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ANALYSIS OF INTEROPERABILITY OPTIMIZATION AND MANAGEMENT OF ZIMBABWEAN BANKS USING ARTIFICIAL INTELLIGENCE.

BY

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THIS RESEARCH PROJECT IS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF THE BACHELORS OF SCIENCE HONORS IN SOFTWARE ENGINEERING WHICH IS IN THE COLLEGE OF ENGINEERING AND APPLIED SCIENCES.

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ABSTRACT

Artificial intelligence (AI) is a technology that enables machines, particularly computer systems to perform tasks that typically require human intelligence. It involves creating computer systems that can learn, reason, and make decisions, similar to how humans do. This study explores how Artificial Intelligence (AI) has been utilized to find the best effective ways to bring efficiency, good customer experience,work better together and manage operations of the banking sector in a smooth and seamless manner. It’s aim is to discover the different methods, strategies and technologies that have helped enhance cooperation and coordination between different banking departments and systems while improving the overall management and operation of the banking institutions to maximise their perfomance, productivity and competitiveness. The study fills a gap in knowledge about AI in the country's banking sector. The research will run a qualitative analysis to gather insights and determine if it is necessary to use Artificial Intelligence in banks. The participants of this research will include heads of the digital banking divisions of the banks to be researched on, as well as important people in the industry including bank employees and managers.

Keywords:Artificial Intelligence, Zimbabwean banks, interoperability, banking sector, risk management, operational efficiency.

DECLARATION

I Varaidzo Dambudzo, hereby declare that this proposal for Bachelor of Science Honours in Software Engineering submitted to the College of Engineering and Applied Sciences at Africa University has not been submitted previously for any degree at this or another university. It is original in design and in execution, all reference material contained therein has been duly acknowledged.

Signature(Student): …  ……. Date: …29/02/2025…….

Signature(Supervisor): … …. Date: …..29/02/2025…….

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DEDICATION

This work is dedicated to the Lord Almighty, for giving me the strength to accomplish it. I also dedicate this work to my parents who have been there to love, support and sacrifice for me so that I accomplish this project.

List of Abbreviations

Anti Money Laundering- AML

Artificial Intelligence- AI

Automated Teller Machine- ATM

Diffusion of Innovation Theory- DIT

Machine Learning- ML

Point of Sale- POS

Reserve Bank of Zimbabwe-RBZ

Technology Acceptance Model- TAM

Technology Organization Environment- TOE

Theory of Planned Behaviour- TPB

Theory of Reasoned Action- TRA

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

Artificial Intelligence is a collection of technologies that empower machines to mimic human-like levels of intelligence, enabling them to perform tasks that typically require human recognition (Russell & Norvig, 2016; Accenture, 2023). Zimbabwe, despite being technologically behind, recently introduced a limited number of Artificial Intelligence (AI) systems to integrate and manage its banking systems. These AI initiatives aim to streamline operations, enhance customer experiences, and drive efficiency within the banking industry. This integration represents a strategic move towards digital transformation, offering opportunities for growth and innovation in Zimbabwe's financial ecosystem.

Interoperability refers to the ability of different systems to work and exchange information seamlessly, in this case using AI. It involves connecting different financial platforms of the digital banking system and applications to enable smooth communication, data exchange and automation of various banking processes. This can be exemplified by facilitating bank to bank transactions by mobile banking or facilitating ZIMSWITCH , where AI systems extract and standardizes the relevant data, securely authenticates and authorizes the transaction, intelligently routes the funds, automatically reconciles the records, monitors for fraud, all while improving efficiency, security and overall customer experience.

Furthermore, the Zimbabwe Data Protection Act of 2021 extends to include safeguards related to significant decisions based solely on automated processing. This research project sought to ensure if the customer continues being the central focus of the services delivered to them by their banks, with the use of AI. Despite the lack of empirical research in this specific area, AI has the potential to improve operational efficiency, customer experiences and risk management in the banking sector. This is because the use of AI has reduced information overload, bringing the banks closer to the long-standing operational goal of focussing on high value work. This allows us to better assist those who need it the most while significantly reducing repetitive and costly low-value work(Accenture, 2023).

This study aimed to fill this knowledge gap by investigating the current state of practices in Zimbabwean banking systems. It explored the importance of the study, presumptions, boundaries, study constraints and definitions of terms.

1.2 Background of the Study

The COVID-19 pandemic accelerated the digital transformation accoss industries, with the banking industry being no exception. This was to ease the burden of having to circulate constantly and to give or receive services needed by the customers.With the switch from physical to digital banking, Artificial Intelligence was recognized as one of the newest technologies that has helped digital banking to be a success. The pandemic's impact on digital banking has been significant, with a notable increase in the adoption of digital channels as customers sought to minimize physical interactions(The Journal of Entreneurial Researchers, 2023).

AI is expected to bring about transformative changes across various industries in the coming years, Ng, A (2017). According to a report by Industry Research Biz, the estimate that the AI in Banking market was worth USD 6794.27 million in 2023 and is anticipated to reach USD 36765.29 million by 2032 witnessing a (Compound Annual Growth Rate) CAGR of 32.5% during 2024 to 2032.The objective of this study was to analyse how Artificial Intelligence was applied to Zimbabwe's banking industry, with the goal of discovering and capitalizing on the various opportunities that arise from its implementation in the banking industry as it holds a vital position in driving economic development and ensuring stability within a country. The statistics above also indicated that AI is increasingly becoming a crucial technology in today's digital economy. It also explained how organizations must be ready to harness its potential advantages in order to stay competitive.

While the technology we now know as Artificial Intelligence (AI) may not be a recent development, its roots can be traced back to the 1950s when Alan Turing first pondered the concept of machines capable of intelligent thought. Turing believed that it was possible to create software for the digital computers that would allow them to observe their environment and learn new skills for example understanding and speaking human language. He also thought that machines could eventually develop this ability by their own, without human guidance. It was during this time that John McCarthy coined the term "Artificial Intelligence" in 1956, defining it as the scientific and engineering pursuit of creating intelligent systems (Stuart 2016). Nearly seventy years later, Turing's vision has become reality with the development of Artificial Intelligence. AI gives machines the capacity to learn from new experience and carry out cognitive tasks, which were thought to be uniquely human.

Over the past decade, there has been a remarkable surge in the demand for AI across numerous industries that drive the global economy. This increased interest can be attributed to several factors, including the availability of vast amounts of "Big Data," significant advancements in computational power, the development of more sophisticated and efficient algorithms, and a widespread investment in AI technology. Artificial Intelligence can analyze large amounts of data within a short space of time, meaning that it helps to reduce the workload of employees in different organizations whilst increasing efficiency and providing personalized experiences to the customers. Significant progress has been achieved through the development and utilization of advanced deep learning models. These sophisticated models have become feasible due to the advent of powerful hardware, particularly graphics processing units (GPUs), and increased computational capabilities. The availability of such robust hardware has played a crucial role in enabling the successful implementation of AI across various domains.

AI has revolutionized the way machines operate by enabling them to learn from experience, adapt to new information, and perform specific tasks autonomously. According to a 2018 report by the World Economic Forum in collaboration with Deloitte, 76 percent of banking industry CEOs recognize AI as a top priority because of its crucial role in achieving a competitive edge. The successful application of AI in banking relies on effectively harnessing the vast amounts of data collected from various sources such as ATMs, web channels, digital wallets, point of sale systems and mobile devices. This wealth of data can be utilized to personalize banking services, transforming them from standardized offerings to tailored experiences that cater to each customer's unique behavior, preferences and needs. This personalized approach not only sets banks apart from their competitors but also enhances compliance measures, boosts customer engagement and drives overall business growth.

1.3 Statement of the Problem

This study aimed to analyse the utilization of artificial intelligence (AI) to enhance the interoperability of banking systems in Zimbabwe and assess the impact on efficiency, effectiveness, customer relations and overall sector performance. By closely examining the current integration of AI into Zimbabwean banking systems, the research identified the specific AI applications in use, evaluated their effectiveness, and comprehended the challenges and opportunities associated with their implementation.

The banking sector in Zimbabwe started to adopt AI for various functions, including risk management and process automation (Techzim, 2025). However, the exploration of AI for improving interoperability is relatively limited. Interoperability plays a crucial role in enhancing operational efficiency and expanding financial inclusion, as demonstrated by initiatives like Zimswitch, which has facilitated interoperability among banks and mobile money operators (FSD Africa, 2020). This interoperability is essential for ensuring smooth transactions across different financial platforms, leading to enhanced customer satisfaction and convenience (KPMG, 2020).

The integration of AI in banking has the potential to significantly enhance risk management by enabling real-time detection of fraudulent activities, reducing operational costs, and ensuring compliance with regulatory standards (Sunday News, 2024). Additionally, AI can streamline processes, personalize financial experiences and elevate customer service through conversational AI tools like chatbots and virtual assistants (Sunday Mail, 2024; International Journal of Accounting and Management Information Systems, n.d.). These AI-driven solutions also enable banks to analyze customer data for more tailored services, ultimately fostering increased customer loyalty and retention (European Journal of Social Sciences Studies, 2020).

Despite the advantages, the Zimbabwean banking sector faces distinct challenges, including resource constraints, evolving customer expectations and regulatory frameworks that may impede AI adoption (European Journal of Social Sciences Studies, 2020). Economic instability and foreign currency shortages further complicate the adoption of AI technologies, necessitating substantial investments in infrastructure and training (The Herald, 2023). Additionally, the need for robust cybersecurity measures to safeguard sensitive financial data presents another obstacle to AI implementation in the banking industry (Financial Gazette, 2022).

Understanding the application and impact of AI within this context was crucial for identifying opportunities and ways to overcome potential obstacles. This study sought to contribute to the existing body of knowledge by offering insights into how AI can enhance interoperability, efficiency and customer experience in Zimbabwe's banking sector, while addressing challenges posed by regulatory and resource limitations. By examining the current state of AI adoption in the country's banking industry, this research aimed to inform policymakers, financial institutions and stakeholders about the benefits and challenges of leveraging AI to enhance banking operations and customer services.

1.4 Research Objectives

The specific objectives of the study included:

- To assess the effectiveness of Artificial Intelligence in the banking industry.
- To investigate the obstacles linked to using the traditional banking operations without the use of Artificial Intelligence.
- To identify the specific Artificial Intelligence technologies, algorithms and tools that can been implemented to ensure interoperability of banking systems and the management process of banks?

1.5 Research Questions

The research sought to provide answers to the following research questions:

- How effective has Artificial Intelligence been in the bank?
- What are the disadvantages of using the traditional banking operations without the use of Artificial Intelligence?
- What are the specific Artificial Intelligence technologies, algorithms and tools that can been implemented to ensure interoperability of banking systems and the management process of banks?

