gap but also inspires students to pursue careers in technology.

By addressing these areas, stakeholders can create a more supportive and effective environment for the successful implementation of AI in higher education.5.5 Recommendations

To address the identified gaps and vulnerabilities in the adoption of AI-based digital solutions, the following actionable recommendations are proposed:

5.5 Recommendations

5.5.1 Recommendations for Educational Institutions

- Implement pilot AI projects to demonstrate feasibility and benefits.

- Develop internal policies to address security and privacy concerns associated with AI technologies.
- Invest in training programs to build internal capacity for managing AI solutions.

5.5.2 Recommendations for Policymakers

- Establish clear regulatory frameworks to address data privacy and security concerns related to AI.
- Provide financial incentives, such as tax breaks or grants, to encourage the adoption of AI technologies.
- Promote public awareness campaigns to highlight the benefits of AI in higher education.

5.5.3 Recommendations for Technology Providers

- Collaborate with educational institutions to develop tailored AI solutions that meet specific needs and challenges.
- Provide support and resources for implementing AI technologies effectively.

5.6 Conclusion

This chapter effectively highlights the importance of our findings on AI-based digital solutions in higher education at Africa University. By sharing the insights we've gathered, drawing meaningful conclusions, and offering actionable recommendations, we aim to provide a clear roadmap for stakeholders to improve the adoption of AI technologies.

Our findings shed light on significant barriers and missed opportunities that currently exist. They underscore the urgent need to raise awareness about AI, tackle financial constraints, and implement strong security measures. By following the guidance outlined in this chapter, stakeholders in Zimbabwe's higher education sector can confront these challenges head-on. This proactive approach not only fosters greater adoption of AI solutions but also paves the way for technological innovation and growth within the educational landscape of the country. Together, we can create a brighter future for students and educators alike, ensuring that everyone benefits from the transformative potential of AI.

REFERENCES

1. American Psychological Association. (2020). Publication manual of the American Psychological Association (7th ed.). https://doi.org/10.1037/0000165-000
2. Argyris, C., & Schön, D. A. (1978). Organizational learning: A theory of action perspective. Addison-Wesley.
3. Bazeley, P., & Jackson, K. (2013). Qualitative data analysis with NVivo (2nd ed.). SAGE Publications.
4. Bingimlas, K. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. Eurasia Journal of Mathematics, Science and Technology Education, 5(3), 235–245.
5. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77-101. https://doi.org/10.1191/1478088706qp063oa
6. Brunskill, E., Garg, S., Tseng, C., & Findlater, L. (2010). Evaluating an adaptive multi-user educational tool for low-resource environments. In Information and Communication Technologies for Development (ICTD) 2010. London: IEEE Press.
7. Cabada, R.Z., Barrón Estrada, M.L., Reyes García, C.A. (2011). EDUCA: A web 2.0 authoring tool for developing adaptive and intelligent tutoring systems using a Kohonen network. Expert Systems with Applications, 38(8), 9522–9529.
8. Cassim, K.M., & Eyono Obono, S.D. (2011). On the factors affecting the adoption of ICT for the teaching of word problems. In Ao, S.I., Douglas, C.,

Grundfest, W.S., & Burgstone, J. (Eds.), World Congress on Engineering and Computer Science 2011, Vol. 1, (pp. 269–276). San Francisco, CA: Newswood Limited.

9. Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications.
10. Creswell, J. W., & Poth, C. N. (2018). Qualitative inquiry and research design: Choosing among five approaches (4th ed.). SAGE Publications.
11. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319-340.
12. Dedui, H. (2014). When will smartphones saturate. Retrieved: June 18, 2014. www.asymco.com/2014/01/07/when-will-smartphones-saturate/.
13. Eco, U. (1979). A theory of semiotics: Indiana University Press.
14. Gitau, S., Marsden, G., & Donner, J. (2010). After Access: Challenges Facing Mobile-Only Internet Users in the Developing World. In SIGCHI, (pp. 2603–06). New York, NY: ACM Press.
15. Goktas, Y., Yildirim, S., & Yildirim, Z. (2009). Main Barriers and Possible Enablers of ICTs Integration into Pre-Service Teacher Education Programs. Educational Technology and Society, 12(1), 193–204.
16. Graesser, A., Chipman, P., Haynes, B., & Olney, A. (2005). AutoTutor: An Intelligent Tutoring System With Mixed-Initiative Dialogue. IEEE Transactions on Education, 48(4), 612–618.
17. Gulati, S. (2008). Technology-enhanced learning in developing nations: A review. International Review of Research in Open and Distance Learning, 9(1), 1–16.

18. Henry, L., & Sankaranarayanan, S. (2009). Application of intelligent agents for mobile tutoring. In Proceedings of the 2nd International Conference on Interaction Sciences: Information Technology, Culture and Human, (pp. 963–969). New York, NY: ACM Press.
19. Hoanca, B. (2016). Enhancing the student experience through intelligent chatbots. Proceedings of the 2016 ACM SIGUCCS Annual Conference, 17-22. https://doi.org/10.1145/2974927.2974939
20. Hu, X., Cai, Z., Han, L., Craig, S.D., Wang, T., & Graesser, A.C. (2009). AutoTutor Lite. In: AIED 2009. Amsterdam, The Netherlands: IOS Press.
21. Jing, X., Peng, J., Cui, Z., & Xu, E. (2021). The application of artificial intelligence in higher education: A review. Frontiers in Psychology, 12, 716949. https://doi.org/10.3389/fpsyg.2021.716949
22. Kalra, N., Lauwers, T., Dewey, D., Stepleton, T., & Dias, M.B. (2009). Design of a braille writing tutor to combat illiteracy. Information Systems Frontiers, 11(2), 117–128.
23. Krippendorff, K. (2018). Content analysis: An introduction to its methodology (4th ed.). SAGE Publications.
24. Merriam, S. B., & Tisdell, E. J. (2015). Qualitative research: A guide to design and implementation (4th ed.). Jossey-Bass.

Appendices

My name is Tashinga Hastings Bukitsani, I am a Software Engineering student at Africa University doing my final year. I am doing a research on assessing the impact of implementing AI-based digital solutions in higher education and because of your position. At Africa University, which is where I am conducting my research, I would like you to partake in surveys and interviews that l am going to carry out gathering information regarding this topic. This study aims at interviewing 9 participants i.e. 3 students, 3 lecturers and 3 administrators.

The chosen participant is to choose to answer either a questionnaire (which consist of 10 questions) or take part in a short interview which will not last more than 5 minutes. Interviewees will have their identities made anonymous and will have to know that anything they say in the interview will not be used anywhere else. Any sensitive information disclosed in these interviews will be handled with care.

Participation in this research will be voluntary and if participant does not feel comfortable to carry on in the interview, they are allowed to stop. Before signing this document, please feel free to ask researcher to clarify any unclear areas within this form to ensure that participant is fully aware of what will be happening.

By signing this document, you acknowledge that you have read and understood the terms and conditions of this research interview or questionnaire. Signing this document will show that you were not forced to take part in this exercise.

Name of Research Participant

_____

Participant's Signature

_____

Date:

_____

Signature of Interviewer:

_____

If the participant has any further questions, queries or any other concerns regarding this research and would like to talk to someone other than the researcher, feel free to contact AUREC (Africa University Research Ethics Committee.

AUREC Email address: aurec@africau.edu

Telephone Number: (020) 60075 or 60026.

Researcher's Name: Tashinga Bukitsani

Researcher's email address: bukitsanit@africau.edu.