1.6 Assumptions

- The sources of information were sensible.
- The data that respondents supplied was accurate,truthfully, and expressed their opinions without jeopardizing data.
- Every Zimbabwean bank that was investigated uses Artificial Intelligence technologies in their day to day operations.

- Interviews were sufficient to collect information about the research.

1.7 Significance of the Study

This study provided valuable insights into the adoption and implementation of Artificial Intelligence technologies in the banking industry, offering a deeper understanding of the advancements made in streamlining processes and improving operational efficiency. By exploring the benefits and challenges associated with Artificial Intelligence integration, the study informed decision-makers about potential advantages and hurdles to overcome. Moreover, the research shed light on the impact of Artificial Intelligence on customer experience and satisfaction, enabling banks in Zimbabwe to prioritize strategies for enhancing service quality. Ultimately, the study offered insights of potential risks and concerns associated with the use of Artificial Intelligence in banks, providing strategies used to mitigate them so as to guide banks towards effective interoperability and management using AI technologies, whilst contributing to the advancement of knowledge in this area and supporting banks in achieving sustainable growth and competitiveness.

1.8 Delimitation of the Study

Delimitations are limitations set by the authors themselves so that the study's aims and objectives do not become impossible to achieve (Fountouki, 2018). They are basically boundaries that the researcher puts on the study. The researcher decides what to include and what to leave out. This narrows down the scope of the study, making it manageable and relevant while the study is being addressed.

The study therefore looked into the evolution of Artificial Intelligence within Zimbabwe only. It concentrated mainly on the city of Harare, as it is where the majority of AI-related headquarters and research centers are located. This made Harare the most accessible and suitable area to conduct the research.

1.9 Limitations of the Study

- Since the researcher is a student, there was limited time to move around for research as she had to go to school as well.
- Other bank authorities were reluctant to provide information to the researcher.
- Some findings were inadequate because banks follow some corporate policies that they needed to adhere to regardless of us who needed to do some research.

- Since some headquaters are outside Harare, there were travelling and financial restrictions.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1 Introduction

According to Creswell (2005) , a review of the literature "is a written summary of journal articles, books and other documents that describes the past and current state of information, organizes the literature into topics and documents a need for a proposed study." (pp.79). This chapter sought to provide an analysis of how AI is applicable to the financial services sector with reference to past and modern literature. By delving into academic articles, research papers, industry reports and real life case studies, the literature review took a closer look at the various ways that AI has been applied in the Zimbabwean banking sector. The theoretical framework, it's relevance and summary were discussed in this chapter in reference to Artificial Intelligence.

Moreover, this literature review identified gaps in our understanding and suggested directions for future research to enhance AI integration in the Zimbabwean banking systems. By drawing upon the insights and experiences shared in previous studies, it set the stage for the research objectives and methodology of this study.

2.2 Theoretical Framework

A theoretical framework is an essential exploration of established theories that acts as a guide for constructing the arguments you will present in your own research It can also be defined as a foundational review of existing theories that serve as a roadmap for developing the arguments you will use in your work (Vinz & George, 2022). Artificial Intelligence has evolved and advanced over the past decades due to the increase in data, advanced algorithms as well as numerous improvements made to computing power and storage(Krishnan. K, 2019). There are several fields and theories where Artificial Intelligence has been harnessed, each serving a unique purpose in aiding to the advancement of banks in this research.

The theories that were adopted as a basis for guiding this study include the Technology Acceptance Model(TAM), Institutional Theory, Technology Organization Environment(TOE), Diffusion Theory and The theory of planned behavior and reasoned action.

Technology Acceptance Model

TAM was proposed by Free Davis (1989) and it was later on extended by Venkatesh and Davis (2000). This theory centers around how individuals accept and adopt new technologies. It proposes that users' attitudes and intentions to use technology are shaped by their perception of its usefulness and ease of use. Perceived usefulness relates to the user's perception of how the technology will enhance their performance. Users are more likely to adopt to a new technology if it is useful, and if it will perfom their requests and tasks correctly and accurately. An example would be that, users may be more likely to adopt the use of chatbots if they assume that they will help them complete tasks quickly.

On the other hand perceived ease of use pertains to the user's perception of how user friendly the technology is. Users are more likely to adopt to a new technology if they view it as an instrument that is ease of use, and if they are made to believe that they can easily learn how to use it and it is user friendly. An example would be how users are more likely to adopt to Automated Teller Machines(ATMs) as it has a friendlier interface and does not require a lot of training so that you know how to use it.

In the context of this study, the Technology Acceptance Model (TAM) was valuable because it helped us to comprehend how internal auditors perceive, become familiar with and understand machine learning (ML) and AI tools for early fraud detection. TAM provided insights into the internal auditors' potential acceptance and likelihood of using Machine Learning and Artificial Intelligence. TAM has also been used in different fields that include marketing, user experience design and information systems.

Other factors that influenced the Technology Acceptance Model include perceived trust. Users are more likely to adopt a new technology, such as internet banking, if they perceive it to be secure, trustworthy, and if they have confidence that their financial information will be kept safe. Perceived control is also significant. Users are more inclined to adopt a new technology if they believe they will have control over it. For instance, the CBZ Touch app allows users to customize settings and functionality to align with their preferences. Additionally, social influence plays a role. If users observe that their social network is utilizing the same technology and benefiting from it, they are more likely to adopt it themselves. For example, if Stanbic Bank has an online chatbot and users hear positive testimonials from people using it, individuals from Steward Bank may be encouraged to use it as well.

Institutional Theory

Institutional theory has been developed by various scholars such as Meyer and Rowan (1977), DiMaggio and Powell (1983), and Scott (1995). It focuses on how social and organizational structures impact the behaviors and actions of individuals. According to this theory, institutions and their members are influenced by external pressures, norms and expectations from their environment. These factors shape individuals' beliefs, behaviors, and practices within the organization. In this study, the adoption of institutional theory helped to understand how the institutional environment in Zimbabwe's banking sector influences auditor perceptions and behaviors concerning fraud detection systems based on machine learning (ML) and artificial intelligence (AI).

Technology Organization Environment

The Technology Organisation Environment framework was initially proposed by Tornatzky and Fleischer (1990) and later refined by Zhu et al. (2006). This framework focuses on technological innovations within organizations and considers three primary dimensions: technological factors, organizational factors, and environmental factors. By considering these dimensions, the framework enhances our understanding of the technological capabilities necessary for implementing machine learning (ML) and artificial intelligence (AI) systems. Additionally, it helps assess the readiness of organizations to adopt these systems while taking into account the influence of the external environment. By adopting this framework, we can analyze the critical factors for success and the challenges faced by internal auditors during the implementation process of ML and AI-based fraud detection systems.

Diffusion of Innovation Theory(DIT)

The Diffusion of Innovation Theory explains how technologies, ideas and innovations spread within a social system and over a period of time. Everett Rogers defines diffusion as “the process in which an innovation is communicated thorough certain channels over time among the members of a social system.” In 1995, his thesis described how new concepts and technologies become more and more popular among people and groups over time. The theory of diffusion of innovations can help comprehend the reasons and mechanisms behind why individuals or organizations choose to embrace this technology within the banking industry in Zimbabwe, specifically using Artificial Intelligence. From Rogers’ definition, there are four main elements in the Diffusion of Innovation theory and they include innovation, communication channels, time and social system.

Innovation

Rogers(2003) describes innovation as an idea,practice, or project that is perceived as new by an individual or other unit of adoption. Adopting innovation is mostly about how individuals learn, get convinced, and make decisions about it. Rogers observed a lack of research on the spread of technology clusters, which are interconnected groups of related technologies. Uncertainty poses a significant challenge when adopting new innovations. The outcomes or consequences of an innovation can cause uncertainty, making people unsure about whether to accept or reject it. These consequences refer to the changes that occur in individuals or society as a result of adopting or not adopting the innovation. To alleviate uncertainty and promote adoption, it is important for people to have knowledge of the innovation's advantages and disadvantages and a clear understanding of its consequences. Rogers categorized consequences as either positive or negative, occurring directly or indirectly, and either expected or unexpected.

Communication Channels

The Diffusion of Innovation Theory diffusion emphasizes the significance of communication channels in spreading information about new inventions. Communication is the exchange of information among participants to achieve mutual understanding. Efficient communication plays a crucial role in raising people's awareness, understanding, and perception of why we must use Artificial Intelligence in banks. This can be achieved through various means such as marketing campaigns, educational materials, interactions and positive recommendations from others.

Social System

The social system refers to a network of interconnected entities working together to address shared challenges and achieve a collective objective. It is shaped by societal norms, the acceptance of nonconformity and the level of cohesion within the system. Furthermore, the adoption rate of an innovation is influenced by factors such as the adopter's traits, social dynamics and the perceived relevance of the innovation (Rogers, 1995). In the context of the diffusion of innovations theory, the social system factor pertains to how social connections, networks and norms impact the adoption of an innovation. The social system aspect plays a significant role in shaping people's attitudes, behaviors and decision-making processes when it comes to assessing the interoperability and management of the banking industry. By comprehending the social system aspect within the diffusion of innovations theory,

stakeholders within the digital banking sector can identify influential individuals, leverage social networks and modify social norms to facilitate the effective management of banks. By engaging with opinion leaders, fostering positive social influences and aligning with institutional elements, stakeholders can cultivate an environment that encourages people to embrace Artificial Intelligence as a secure and practical method for integrating and managing banks.

Time

Rogers (2003) emphasizes that behavioral research often overlooks the element of time, but he argues that incorporating the time dimension in diffusion research is a key strength. The process of innovation diffusion, categorizing adopters and adoption rates all inherently involve considering time. By examining the time factor in the theory of diffusion of innovations, which refers to the speed at which individuals or groups adopt an innovation within a specific timeframe (Halton, 2023), we gain important insights into the adoption of Artificial Intelligence in banks. This examination allows us to understand the pace of adoption and the evolving patterns over time. According to Rogers, the diffusion of innovation is divided into five categories. These categories include Innovators, Early Adopters, Early Majority, Late Majority and laggards.

Innovators are individuals who embrace risks, have a sense of adventure and possess a high level of education. They are known for their willingness to explore and experiment with novel concepts and technologies. Additionally, they frequently play a pivotal role in originating or inventing the innovation itself.

Moving to the subsequent phase, we encounter the early adopters, who are usually influential figures held in high regard within their social networks. They possess a significant degree of social influence and are recognized for their willingness to offer feedback on the innovation and contribute to its enhancement. An example would be IT enthusiasts who want to engage in all activity relating to the management of banks using advanced technologies like AI.

Furthermore, we have the early majority, who exhibit a higher level of skepticism compared to early adopters. They seek validation from social proof before embracing an innovation, particularly if it is widely accessible and user friendly. Their decision making process is characterized by careful deliberation and thoughtful consideration. Notably, the inclusion of the early majority marks a significant turning point in the adoption rate, emphasizing the importance of time in this context. As awareness spreads regarding the effective utilization of

Artificial Intelligence in banking, by the experiences and endorsements of early adopters, individuals are more inclined to adopt the technology themselves.

The late majority represents the fourth group, characterized by a conservative approach and a tendency to adopt an innovation only once it has achieved widespread acceptance. They are more inclined to embrace the innovation if it becomes a necessity in their work or if they observe others using it, as they approach change with greater caution.

Finally, we have the laggards, who occupy the last stage. These individuals exhibit resistance towards change and may ultimately never adopt the innovation. Laggards often consist of older individuals who hold more traditional values and beliefs that hold them back from accepting change or those who possess limited technological proficiency. Some of them, when very necessary adopt to change long after it has been introduced.

Theory of Planned Behavior(TPB) and Theory of Reasoned Action(TRA)

The Theory of planned behavior is an extension of the Theory of reasoned action (Azjen & Fishbein,1980; Fishbein & Azjein, 1975). These theories explain how attitudes and beliefs influence behavior.

The Theory of Reasoned Action proposes that behavior is impacted by two primary elements: attitudes and subjective norms. Attitudes represent an individual's assessment of behavior as either positive or negative. In line with TRA, a positive attitude towards a behavior enhances the probability of engaging in that behavior. When it comes to optimizing the integration and management of banking systems through the use of Artificial Intelligence (AI), having a positive attitude towards a certain action increases the likelihood of actually doing it. People are more likely to view AI favorably if they believe that its systems are more secure compared to traditional banking methods. Additionally, individuals are more likely to have a positive attitude towards AI if they perceive the introduced AI techniques as simpler to use than traditional approaches.

On the other hand, subjective norms pertain to the perceived societal influence or pressure to either perform or avoid a behavior. As per TRA, attitudes and subjective norms interact to shape a person's behavioral intention, which subsequently influences their actual behavior. Subjective norms basically explain individual's perception of what important people or groups think they should do. It involves considering the beliefs and opinions of others and feeling motivated to meet their expectations. Subjective norms can influence a person's intentions and subsequent behavior. If someone feels strong social pressure and has a strong motivation to conform, they

are more likely to form positive intentions and follow through with the behavior. Subjective norms interact with attitudes and perceived behavioral control to shape a person's intentions and actions. An example would be that if the clients from Steward Bank like chatbots, then the clients at CBZ are most likely to appreciate it because of the positive testimonials they hear from Steward Bank clients. On the other hand if the Steward bank clients provide a negative feedback on chatbots, then customers from other banks will take time or never accept to use chatbots because of the negative feedback they got.

The theory of Planned Behavior is a psychological theory that helps us understand how people make decisions about their behavior. It suggests that individuals have control over their own actions and that their choices are influenced by their own will (Zhang, 2018).Theory of Planned Behavior is an extension of the Theory of Reasoned Action, and it adds on the third element which is perceived behavioral control. Perceived behavioral control is an individual's perception of the ease or difficulty of perfoming a particular behavior (Azjen, 1987). It relates to an individual's perception of their level of influence over a particular behavior. According to the Theory of Planned Behavior (TPB), the intensity of attitudes, subjective norms and perceived behavioral control interact to shape a person's behavioral intention, which subsequently impacts their behavior. An example of how perceived behavioral control can be achieved can be in banks whereby when they implement Artificial Intelligence, they have to make sure that the clients have the technical knowledge so that they can navigate through the new system. To do this, they then provide AI experts to help the clients learn the new initiatives by training or handing out materials with step by step instructions on how to navigate through that system, making sure that everything is clear so that it boosts the client's confidence and skills. Therefore we see that banks can improve people's perceptions and it all depends with how they introduce Artificial Intelligence to their clients.

2.3 Relevance of the Theoretical Framework to study

In order to ensure a seamless shift from traditional banking methods to the utilization of Artificial Intelligence(AI) for banking, it is crucial to have a comprehensive understanding of the adoption process of innovations. This understanding allows us to identify and prevent potential failures that may occur during the implementation of new technologies. In the theoretical framework of this research, five well established theories are examined.

The Theory of Reasoned Action is important because it helps us understand why people behave the way they do. It looks at people's attitudes and what they think others expect of them. This

theory helps experts figure out why people make certain choices and find ways to encourage positive behaviors.The TPB helps researchers understand the underlying motivations, beliefs and social influences that shape the adoption and use of AI in the banking sector. It enables the prediction of behavioral intentions towards AI adoption, identification of barriers and facilitators to successful implementation, and informs evidence based decision-making and policy formulation. By applying the TPB, researchers can gain insights that inform strategies to promote the effective management of AI in Zimbabwean banks, leading to improved efficiency and customer service.

The Diffusion of Innovation theory is highly relevant as it helps us understand how and why new ideas, technologies or practices spread and are adopted by individuals or groups. This theory provides insights into the factors that influence the adoption process, such as the characteristics of the innovation, the communication channels used, the social context and the characteristics of the adopters themselves. Understanding the diffusion of innovation is crucial for organizations and policymakers as it allows them to develop effective strategies to facilitate the adoption and implementation of innovations, leading to improved outcomes and societal progress.

The Technology Organization Environment (TOE) theory is important because it helps us comprehend how technology, organizations and their surrounding environment interact. This theory highlights the impact of technological factors, organizational traits and the broader context on the adoption and implementation of technology within an organization. By taking these factors into account, the TOE theory offers valuable insights into how organizations can effectively manage technological changes, adjust to their environment and successfully integrate technology. It helps identify the main factors that determine technology adoption and supports organizations in making informed decisions to enhance their technological capabilities and gain a competitive edge.

The Institutional theory is significant because it enables us to comprehend how social and cultural norms, values and institutional pressures impact organizations. This theory centers on how organizations conform to and are molded by the larger institutional environment in which they exist. It emphasizes the importance of legitimacy and adherence to established rules and practices. Understanding institutional influences is vital for organizations as it helps them navigate intricate societal expectations, establish legitimacy and make strategic decisions that

align with institutional norms. The Institutional theory provides valuable insights into how organizations can adjust, gain acceptance and prosper within their institutional contexts.

The Technology Acceptance Model (TAM) theory is highly relevant as it helps us understand the factors that influence individuals' acceptance and adoption of new technologies. This theory focuses on the beliefs and attitudes of users towards a technology, particularly its perceived usefulness and ease of use. By considering these factors, the TAM theory provides insights into the determinants of technology adoption and usage behavior. Understanding user acceptance is crucial for the successful implementation of new technologies as it helps organizations design user friendly systems, address potential barriers and promote positive user experiences. The TAM theory assists in guiding the development and adoption of technologies that meet user needs and preferences, ultimately leading to higher user satisfaction and adoption rates.

Summary

The chapter basically explained in detail the theoretical framework and it’s relevance with respect to optimizing the interoperability and management of banks in Zimbabwe. These theoretical frameworks offered a structured approach to analyzing different factors, such as the characteristics of an innovation, individual beliefs and attitudes, social influences and behavioral objectives. The insights derived from this study can guide financial institutions and other relevant stakeholders in formulating focused policies that promote the successful management of banks. The next chapter discussed the Methodology of this research.

CHAPTER 3:METHODOLOGY

3.1 Introduction

A research methodology describes the techniques and procedures used to identify and analyze information regarding a specific research topic(Divya Sreekumar, 2023). This research clearly explained the data collection methods and sampling techniques that were used to collect the data. It also explained in detail the research design that was used, data collection instruments and procedures, all the ethical considerations and summary of the whole chapter.

3.2 The Research Design

To acquire thorough understanding of the research problem, the study used a qualitative analysis. Creswell (2012) defines qualitative research as the process of investigating and comprehending the significance of the behavior of people or groups, therefore addressing either a social or human problem. The study analysed how banks throughout Zimbabwe have made use of artificial intelligence to raise consumer satisfaction and efficiency. This method was suitable for this research since it is used to investigate the experiences, opinions and difficulties related to the acceptance of artificial intelligence in the banking industry. To analyze the qualitative data, thematic analysis was used, which involves identifying patterns or themes within the data (Braun & Clarke, 2006; Nowell et al., 2017). This method was chosen for its flexibility and ability to capture important insights from interview transcripts and observational data (Maguire & Delahunt, 2017). Observations were also conducted to provide additional context and depth to the study, allowing researchers to record firsthand experiences and interactions within the banking environment (Scribbr, 2025). By combining thematic analysis with observational data, the study aimed to provide a rich and detailed understanding of AI's impact on banking operations.

3.3 Population and Sampling

A population is a group of individuals taken to measure a sample (Creswell, 2018). The study mainly focussed on the registered banks that are operating in Zimbabwe. As of May, 2023, there are thirteen commercial banks, five building societies, one savings bank, which makes it nineteen operating banks in Zimbabwe.On the contrary, a sample pertains to a particular group from which data will be gathered to make the research practical and achievable (Bhandari, 2022).

In order to make the research practical and manageable, a sampling strategy was used. This strategy involved selecting a subset of banks from the overall population to gather data. A purposive sampling approach was utilized to ensure that the selected banks represented a diverse range in terms of their level of AI integration and size. The sample consisted of a combination of banks that have adopted AI technology to enhance their management processes. Factors such as the use of AI-driven customer service systems, AI-powered risk assessment tools, and AI-based fraud detection systems were taken into consideration when banks were chosen for the sample. By employing a purposive sampling strategy, the research obtained insights from banks that actively implemented AI solutions to optimize their operations. This method provided valuable information on the advantages, challenges and outcomes of AI implementation in the specific context of bank management in Zimbabwe. By utilizing this method of non-probability sampling, individuals were selected as participants for the study based on specific predetermined criteria, their expertise in the relevant domain and their relevance to the subject under investigation. The study focussed on employees working in banks who have direct involvement in the installation, management or support of banking services. This encompasses IT personnel as well as banking managers. The selection process considered factors such as the participants' positions, level of proficiency and experience within the banking industry.

3.4 Data Collection Instruments

The research made use of a qualitative research methodology. The research design also utilised different instruments that will be explained below.