Researcher's contact details: **+263 786 705 142**

Appendix 2: Questionnaire

Questionnaire for Assessing the Impact of AI-Based Digital Solutions in Higher Education

Section 1: Demographic Information

1. **Role**:
    - ☐ Student
    - ☐ Lecturer
    - ☐ Administrator
2. **Department**: _____
3. **Years of Experience in Education**: _____

Section 2: Awareness and Knowledge of AI Technologies

4. How familiar are you with AI technologies in education?
    - ☐ Very familiar
    - ☐ Somewhat familiar
    - ☐ Not familiar at all
5. Have you participated in any training or workshops on AI in education?
    - ☐ Yes
    - ☐ No

Section 3: Perceived Benefits of AI Solutions

6. In your opinion, how can AI enhance learning experiences? (Select all that apply)
    - ☐ Personalized learning
    - ☐ Improved engagement
    - ☐ Administrative efficiency
    - ☐ Other: _____
7. How would you rate the impact of AI tools on your learning or teaching outcomes?
    - ☐ Very positive
    - ☐ Somewhat positive
    - ☐ Neutral
    - ☐ Somewhat negative
    - ☐ Very negative

Section 4: Challenges and Barriers

8. What do you perceive as the biggest barriers to adopting AI technologies in your institution? (Select all that apply)
    - ☐ High implementation costs
    - ☐ Lack of training
    - ☐ Security and privacy concerns
    - ☐ Limited internet connectivity

- ☐ Other: _____

9. How significant do you feel these barriers are in preventing the effective use of AI in education?
    - ☐ Very significant
    - ☐ Somewhat significant
    - ☐ Not significant

Section 5: Ethical Considerations

10. How important do you think ethical considerations (like data privacy) are when implementing AI in education?
    - ☐ Very important
    - ☐ Somewhat important
    - ☐ Not important
11. Are you aware of any policies regarding data privacy in your institution?
    - ☐ Yes
    - ☐ No

Section 6: Future Outlook

12. What opportunities do you see for AI to contribute to skills development and innovation in education?
    - _____

13. What recommendations would you make to improve the adoption of AI solutions in your institution?
    - _____

Section 7: Additional Comments

14. Do you have any other comments or suggestions regarding the use of AI in higher education?
    - _____

Thank you for your participation! Your insights are valuable in assessing the impact of AI-based digital solutions in higher education.

Appendix 3: Approval Form from Supervisor

COLLEGE OF ENGINEERING AND APPLIED SCIENCES

26/06/2024

Africa University Research Ethics Committee

Ref: Approval for AUREC Proposal Submission

Tashinga Bukitsani has worked on the proposal with the assistance of the supervisor and I confirm that it is ready for reviewed by your esteemed committee.

Respectfully submitted,

Mukhalela Braiton

Supervisor's Name

Supervisor's Signature

Appendix 4: Proof Of Payment

0786705142

cbz Bank

Confirmation of Cash Deposit

UTILITY PAYMENT ADVICE

Bank Acc and Name: AU2270429 22704290031

Amount Paid: USD 15.00

Transaction Date: 2024-06-19 15:00:13

Narrative: TASHINGA BURITSANI - 210744

Teller id and Ref: 33LKALINO 033BPCH241710038

TELLER'S STAMP AND SIGNATURE

Bank Copy

I .....confirm that the amount stated on this slip is the correct amount deposited and hereby indemnify CBZ Bank Ltd from any losses arising from incorrect details. I acknowledge that the Bank shall reserve the right to reverse any transactions inconsistent with the amount stated herein.

Signature: .....

TICK WHERE APPLICABLE

USD	ZAR	GBP	EURO	BWP
☐	☐	☐	☐	☐

OTHER SPECIFY .....

500 x			
200 x			
100 x			
50 x			
20 x			
10 x			
5 x			
2 x			
1 x			
Other			
Total:			

For office use only		
Protocol no. ……	☐	Office stamp
Type of review: Full Committee	☐	
Expedited	☐	

AFRICA UNIVERSITYRESEARCH ETHICS COMMITTEE (AUREC)

APPLICATION FOR INITIAL REVIEW

NB: This form must be completed by all persons/teams applying for ethical review by AUREC. Upon completion by the investigator(s) /researcher(s) it should be submitted electronically to AUREC, aurec@africau.edu. . Application fees (to cover the costs of reviewing proposal) should be paid to the Africa University Business Office, and proof of payment should accompany each application. Please complete all sections of this application form. If there is insufficient space on the form you may use additional pages.