The semi-structured interview guide was used to conduct in-depth interviews with key stakeholders, including the manager of the digital banking division and IT Staff members from Steward Bank, FBC and CBZ Bank. These interviews were conducted virtually, utilizing platforms such as Zoom Meeting, Google Meet or Microsoft Teams, depending on the preference and comfort of the interviewees. The interview guide consisted of open ended questions that were designed to explore various aspects related to the acceptance, benefits, challenges and potential solutions for the successful implementation of Artificial Intelligence in the realm of digital banking. With participants' consent, the interviews were audio recorded and subsequently transcribed for analysis.

Secondary data was also used. Secondary data refers to information that has been previously collected from primary sources and made easily accessible for researchers to utilize. It

encompasses data that has already been gathered and is available for further analysis. The secondary data that was used include:

- Books
- Published sources
- Newspapers
- Published financial records

3.5 Data Collection Procedure

Data collection is a systematic process of gathering observations or measurements (Bhandari,2020). This study aimed to explore the reasons why there is need for safer and more efficient Artificial Intelligence tools in banks, while also comparing them to the traditional banking methods that were used prior to the implementation of AI in the banking sector.The data collection procedure for this study entails utilizing questionnaires, secondary material and interviews.

Firstly, interviews with important players such bank management and IT professionals were done. By using tools like Zoom, Google Meet and Microsoft Teams, these interviews took place virtually, therefore guaranteeing convenience for all those who were willing to engage in the study. The interviews were audio recorded and transcribed with participant permission for additional study. Additionally, secondary material was compiled from sources including industry reports, scholarly publications, and relevant records. These secondary sources offered insightful analysis of the present scene of AI integration and management in Zimbabwe's banking sector. To extract relevant data, the gathered secondary material was closely examined, investigated and combined. With everything considered, this data collecting strategy of combining secondary material and interviews was enabled thorough investigation of the optimization of artificial intelligence integration and management in Zimbabwean banking systems.

3.6 Analysis and Organization

The objective of this research was to conduct a qualitative analysis to analyse the interoperability optimization and management of banks in Zimbabwe through the use of Artificial Intelligence (AI). Thematic analysis was applied to the qualitative data collected from interviews to identify recurring patterns, themes, and insights that were relevant to the research questions. The analysis primarily focussed on capturing the perspectives and experiences of

the participants regarding the implementation of AI for integrating and managing banking systems in Zimbabwe. This was done by coding using some software tools designed for this analysis. Interpretation process helped to identify the main themes and make connections between different ideas by analyzing the coded data. It also allowed for the exploration of shared experiences, disagreements or differing viewpoints among the participants.

3.7 Ethical Consideration

Following ethical guidelines is essential to protect the rights, privacy and confidentiality of participants. In this study, the researcher adhered to the following ethical guidelines:

Informed Consent: Before participating in the study, participants were provided with detailed information about the study's objectives, methods, potential risks and benefits, requirements for voluntary participation, and assurance that it was their right to withdraw at any time. Participants received consent forms to sign, therefore attesting to their informed, voluntary involvement.

AUREC Verification: AUREC, an independent ethics board, confirmed the research techniques to find and fix any ethical violations. This verification procedure sought to guarantee that all participants engaged in the research were shielded from any possible damage connected with the study and that ethical limits were not to be violated at any level of operation.

Confidentiality and Anonymity: The researcher made steps to guarantee the privacy and confidentiality of the data of the participants. To protect anonymity, identifiable personal information about the individual was erased from the gathered data. Participants in research records were identified by pseudonyms.

3.8 Summary

The methodology of the study was outlined in this chapter. It covered details such as the sample population, the research design, data collection procedure and the instruments used in the study. The chapter further explored the data collection technique that was employed and concluded by explaining and justifying the approach that was taken for presenting the data and all ethical considerations that were used to make the research a success.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the study's results concerning the utilization of Artificial Intelligence (AI) to enhance interoperability and management within Zimbabwe's banking sector. The data analysis, presentation and interpretation offer valuable insights into the status of AI implementation in banks. The data collection involved conducting interviews with key stakeholders and the qualitative analysis methods applied allowed for a comprehensive understanding of the experiences, obstacles and perspectives related to AI integration in the banking sector.

The findings in this chapter are structured to address the research objectives outlined in Chapter 1, specifically focusing on how AI optimizes interoperability, enhances operational efficiency and influences customer relations in the Zimbabwean banking industry. Through qualitative analysis, the chapter delves into the themes derived from the interviews, providing a thorough examination of the advantages and obstacles linked to AI adoption in this setting. By exploring these outcomes, the study aims to contribute to the existing body of knowledge on AI in banking, offering actionable insights for policymakers, financial institutions, and stakeholders interested in leveraging AI to enhance banking operations and customer services.

INTERPRETATION OF RESULTS

Data preparation

Data preparation in qualitative research involves organizing and refining raw interview data before it is analysed. This process includes steps like transcribing interviews, data cleaning, data organization, coding responses, data analysis, validation and verification and identifying key themes (Savin-Baden & Howell, 2024). By carefully preparing the data, the researcher ensured that it was structured in a way that made it easier to analyse and interpret, leading to more meaningful insights.

Transcription

Transcription is all about listening to recordings of interviews or conversations and writing down what people say (Hecker & Kalpokas, n.d). It includes capturing not just the words but also the little details, like pauses and emotions, so the written version truly reflects the original

discussion. A unique identifier was assigned to each interview to protect the participant's anonymity.

Data Cleaning

Data cleaning involves fixing errors like missing information, identifying information and duplicates and making sure everything is in the same format. Inconsistencies were checked and unreliable data was removed. This process improved the quality of the dataset, helping to ensure that the findings were based on accurate information, which led to more trustworthy conclusions.

Initial Coding

During initial coding, the researcher assigned specific codes to different parts of the interview data. Each code represented a concept, idea or theme that emerged from the participants' responses. This process was done carefully and repeatedly across all interviews to identify common patterns and important viewpoints.

Coding Scheme Development

A coding scheme was created to organize the interview data into significant themes. This scheme was informed by the research objectives and the initial analysis of the data. It included both predefined codes based on the research questions and new codes that emerged during the analysis. By identifying key themes and defining each code clearly, the researcher could consistently label and group similar ideas, making it easier to identify patterns and draw meaningful insights from the findings.

Data Organization

This involves structuring collected data for easier analysis. In this study, coded data segments were grouped according to assigned codes, allowing for straightforward retrieval and comparison during the analysis phase. This systematic arrangement helped identify patterns and insights, enhancing the understanding of the findings.

Data Analysis

Various qualitative data analysis techniques were applied to identify connections and themes within the dataset. Similarities and differences were identified in participant responses, exploring patterns and variations to interpret the underlying meanings and implications. By

coding the data to highlight key themes, raw information was transformed into valuable insights that enhanced the understanding of the research findings.

Validation and Verification

To ensure the analysis is trustworthy and reliable, a validation and verification process was implemented. This included member checking, where participants reviewed the findings and provided feedback to confirm accuracy. Verification involves clearly documenting the methods used and being aware of potential biases. Together, these efforts made the insights become more meaningful and reliable.

Theme Development

Through a careful process of reviewing and organizing codes and data segments, main themes and sub themes were created, showing the important findings from the data. These themes captured the key patterns, views and concerns shared by participants about using Artificial Intelligence in the banking sector, clearly reflecting their experiences and thoughts.

4.2 Data Presentation and Analysis

The researcher conducted a thematic analysis for this research, the qualitative research part. Thematic analysis is usually applied when interviews have been done, whereby the researcher closely examines the data they collected to identify the common topics, ideas and patterns that came up repeatedly whilst conducting the interviews (Caulfield,2019). These topics, ideas and patterns are called themes. The themes are used to address the research and provide feedback about the issue that was discussed. All themes in this research were named based on how the author interpreted the meanings of the research participants' intentions.

Thematic Analysis

Research Objective 1: To assess the effectiveness of Artificial Intelligence in the banking industry.

Theme 1: Customer Experience and cost reduction

- Participants expressed how AI-driven tools provide full-time customer support by allowing them to apply for any product, answering all queries instantly and assisting with transactions whilst reducing waiting times.
- Artificial Intelligence was perceived as a tool with a simpler user interface that makes banking more user friendly and intuitive.

- Participants expressed the need for personalized notifications that would gently remind them of important tasks, such as upcoming payments and other individual needs.
- Participants emphasized that AI tools are beneficial for customers of all ages and backgrounds, including young individuals, adults, those with disabilities and everyone with different financial situations. This inclusivity makes banking services more accessible and welcoming for everyone financially.

Theme 2: Operational Efficiency

- Participants appreciated how AI minimizes manual tasks through automation, particularly in areas such as data entry, transaction processing.
- Participants emphasized Artificial Intelligence's ability to process and analyse large volumes of data quickly.
- Participants highlighted how there is increased job satisfaction since employees can focus on more complicated tasks.
- Artificial Intelligence was perceived as a tool that assists employees by automating repetitive tasks.

Theme 3: Risk Management and fraud detection

- Participants articulated the necessity for AI tools capable of simulating scenarios and effectively understanding and forecasting potential risks.
- Participants emphasized that immediate alerts and responses to suspicious activities are in place, such as the automatic decline of a transaction when an incorrect M-PIN is entered, which helps to reduce potential losses.
- Participants highlighted customer confidence in banking services due to good fraud detection measures being used.
- Some participants stated how there has been a reduction of financial losses due to fraud when comparing AI-driven methods to traditional banking practices, resulting in significant savings for banks.

Theme 4: Enhanced Security

- Participants highlighted the need for more advanced security measures that continuously monitor account activities using AI algorithms to help the bank to detect and respond to security breaches.
- Participants emphasized how AI can assess the security measures of third-party vendors and partners, ensuring their practices meet the bank's standards to reduce risks.
- The use of AI was seen to mitigate fraud risks and enhance the security of all payments and transactions.
- Participants highlighted how AI tools can facilitate automated responses, for example locking the account after many attempts of trying to invade in the account, alerting customers of any security breaches before they escalate.

Research Objective 2: To investigate the obstacles linked to using the traditional banking operations without the use of Artificial Intelligence.

Theme 1: Time consuming and inefficient

- Participants highlighted how physical customer service inquiries take a long time to be resolved compared to the automated AI systems like chatbots that can quickly provide answers to the customer.
- Participants highlighted how dependence on physical paperwork causes some delays in retrieving, processing and approval of documents.
- Participants highlighted how traditional banking involved longer wait times causing delays in getting issues resolved, especially when they needed to be transferred between departments to resolve enquiries.
- Participants highlighted how traditional banking methods would lead to repetitive tasks for example recapturing a policy that already exists in the system and that would consume employee time and reduce productivity.

Theme 2: Employee Challenges

- Participants spoke about how they do not appreciate how they did repetitive tasks, for example transaction processing and data entry with traditional banking.
- Participants highlighted how inefficient and time consuming it was, especially training new employees on legacy banking systems as these systems have

complex procedures that require a lot of training materials, making it hard for new employees to learn quickly.

- Participants articulated how they would feel so frustrated due to the absence of modern tools as their competitors were doing better than them whilst using modern technologies.
- Dissatisfied employees may find it hard to give good customer service, which can lower customer satisfaction and loyalty.

Theme 3: Poor customer experience

- Participants highlighted that traditional banking hours and methods for example phone calls restricted customer access to assistance, and this made it difficult for them to seek help, especially the ones with busy schedules.
- Participants articulated how there were inadequate systems for collecting and acting on customer feedback and this prevented banks from addressing common concerns.
- Participants highlighted how different levels of service at various branches and among employees would confuse and frustrate customers.
- Participants noted that customers often struggled to resolve issues when transferred between departments without satisfactory outcomes and complicated procedures for account management and transactions could overwhelm them, leading to dissatisfaction.

Theme 4: Limited data analysis

- Participants emphasized how it was difficult to identify and cope up with the emerging market trends whilst they were using the traditional banking methods.
- Participants highlighted how traditional banking methods were too slow in analysing data as they had to go through large volumes of data manually and this caused delays in making smart and efficient data driven decisions.
- Participants reported how it was difficult to identify and stop fraudulent activities with the traditional banking methods.
- Participants stated that data analysis was not effective in traditional banking, impacting efficiency and ability to make informed decisions based on data in a timely manner.

Research Objective 3: To identify the specific Artificial Intelligence technologies, algorithms and tools that can been implemented to ensure interoperability of banking systems and the management process of banks?

Theme 1: Machine Learning Algorithms

- Participants highlighted the need for adequate training and support from AI and ML experts to keep good standards of the bank.
- Participants explained how the use of Machine Learning has helped to automate daily tasks, for example data entry and checking of different accounts using internet and mobile banking therefore making operations efficient and allowing staff members to do more complex tasks.
- Participants highlighted how machine learning algorithms enhance speed in identifying anomalies and detect fraud in its early stages therefore improving accuracy.
- Participants explained how banks have employed machine learning to enhance credit scoring accuracy and speed by analysing borrower data from financial documents that they have. This reduces decision making time and some regulatory expenses.

Theme 2: Process Automation

- Participants explained how data entry, onboarding new client transactions and performing repetitive manual activities such as account opening and other customer services can be done easily through automation of software tools for bank installations.
- Participants highlighted how integrating chatbots into banking apps improved customer service quality, enabling a twenty-four hour and seven days support by handling routine questions and transactions quickly and efficiently.
- Participants pointed out that customers are constantly looking for better experiences and convenience, so the improved ATMs availed of essential services as they allow people to withdraw their money at any time of the day including non-working hours of banks.
- Participants mentioned that by understanding customer behaviour and usage patterns, chatbots offer personalized customer support that reduces the workload of having to email or physically enquire from one department to the other to recommend suitable financial services and products.

Theme 3: Computer Vision and enhanced security

- Participants emphasized how banks use AI powered fingerprints and facial recognition to enhance security and customer and staff verification.

- Participants highlighted how banks use computer vision powered cameras to monitor ATMs and Point of Sale payments to monitor transactions in real time and detect suspicious activities, for example card skimming.
- Participants explained how they use signature verification by scanning and analysing handwritten signatures to confirm the identity of customers every time they try transacting with the help of the machine learning as stated above by comparing submitted signatures with the one that is already stored.
- The use of AI is seen as a secure way to automate the extraction of data from physical documents, such as identity documents and receipts, through Optical Character Recognition, which scans and digitizes documents. This allows banks to process and verify information more efficiently, for example in loan applications and account opening applications.

Theme 4: Predictive analysis

- Participants explained how AI's predictive analysis could monitor transaction routes when a bank-to-bank transaction is made to check for anomalies, not just fraud but also for errors, ensuring funds are transferred correctly and securely in real time.
- Participants highlighted how AI's predictive analysis could also monitor every transaction made by the customer to ensure regulatory compliance by checking anomalies that indicate non-compliance for example Anti Money Laundering and Know Your Customer.
- Participants expressed how banks utilize AI-driven predictive analytics to comprehend customer behaviour, enabling the provision of personalized financial products and services, including predictive suggestions for savings or investment choices based on individual customer profiles and transaction histories.

Theme 5: Payment Switching Technology

- Participants emphasized the drastic improvement of the speed and reliability of transactions across different banks in Zimbabwe.
- Participants highlighted how AI tools help to analyse transaction patterns in real time, which is crucial for maintaining high service levels and adapting to the dynamic needs of the banking sector in Zimbabwe.
- Participants explained how they have managed to automate much of the decision making process in transaction routing, which reduces human error and increases the overall efficiency of the banking network.

- Participants expressed how the integration of AI algorithms in the switching system allows for smarter routing of payments, ensuring that transactions are not only faster but also more cost effective.

4.3 Discussion and Interpretation

This section delves into the interpretation of the findings when interviews were held to collect data. By utilizing thematic analysis, the study revealed that participants largely acknowledge the necessity of implementing AI in the banking industry. The findings shed more light on the reasons why AI is crucial, it's effectiveness in simplifying financial services for users and the obstacles that were overcome with the integration of AI in financial institutions. Additionally, it closely analyses how banks have begun to adopt AI.

In the fast changing world, AI is very important and is reshaping how banks work, whilst redefining customer interactions. Aligned with Research Objective 1, the study evaluated the effectiveness of AI applications in banking, focusing on themes such as enhancing customer experience and reducing costs, improving operational efficiency, strengthening the ability to manage risks and detect and fortifying enhanced security measures. Research Objective 2 addressed the obstacles associated with traditional banking practices without AI integration, highlighting challenges like time inefficiency, employee issues associated with traditional methods, customer dissatisfaction and limited data Analysis. By exploring these hurdles, we emphasize AI's role in overcoming limitations and enhancing operational performance. Research Objective 3 investigated the specific AI technologies, algorithms and tools driving the banking systems for interoperability optimization and management processes, including machine learning algorithms, process automation, computer vision for security, payment switching and predictive analysis. This exploration aims to identify advanced AI innovations fuelling efficiency, innovation, and competitiveness in the banking sector.

The participants of the study highlighted a lot of issues regarding the different interviews that were conducted. In alignment with the first research objective, which aimed to assess the effectiveness of Artificial Intelligence in the banking sector, the study highlighted four main themes that illuminate the transformative impact of AI integration. The theme of customer experience and cost reduction explores into the transformative impact of AI on customer interactions and operational expenses. A participant emphasized, "*The seamless integration of AI technologies has not only personalized our services but also simplified customer interactions and significantly reduced costs, giving us a strong competitive edge.*" This also

reflects on a recent report of the broader industry trend by Deloitte (2023), that noted that "*banks that have been using solutions provided by AI have seen up to a 30% reduction in operation costs while also improving customer satisfaction*." Therefore, the theme also explained how AI powered solutions provide continuous customer support, addressing individual needs seamlessly to enhance overall satisfaction and optimize resource allocation.

Participants expressed their dedication to customer satisfaction and the positive impact of AI initiatives on customer service. An IT member highlighted, "*Our AI-driven customer service bots have cut our response time by 65%, which is a noticeable improvement.*" Beyond accessibility and convenience for customers, AI adoption streamlines routine inquiries, driving efficiency and reducing overhead costs. Moreover, participants stressed the importance of personalized notifications to assist forgetful or busy clients, highlighting the value of AI in improving customer engagement by promoting inclusivity and accessibility for individuals of diverse financial needs and literacy levels. Zimbabwean banks have commended AI for its role in delivering ongoing customer support, simplifying interactions and fostering relationships beyond transactions.

Moreover, operational efficiency highlights the importance of AI in streamlining processes and enhancing productivity within the banking sector through advanced technologies. A participant noted, "*AI automation has significantly enhanced our workflow, leading to process improvement, reduced errors, and time savings. Tasks that once took 2 days can now be completed in less than twenty-four hours, showcasing the efficiency gains and error reduction that AI brings.*" This demonstrates the transformative impact of AI on banking operations, simplifying employee tasks and task management while fostering innovation and improving overall organizational effectiveness. The relationship between operational efficiency and customer experience is evident, as swift and accurate service directly correlates with heightened customer satisfaction. The integration of AI has revolutionized operational efficiency in banks, with a banker emphasizing, "*AI doesn't replace jobs; it enhances them* " noting how automation of routine tasks like data entry allows staff to focus on higher value activities. This shift not only boosts job satisfaction but also drastically reduces operational costs by swiftly and accurately managing vast data sets, a crucial advantage in Zimbabwe's resource conscious economic landscape.

Under Risk Management and Fraud Detection, AI has played a pivotal role in safeguarding Zimbabwean banks. Participants discussed how AI's predictive capabilities aid in scenario

simulation for risk assessment. One participant emphasized, "*In banking, foresight equates to stability*," highlighting AI's significance in anticipating and mitigating risks. This aligns with findings from a study on AI adoption in Zimbabwe's banking sector, which expressed how the registered banks in Zimbabwe had started implementing AI to enhance security and risk control to leverage AI software embedded into their banking systems to gain a competitive advantage.

The technology's swift detection of suspicious activities, such as incorrect M-PIN entries, has significantly reduced financial losses, thereby enhancing customer trust in the banking system. Risk management and fraud detection emerged as pivotal themes within the banking sector, as highlighted by the study participants. Participants stressed the value of AI tools that can simulate scenarios and predict potential risks effectively, emphasizing the importance of proactive risk mitigation strategies. Furthermore, the implementation of immediate alerts and responses to suspicious activities, like automatically blocking transactions with incorrect M-PIN entries, was identified as a critical measure to mitigate risks and minimize losses. Participants also noted the positive impact of robust fraud detection mechanisms on enhancing customer confidence in banking services, stressing the importance of establishing trust through strong security measures. Additionally, some participants observed a tangible decrease in financial losses linked to fraud incidents when comparing AI driven approaches to traditional banking methods, showcasing the significant cost savings and enhanced security brought about by AI technologies in the banking sector.