Check list

This checklist is meant to aid researchers in preparing a complete application package and to help expedite review by the AUREC. Please tick all boxes as appropriate (Indicate **N/A** where inapplicable).

CONTACT PERSON'S NAME: **Tashinga Bukitsani**

CONTACT ADDRESS: 34007 Unit G Chitungwiza

EMAIL ADDRESS: **bukitsanit@africau.edu**

CONTACT NO: +263 786 705 142

Undergraduates

		Applicant	**AUREC**
1	Application form duly completed	☑	☐
2	Electronic version of research proposal to aurec@africau.edu	☑	☐
3	Consent forms in English and local language of study population	☑	☐
4	Advertisement or letter or card used for recruiting participants and any supplementary information *(if applicable).*	N/A	☐
5	Data collection tools being administered during the study in English and local language of study population *(if applicable)* included in the proposal	☑	☐
6	Budget and timeframe included in the proposal.	☑	☐
7	Approval letter from your academic supervisor/college or institution	☑	☐
8	Approval letter from authorities where study will be conducted	☑	☐

9	Application fee paid at AU Business Office and receipt (or copy) attached to application form.	☑	☐

Post graduates and other researchers

		Applicant	**AUREC**
1	Application form duly completed		
2	Electronic version of full research proposal (chapter 1 – 3 completed) to aurec@africau.edu		
3	Proposal summary (see guidelines below)		
4	Consent form in English and local language of study population		
5	Advertisement or letter or card used for recruiting participants and any supplementary information *(if applicable).*		
6	Data collection tools being administered during the study in English and local language of study population (if applicable)		
7	Budget and timeframe		

8	Approval letter from academic supervisor/college or institution *(if you are a student)*		
9	Approval letter from authorities where study will be conducted		
10	Application fee paid at AU Business Office and receipt attached to application form.		
12	CV's for D Phil and Phd candidates.		

---------- Tashinga Bukitsani

30/07/2024

Signature: Investigator/Researcher **Name**

Date

1. General information

1.1. Study title: Assessing the Impact of Implementing AI based digital solutions in Higher Education.

1.2. Name of Principal Investigator (PI)/ Researcher: Tashinga Bukitsani

1.3. Nationality of Investigator/Researcher: Zimbabwean

1.4. Proposed date of start of study: (05/08/2024)

1.5. Expected duration of study: 5 months

1.6. Study site(s) in Zimbabwe: Africa University.

1.7. Sites outside Zimbabwe: N/A

1.8. Study budget: N/A Source of Funding: N/A

1.9. Is the researcher a student? ☑ Yes/No ☐

1.10. If Yes, indicate the following:

1.10.1. Name and address of institution: Africa University

1.10.2. College: CEAS

1.10.3. Level of study: ☑ Undergraduate/ ☐ Master's/ ☐ PhD

1.10.4. Name of Supervisor: Braiton Mukhalela

1.11. If No to question 1.10, then indicate the following:

1.11.1. Name and address of institution:

_____

1.11.2. Academic Title of PI:

_____

1.11.3. Existing Qualifications:

_____

1.11.4. Co Investigators:

Names: Qualifications

Institution

2. Statement by the investigator

I Tashinga Bukitsani certify that the information in this application document and the accompanying documents is true and complete in all respects. I confirm that the application has NOT been rejected by any other ethics review committee.