Additionally, participants in the study recognized the current implementation of security measures in the banking sector while stressing the necessity for ongoing improvements. They emphasized the importance of using AI algorithms to monitor account activities continuously, proposing the addition of extra measures to enhance the existing security framework. One participant conveyed this sentiment stating, "*Although we have security measures in place, incorporating AI algorithms for better monitoring of account activities is essential for advancing our practices.*" Moreover, participants highlighted AI's role in assessing the security practices of third party vendors and partners, suggesting that there is room for strengthening current protocols to effectively reduce risks. AI was viewed as crucial in mitigating fraud risks and securing transactions, hinting at potential enhancements to fortify the security landscape. Participants also pointed out the proactive nature of AI tools in enabling automated responses, suggesting that existing measures could be augmented by features like automatic account locks following multiple unauthorized access attempts and alerts for customers regarding security breaches before they escalate. Enhanced Security through AI stands as a cornerstone for

safeguarding both customer and bank assets. These systems not only identify breaches but also evaluate the security protocols of third party vendors, ensuring a strong banking ecosystem. Automated security responses, such as account locking after multiple failed access attempts, have played a vital role in upholding transaction integrity, making banking in Zimbabwe a safer and more secure environment.

In terms of the obstacles linked to using the traditional banking methods, participants responded with concerns about time, inefficiency, limited data analysis, poor customer experience and some specific employee challenges. The first theme, centred on time consumption and inefficiencies inherent in traditional banking methods, brought forth several key observations from participants. They highlighted the slow and ineffective nature of traditional banking practices. Participants pointed out that traditional methods often resulted in prolonged resolution times for customer service inquiries, contrasting this with the rapid assistance provided by automated AI systems such as chatbots. These AI systems swiftly address customer queries, offering quick solutions. Participants also discussed how the extensive use of physical paperwork contributes to delays in document handling and approval processes. One participant expressed frustration, stating, "*Dealing with issues in person that needs a representative always takes much longer. If the problem involves another department, the process is further delayed as the representative needs to make calls or physically visit that department for clarification. This physical approach is not only time consuming but also annoying for customers.*" Additionally, participants highlighted the repetitive nature of tasks in traditional banking, such as redundant data entry, which consumes valuable time and hampers employee productivity on other essential duties. Participants from banks recounted how traditional methods significantly impede operational efficiency. Furthermore, participants kept on emphasizing the delays arising from manual document processing and the inefficiencies associated with face to face customer service interactions. The reliance on paper based systems and the necessity for departmental transfers to resolve issues contribute to prolonged wait times, diminishing overall productivity and customer satisfaction.

Employee Challenges were also a significant concern among participants. They described the frustration of engaging in repetitive tasks in traditional banking settings. "*We're not just clerks; we're meant to be innovators in our roles,*" expressed a participant, highlighting the demotivation caused by outdated systems and the extensive training required for newcomers. This dissatisfaction could potentially lead to subpar customer service, impacting both the bank's reputation and employee morale, particularly when competitors leverage modern

technological solutions. Furthermore, focusing on the challenges faced by employees in traditional banking environments, participants raised valid concerns about the repetitive and time consuming nature of tasks like transaction processing and data entry. With reference to the system complexity and large training materials and sessions that hinder speedy learning, participants also underlined the significant time commitment required to teach new employees on outdated banking systems. "*Training new employees on our legacy systems is a slow and tedious process, making it difficult for them to grasp the complexity of our operations,*" one participant said. Participants also voiced annoyance at the absence of contemporary tools and pointed out how competitors using modern technologies were outperforming them. The subject matter also covered why dissatisfied employees affect the quality of customer service, stressing how this may lower customer loyalty and satisfaction. These insights underscored the critical importance of providing employees with contemporary tools, efficient training processes and a supportive work environment to boost both employee morale and customer service quality within the banking sector.

In addition, participants highlighted the challenges posed by limited accessibility to assistance during specific hours and through traditional communication methods like phone calls, which hindered customer support. One participant commented, "*The inflexible banking hours and reliance on outdated communication channels create obstacles for customers, making it difficult for them to seek help promptly or in a manner that suits their needs.*" Moreover, participants pointed out a lack of effective feedback mechanisms, with one individual stating, "*In the absence of a clear way to share their experiences, customers feel unheard and disconnected from the bank's capacity to address their concerns promptly.*" Participants also brought attention to the confusion resulting from inconsistent service levels across branches and employees. The variability in service standards was identified as a significant factor contributing to decreased customer satisfaction and loyalty. Furthermore, participants outlined the challenges customers encountered when navigating between departments without achieving satisfactory resolutions, alongside the complex procedures for account management and transactions that often overwhelmed them, ultimately leading to heightened dissatisfaction. The lack of consistent service quality across branches, along with deficiencies in feedback mechanisms, frequently left customers feeling neglected, especially when confronted with complex procedures or when issues were bounced between departments without resolution.

Participants also highlighted the challenges of keeping up with new market trends using outdated methods. One participant likened trying to track market changes with obsolete

approaches to navigating a rapidly evolving world with outdated maps. They also noted that traditional banking practices were slow in data analysis due to the manual processing of vast amounts of data, leading to delays in making informed decisions based on data. Participants expressed the challenges in identifying and preventing fraud using traditional banking methods. One participant emphasized the current struggle in detecting and halting fraud, emphasizing the necessity of artificial intelligence tools for enhanced data analysis within banking systems. Moreover, the lack of advanced data analysis capabilities acted as a barrier to strategic decision-making. "*Without AI, we're like farmers using a hoe in the age of tractors,*" remarked one participant, illustrating the struggle of keeping pace with market trends and swiftly identifying fraud with conventional manual data processing. This inefficiency in data management not only impedes the ability to adapt to market changes but also impacts the bank's capacity to provide personalized services and effectively mitigate risks, ultimately hindering growth and innovation in Zimbabwe's banking sphere.

Research Objective 3 was mainly pinpointing the specific AI technologies, algorithms and tools that have transformed banking systems in Zimbabwe, focusing on four key themes: Machine Learning Algorithms, Process Automation, Computer Vision and Predictive Analysis. Under Machine Learning Algorithms, Zimbabwean banks emphasized the critical need for specialized training in AI technologies, as one participant noted, "*In Zimbabwe, we're not just adopting technology; we're shaping it to fit our unique economic landscape.*" This training is pivotal for maintaining high operational standards and leveraging ML to automate routine tasks like data entry and account management, thereby freeing up staff for more strategic roles. Machine learning also plays a significant role in enhancing fraud detection and improving credit scoring, which directly impacts the efficiency and cost-effectiveness of banking operations. Moreover, machine learning has proven crucial for enhancing fraud detection by identifying anomalies at an early stage, whilst strengthening security measures. It also plays a significant role in improving credit scoring by analysing vast amounts of borrower data, which not only speeds up decision making but also cuts down on regulatory expenses. The need for ongoing training in AI and ML technologies was also highlighted to ensure that the banking standards remain high.

In Zimbabwean banks, the adoption of process automation by using Natural Language Processing (NLP), was also discussed as a game changer, particularly with the integration of online and mobile banking, as well as chatbots for twenty-four hours and seven days customer support and an increased reliance on ATMs mainly for those that want to withdraw money

anytime of the day. Participants pointed out, "*Banking is now a service, not just a place*," reflecting the shift towards digital convenience. Automation has streamlined onboarding, transaction processing, and customer inquiries, with the mentioned tools playing an increasingly vital role in providing non-stop services. This automation not only caters to customer demands for convenience but also personalizes service through AI analysis of customer behaviour. One significant risk that was noted that was caused by using AI was cybersecurity issues. With the shift to digital banking, there's a higher chance of cyber-attacks like hacking and phishing, leading to potential financial losses or identity theft. Participants expressed the need to invest in robust cybersecurity measures like firewalls and encryption, alongside regular security audits. Educating customers about cybersecurity, such as not sharing personal details online and spotting phishing attempts, is also vital. Another risk that was spoken about is technological reliability. The participants explained how automated systems tend to fail due to glitches, power outages or connectivity issues, common in Zimbabwe. Mitigation includes backup systems, regular maintenance, and alternative service methods like mobile banking or strategic branch locations. Digital exclusion was also noted as a risk that can potentially happen because of the adoption of AI in banks. Participants expressed how the new technology is leaving some population segments behind and they suggested how banks are trying to address this by promoting digital literacy, particularly in rural areas, and keeping some traditional service points available.

Regarding Computer Vision and enhanced security, Zimbabwean banks are starting to adopt cutting edge technologies like AI powered biometric systems. "*Security in Zimbabwe's banks isn't just about walls and safes anymore; it's about recognizing who's behind every transaction,*" said one participant. These technologies include fingerprint and facial recognition for identity verification and computer vision for monitoring transactions at ATMs and POS systems, combating issues like card skimming. Participants also expressed the use of Optical Character Recognition for document processing to further enhance security by ensuring data integrity and efficiency in customer verification processes. In Zimbabwe, the implementation of AI powered biometric systems and computer vision technologies in banking introduces several risks alongside their security enhancements. One major risk that was expressed by participants is data privacy and protection. With biometric data like fingerprints and facial recognition being collected, there's a potential for data breaches which could expose sensitive personal information. To mitigate this, most IT staff suggested that these systems are compliant with data protection laws, employ strong encryption methods and limit data retention to what

is strictly necessary. Regular audits and penetration testing can also help in identifying vulnerabilities. Another risk is technological dependency. If the systems fail, whether due to technical faults, power shortages common in Zimbabwe, or cyber-attacks, it could lead to service disruptions or even false positives in identity verification, causing inconvenience or security lapses. Participants expressed how they could counter this by having robust backup systems, ensuring regular software updates, and maintaining some level of manual verification processes as a fallback. Bias in AI systems is another concern that was discussed. If the algorithms are not trained on diverse datasets, they might not accurately verify identities of all demographic groups, potentially leading to discrimination. To address this, banks noted how they should work on ensuring their AI models are trained with diverse data reflective of Zimbabwe's population and continuously update and test these systems for fairness and accuracy.

Predictive Analysis was highlighted as a transformative tool in Zimbabwe's banking sector. Participants explained how AI helps in real time monitoring of transactions not only for fraud but also for compliance with regulations like Anti-Money Laundering (AML). They explained how this analysis allows banks to offer tailored financial advice and products, ensuring both compliance and customer satisfaction in a challenging economic environment. One primary risk discussed was data accuracy and privacy. If the data used for predictive models is not representative, the outcomes could be misleading, leading to poor decision-making or customer dissatisfaction. Additionally, participants about how handling large volumes of personal transaction data raises privacy concerns. To mitigate these risks banks ensured high data quality through extreme validation processes and compliance with data protection regulations. Encrypting data, especially during transmission and storage, and anonymizing data where possible can safeguard privacy was another mitigation strategy. Another significant risk is over-reliance on AI predictions. In an economy as volatile as Zimbabwe's, where market conditions can shift rapidly, AI models might not adapt quickly enough to new economic realities, potentially leading to compliance issues or inappropriate financial advice. Participants explained how they are still in the process of combining AI insights with human oversight, ensuring regular model updates and human intervention for critical decisions. Training staff to understand and interpret AI outputs also helps in making informed decisions. Regulatory compliance is another risk that was discussed. AI systems must be programmed to adapt to changes in AML and other financial regulations, which can be complex and frequently updated. To manage this, participants expressed the ongoing need to maintain close collaboration with

regulatory bodies, ensuring their AI systems are updated with the latest regulatory requirements. They also explained how they have established internal compliance teams focused on AI governance to help in aligning AI practices with legal frameworks.

Participants in the discussion highlighted the remarkable advancements brought about by payment switching technology in Zimbabwe's banking landscape. The speed and reliability of interbank transactions were notably improved, reflecting a significant enhancement in financial operations. Furthermore, the integration of AI tools for real time transaction pattern analysis was emphasized as pivotal for maintaining service excellence and adapting to the evolving demands of the banking industry. Additionally, the automation of decision making processes in transaction routing was discussed as a key factor in reducing errors and optimizing the overall efficiency of the banking network. As one participant noted, "*Automating decisions is not just about speed; it's about precision in a fast paced environment." The utilization of AI algorithms for smarter payment routing was also lauded for its dual benefits of expediting transactions and enhancing cost effectiveness.* Moreover, the proactive identification and resolution of potential system bottlenecks through AI powered technology were commended as a crucial advancement over traditional systems. An exemplary illustration of this cutting edge technology is the ZIMSWITCH system, which epitomizes the innovation and efficiency embraced by Zimbabwe's banking sector.

4.4 Summary

With the context of analysing the interoperability optimization and management of Zimbabwean banks through AI, this chapter navigated some essential stages encompassing how the data for the results was prepared, how it was analysed using thematic analysis and its interpretation based how the participants of the study responded. Notably, AI proved to be an essential and very much needed technology in the banking sector as a pivotal strategy to enhance security, reduce fraud, helping with repetitive and complex tasks and improving user convenience in the banking realm of Zimbabwe. The ongoing journey towards widespread implementation of more AI tools, algorithms and techniques in the country's digital banking landscape signifies a critical stride towards fortified security protocols and enriched customer experiences.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In the previous chapter, an examination was conducted on data obtained from interviews with digital banking division managers from various banks, alongside insights from IT experts and existing documentation. This chapter will present a comprehensive overview of these findings, along with providing recommendations and concluding reflections.

5.2 Discussion

To understand how AI has been used in Zimbabwe's banks for proper management and interoperability, the research made use of a thematic analysis as a method to analyse the data. Data collection was conducted through interviews online with some digital banking expertise in several banks, as well as the IT specialists responsible for the AI field that are within the banks. The researcher also investigated existing documentation of the banks to further understand reasons behind AI adoption in Zimbabwe.

In the optimization of interoperability and management within Zimbabwean banks using AI, the focus is on integrating AI technologies throughout the banking sector to boost system compatibility and administrative efficiency. AI technology is instrumental in optimizing banking operations by automating processes, improving data analysis and securing transactions across different platforms. Despite implementation challenges, AI provides effective solutions for critical banking issues such as fraud detection, compliance and personalised customer service. In Zimbabwe, banks strategically deploy AI to boost operational efficiency, enhance customer service and ensure regulatory compliance while adhering to ethical standards and business goals. This involves integrating AI into existing systems to facilitate smooth data exchange and transaction processing. Banks ensure compliance with local regulations through regular audits and transparent decision making. Training and supporting staff are essential for effective AI management, allowing employees to leverage these technologies effectively. Furthermore, managing AI involves addressing security concerns such as data breaches and algorithmic biases by implementing robust cybersecurity measures and ethical AI practices (Chikowore, 2022).

For further discussion, it is necessary to restate the objectives for this research which are as follows:

Research Objective 1

To assess the effectiveness of AI in the banking industry

Research Objective 2

To investigate the obstacles linked to using the traditional banking methods

Research Objective 3

To identify the specific AI technologies, algorithms and tools that have been implemented to ensure interoperability of banking systems and the management process of banks.

The results of **research objective 1** summarized how effective AI is in the banking industry. It also looked exactly why AI is necessary in the first place. Banks understand customer experience, security, efficiency and risk management the most. The respondence spoke about how they always want to make sure that their systems are simple and user friendly because of the diversity of their customers. Some users, especially from rural areas and the older demographic are not as technologically advanced as the younger demographic and those in cities and towns that are exposed to technology. As such, having complex systems opens doors for so many errors and mistakes that leaves the systems prone to attacks. Respondents also agreed that security was another reason why AI was implemented. The more secure the systems are, the more they maintain their customer loyalty and business credibility for the protection of their customers.

Objective 1 also aligns with the Technology Acceptance Model (TAM), which focuses on areas like customer experience, operational efficiency, risk management and improved security. TAM stresses the importance of users seeing the technology as useful and easy to use when adopting it. The participants' positive feedback on AI's ease of use, customer support and personalized notifications directly links to how easy it is to use AI and how helpful it is by making banking more straightforward and accessible. This improves the overall user experience and makes banking more convenient. Tasks being automated and data being processed quickly also make operations more efficient, showing that employees can focus on more challenging tasks, which makes their job satisfaction higher. AI's contributions to fraud detection, risk management and security measures further enhance its usefulness by ensuring

safer transactions and reducing financial losses, ultimately building trust with customers. The fact that AI tools cater to a wide range of demographics shows how versatile they are, aligning with TAM's idea that easy-to-use and beneficial technology will be more widely embraced, ultimately improving how banks in Zimbabwe manage and work with new technologies.

The results for **research objective 2** summarized the investigation of the obstacles linked to using the traditional banking methods before the concept of AI was introduced to banks. Participants highlighted that traditional banking methods are time consuming and inefficient, leading to delays in customer service, document processing and issue resolution. Employee challenges included dissatisfaction with repetitive tasks and the complexity of training on outdated systems, which impacted productivity and customer service quality. Poor customer experiences stemmed from restricted access to assistance, inadequate feedback systems and inconsistent service quality across branches. Limited data analysis capabilities in traditional banking hindered the identification of market trends, efficient data processing and fraud prevention. Overall, the findings underscore the urgent need for modernization and AI integration in traditional banking to address operational inefficiencies and enhance customer satisfaction effectively.

Linking this to existing literature, the theme time consuming and inefficiency, participants clearly identified several bottlenecks in traditional banking. The use for physical customer service, extensive paperwork and transfers from one department to the other for resolving queries all contribute to longer processing times and reduced productivity. This mirrors findings in the literature where the Technology Acceptance Model (TAM) suggests that perceived ease of use significantly influences user acceptance of technology (Davis, 1989). Here, the lack of AI integration directly correlates with decreased efficiency, aligning with the TAM's premise that technology perceived as cumbersome is less likely to be adopted or effectively utilized.

In the context of employee challenges, the dissatisfaction with repetitive tasks and the training sessions on outdated systems reflect a broader narrative in organizational behaviour theories. The Institutional Theory suggests that organizations adopt practices to conform to external pressures or norms (DiMaggio & Powell, 1983). However, the resistance to modern technology adoption in banking, as perceived by employees, indicates a lag in institutional transformation, where the banking sector is slow to adapt to technological advancements seen in other competitors. Additionally, the Theory of Planned Behaviour (Ajzen, 1991) and the Theory of

Reasoned Action (Fishbein & Ajzen, 1975) would predict that such dissatisfaction could lead to lower performance and morale, impacting service quality. The Technology Organization Environment framework (Tornatzky & Fleischer, 1990) would further explain this as a challenge within the organizational context where the lack of modern tools affects the internal processes and employee satisfaction.

Regarding poor customer experience, the limitations of traditional banking hours, inadequate feedback systems and inconsistency in service quality across branches are significant. These issues resonate with the Diffusion of Innovations theory (Rogers, 2003), where customer adoption of banking services could be hindered by these inefficiencies, leading to lower customer satisfaction and loyalty. The integration of AI would theoretically facilitate better customer service through personalization, availability and responsiveness aspects as highlighted by participants to ensure customer satisfaction.

Finally, the theme of Limited Data Analysis underscores the inadequacies of traditional methods in handling large datasets for strategic decision making. The slow pace of manual data analysis impacts not only operational efficiency but also the strategic positioning of banks in a competitive market. This connects back to the earlier mentioned theories where the adoption of AI technology could significantly enhance the organization's ability to respond to market trends and manage risks like fraud more effectively, as supported by contemporary literature on big data analytics in finance (Chen, Chiang, & Storey, 2012).

The integration of Artificial Intelligence (AI) in the banking sector, as explored in Research Objective 3, marks a significant transition from traditional banking methods to more advanced, user friendly, secure and efficient systems. This shift, particularly evident with Machine Learning Algorithms, not only streamlines routine tasks to enhance efficiency but also enables banks to engage in complex analytical activities. The emphasis on training and support aligns with the Technology Acceptance Model (TAM), highlighting the importance of perceived usefulness in technology adoption. The introduction of Process Automation, including chatbots, demonstrates a strategic effort to improve customer experience, consistent with the Technology Organization Environment (TOE) framework. The focus on Computer Vision and Enhanced Security underscores AI's critical role in strengthening security measures and maintaining customer trust, aligning with the Theory of Planned Behaviour (TPB) and Theory of Reasoned Action (TRA) principles. Predictive Analysis for transaction monitoring and compliance enhances risk management efficiency, while Payment Switching Technology

boosts transaction speed and reliability, reflecting the environmental context outlined in the TOE framework. These insights confirm the strategic importance of AI in banking operations and illustrate the practical application of theoretical frameworks in understanding the impact of AI technologies on the banking sector. This integration represents a proactive approach by banks to embrace technological advancements and meet market demands for efficiency, security, and customer focused services.

5.3 Conclusions

In conclusion, the adoption of AI technologies, tools and algorithms in Zimbabwe's digital banks represents a significant step towards streamlining banking operations, enhancing system connectivity and driving innovation in banking processes. By exploring participant perspectives and identifying common themes, this study has provided valuable insights into AI's potential in banking operations. The strategic use of AI to improve interoperability and management processes has enabled banks in Zimbabwe to enhance decision making, automate routine tasks and elevate customer service. This commitment to technological progress underscores the essential role of adopting advanced technologies to adapt to evolving market conditions and meet growing expectations within the digital banking sector.