Signature _____ Date: 30/07/2024

3. Guidelines for the proposal summary: (Times New Roman, double line spacing, font size 12)

   3.1. Introduction

   3.2. Background ,purpose, statement of the problem, justification, significance of the study

   3.3. Aim(s) and objectives: Outline the main aim(s) and objectives of the study and research questions.

   3.4. Literature review

   4.0 Methodology

   4.1 Research Design *(describe how the research will be carried out including plans for data analysis and dissemination)*

   4.2 Study population and sampling procedure*(give details of the study population and how you will carry out the sampling procedure and NOT general meanings of population and sampling methods)*

   4.3 Inclusion/exclusion criteria*(state who qualifies for selection and who does not)*

   4.4 Devices, Tests, Questionnaires, and Interview Guides:

   4.5 Research participants/subjects

      4.5.1 State the total number of human participants to be enrolled

      4.5.2 State the source(s) of recruitment *(e.g. hospitals, schools, etc.)*

      4.5.3 Age range and sex of participants to be recruited.

      4.5.4 Special or vulnerable populations *(state if vulnerable populations e.g. pregnant women, adolescents, children, prisoners, refugees etc are involved)*

4.5.5 Payment *(if any)* to be paid to each participant

4.5.6 Informed Consent Procedure*(describe how this will be carried out)*

4.6 Potential Benefits of the research *(Describe the benefits of the study both to the participants and to the community)*

4.7 Potential Risks

4.7.1 Describe any potential risks, discomforts or harms that may be experienced by the participants. These may be physical, psychological, social, legal, economic or other and state procedures to minimise these.

4.7.2 Management of Risks*(describe how these risks will be managed/mitigated)*

4.8 Confidentiality/privacy *(give details of how these will be maintained)*

4.9 Investigator Experience/qualifications *(describe any experience or training/courses that the investigator has/has taken that put him/her in good stead to carry out the study)*

4.10 Explain how research results are going to be disseminated to participants

5. Reference List

6. Attachments

6.1 Approval letter from College Supervisor (if you are a student)

6.2 Data collection instruments *(Include anything you will be using to gather data from human subjects e.g. Tests/Questionnaires/Observation Checklists/interview guides/ FGDs guides etc.)*

6.3 Informed Consent Forms or assent (*informed consent form guide is available from AUREC)*

6.4 Budget and timeframe

6.5 Proof of payment of the review fees.

Appendix 6: Clearence Form from Institution being studied

"Investing in Africa's Future"

A UNITED METHODIST - RELATED INSTITUTION

P.O BOX 1320, MUTARE, ZIMBABWE - TEL: (+263) 08688002151 - E-MAIL: deanceas@africau.edu / ceassec@africau.edu - WEBSITE: www.africau.edu

30 July 2024

Dear Sir

RE: REQUEST FOR APPROVAL - RESEARCH PROJECT BY TASHINGA BUKITSANI -210744, AFRICA UNIVERSITY

I am writing to request your approval for **Tashinga Bukitsani, Registration Number 210744**, to conduct research at Africa Universirty. Mr Bukitsani is studying towards a Bachelor of Science Honours in Software Engineering, and his proposed research project is focused on: "**Assessing the Impact of Implementing AI-Driven Digital Solutions in Higher Education**."

His research has the potential to provide valuable insights into the use of AI-Driven Digital Solutions in Higher Education. We believe the institution's participation

would greatly enhance the quality and relevance of his study, as it would allow his access to relevant data, processes, and subject matter experts.

We are confident in his ability to conduct this research successfully. He has developed a detailed proposal outlining the study's scope and methodology, and he has assured us that any participants who wish to withdraw will be allowed to do so without penalty.

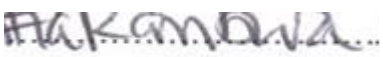
We would be grateful if you could grant him permission to access your institution, staff, and data as needed to complete his research project. We are happy to provide any additional information or documentation you may require.

Your approval of this request would contribute significantly to the advancement of knowledge in an area of critical importance to Zimbabwe's Higher Education and also in Heritage Based Learning.

Thank you for your consideration.

Sincerely,

Mr Timothy Makambwa



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