Objective 1

The results from the first research objective clearly demonstrate how AI is effectively improving various areas of the banking sector in Zimbabwe. Participants highlighted in the Customer Experience and Cost Reduction category how AI tools enhance customer service by providing 24/7 support, simplifying processes like applying for products, resolving queries, and assisting with transactions, leading to reduced wait times. AI has also made banking interfaces more user friendly and intuitive, whilst customers are appealing for personalized reminders and notifications of important tasks for example upcoming payments that need to be done. AI has also promoted inclusivity across various age groups and levels of financial literacy. Regarding Operational Efficiency, AI's automation of tasks like data entry and transaction processing was praised for enabling quick data analysis, boosting job satisfaction by freeing up staff to focus on more complex duties. In addition, in terms of Risk Management and Fraud Detection, AI's ability to predict risk and promptly alert suspicious activities was highlighted for enhancing customer trust and minimizing financial losses through early detection of fraud. Moreover, participants emphasized AI's role in continuously monitoring account activities and assessing third party security to strengthen banks against potential

breaches in the realm of Enhanced Security. These participants appealed for more security measures that continuously monitor activity using AI algorithms to help the bank to detect and respond to different security breaches.

Objective 2

The investigation into the challenges of traditional banking practices without Artificial Intelligence (AI) integration, as explored in Research Objective 2, has yielded important insights. Traditional banking systems are found to be time consuming and inefficient compared to AI-powered systems, relying heavily on manual processes that lead to prolonged resolution times and decreased productivity. This inefficiency affects operational costs and customer satisfaction, as participants have experienced. Employees often express discontent due to repetitive tasks and the intensive nature of their responsibilities in traditional banking environments. Outdated systems require extensive training, which is both time consuming and resource intensive. This dissatisfaction can lead to lower service quality, impacting both employee morale and customer loyalty, highlighting the need for technological upgrades to remain competitive. Furthermore, traditional banking methods limit customer experience with restricted service access, limited operating hours and cumbersome communication channels, hindering customer satisfaction. The lack of effective feedback mechanisms further distances customers, resulting in an unsatisfactory experience marked by confusion, frustration and dissatisfaction with service disparities across branches (Mogotloane, 2023). The inability to effectively analyse data poses a significant challenge for traditional banks, as manual data handling hampers their ability to quickly identify market trends, manage risks and detect fraudulent activities essential for strategic decision-making and operational efficiency (Ngai, Hu, Wong, Chen & Sun, 2011). This lag in response negatively impacts financial outcomes and competitive positioning in a data driven market. Integrating AI technologies offers a solution to these challenges, providing operational improvements and strategic advantages in customer engagement, risk mitigation and market responsiveness. As banks undergo digital transformation, adopting AI is not just an option but a necessity for maintaining relevance and competitiveness in the financial sector (Bao & Li, 2018).

Objective 3

In conclusion, the findings from Research Objective 3 reveal a transformative impact of Artificial Intelligence (AI) technologies on the banking industry, particularly in Zimbabwe. The deployment of Machine Learning Algorithms has significantly enhanced operational

efficiency by automating routine tasks such as data entry and enabling more accurate and swift fraud detection. The emphasis on training and support for AI systems highlights the importance of human-AI collaboration for maintaining high service standards and reducing financial losses within the organization. Process Automation has revolutionized customer service through the integration of chatbots and automated systems for account management, providing a nonstop service availability at any time of the day and is in line with the customer focus approach. This not only improves customer experience by offering convenience but also aligns with the global trend towards digital banking solutions that cater to diverse customer needs.

Regarding Computer Vision and Enhanced Security, the use of AI for biometric verification and real time transaction monitoring has been pivotal in securing banking transactions. This adoption reflects a broader industry trend towards enhancing security measures through technology (Jain, 2020). The application of Predictive Analysis has enabled banks to monitor transactions for compliance and fraud, optimizing the flow of funds and personalizing services based on customer data analysis (Kim & Choi, 2020). This predictive capability aids in risk management as well as strategic customer engagement, enhancing customer satisfaction and loyalty. Lastly, Payment Switching Technology has seen remarkable advancements with AI aiding in real time transaction analysis and decision making, which has been vital for improving the speed and reliability of banking operations in Zimbabwe. AI can transform payment systems in developing economies to be more efficient and cost effective (Mhlanga, 2020).

5.4 Implications

The research conducted on the integration of Artificial Intelligence is significantly enhancing various aspects of the banking sector in Zimbabwe, as highlighted by the participants. The findings from this study, as articulated across the three research objectives, underscore the transformative role of Artificial Intelligence (AI) in Zimbabwe's banking sector, with far-reaching implications for management, interoperability, customer service and competitiveness.

The results from Objective 1 reveal that AI significantly enhances customer experience, operational efficiency, risk management and security as evidenced by participants' praise for 24/7 support, intuitive interfaces and fraud detection capabilities. This implies that Zimbabwean banks must prioritize more AI investments to meet customer demands for personalization for example reminders for upcoming payments and promote inclusivity across diverse demographics, while also freeing staff for higher value tasks and strengthening trust through strong security measures. However, the appeal for more AI-driven monitoring suggests

current systems may not fully address evolving threats, pointing to a need for continuous upgrades and collaboration with technology providers to sustain these gains. Additionally, to enhance security, financial institutions must prioritize the adoption of AI in banks. Through the utilization of AI technologies, financial institutions can considerably lower the risk of unauthorized access, identity theft and fraudulent transactions. This calls for making investments in cutting edge AI technology and making sure that it integrates seamlessly with online banking platforms. Moreover, ultimately the successful adoption of AI in banks hinges on building and maintaining customer trust and confidence. Transparent communication, seamless user experience and proactive cybersecurity initiatives are key in fostering a secure and trusted banking environment that meets the evolving needs and expectations of customers.

The exploration of objective 2 on traditional banking challenges further amplifies this urgency, showing that manual processes lead to inefficiencies, employee discontent and poor customer satisfaction, all of which erode efficiency and competitiveness in this digital era. This implies that banks resisting AI adoption risk falling behind, necessitating immediate action like staff training and system modernization to bridge the gap with competitors. Furthermore, as technology continues to evolve, financial institutions must stay abreast of technological advancements in AI. Investing in research and development, adopting innovative AI solutions and leveraging AI driven security measures can enhance the effectiveness and reliability of AI methods over time.

Objective 3's focus on specific AI technologies such as machine learning, process automation, computer vision and predictive analytics demonstrates their practical benefits, from faster fraud detection to seamless payment switching, suggesting that banks should strategically deploy these tools more to optimize operations and personalize services. Together, these findings imply a dual challenge and opportunity for Zimbabwe's banking sector that adopting AI is essential for survival and growth in a digital driven market. For practitioners, this means investing in more scalable AI solutions, especially those fostering human to AI collaboration through training, and aligning with the different regulatory frameworks to ensure compliance and security. Ultimately, these implications position AI as a catalyst for modernizing banking, urging stakeholders to act decisively to harness its potential while addressing implementation challenges in a developing economy.

5.5 Recommendations

Based on the provided research findings and implications, here are tailored recommendations for management and interoperability of AI in Zimbabwean banks:

Financial Institutions:

- Invest in Advanced AI Technologies:
  Financial institutions need to persist in investing in advanced AI technologies that provide strong security features and seamless integration with various banking platforms. Additionally, they should give precedence to AI solutions that enhance operational effectiveness, risk control and customer service.
- Conduct Regular Security Audits, Tests and Assessments:
  Perform regular security audits, vulnerability assessments, and penetration testing on AI systems to identify and mitigate potential risks. Establish protocols for handling security incidents and ensure rapid response to emerging threats that are familiar.
- Emphasize Security Measures:
  Financial institutions should prioritize the adoption of AI to enhance security in banking operations. Implementing advanced AI technologies can significantly reduce the risks of unauthorized access and fraudulent transactions, ultimately building customer trust and confidence.

  Technology Providers:
- Establish Industry Standards:
  Collaborate with other financial institutions, technology providers and regulatory bodies to establish industry wide standards for AI interoperability. Ensure that AI systems can communicate effectively and securely with each other.
- Customize AI Solutions:
  Work closely with technology providers to customize AI solutions based on specific security requirements, user preferences and regulatory guidelines. Ensure that AI systems are tailored to the unique needs of the banking sector in Zimbabwe and update them every now and then so that fraudulent activities are reduced.

  Regulatory bodies:
- Provide Training and Support:
  Offer comprehensive training and support to staff on the implementation, integration and maintenance of AI systems. Foster a culture of continuous learning to ensure that employees are equipped to leverage AI technologies effectively.

- Stay Updated with Emerging Technologies:
  Stay informed about emerging technologies, trends, and threats in AI to proactively address security vulnerabilities and enhance system reliability. Foster a culture of innovation and adaptability to ensure that AI systems remain up to date and effective.
  Customers:
- Facilitate secure and efficient banking:
  Encourage the utilization of AI solutions provided by financial institutions to enhance security and streamline digital transactions. Stay knowledgeable and informed about the advantages, risks and recommended practices related to AI to enable well informed decision making processes. Promptly notify financial institutions and regulatory bodies of any suspicious activities or security issues concerning AI for timely intervention and resolution. Ensure the regular updating of AI applications and configurations to maintain optimal security measures and transaction accuracy in digital banking processes.

By implementing these tailored recommendations for management and interoperability of AI in Zimbabwean banks, stakeholders can contribute to the successful adoption and integration of AI technologies in the banking sector. This will lead to improved operational efficiency, enhanced security measures, regulatory compliance and a more seamless user experience for customers.

5.6 Suggestions for future research

To contribute valuably to the advancements and best practices in the field of Artificial Intelligence in Zimbabwean banks, researchers could look at the following research areas:

- Enhancing User Education and Awareness in AI Integration: Develop comprehensive user training initiatives and awareness campaigns to advocate for the benefits of using AI in the banking sector, tackle acceptance challenges and establish trust among both customers and staff. Research and evaluate the impact of user training programs and awareness campaigns aimed at promoting the benefits of AI in the banking sector. Address acceptance challenges, build trust among customers and employees and ensure a comprehensive understanding of AI capabilities and limitations in digital banking operations. Measure the effectiveness of these educational initiatives in fostering secure and responsible utilization of AI technologies.

- Ethical AI Policies and Governance in Banking Innovation: Investigate the necessity of ethical AI policies, privacy concerns, ethical dilemmas and governance frameworks to support innovation and ethical implementation of AI in the banking industry. Government involvement is crucial to establish clear guidelines based on ethical principles, ensuring responsible deployment of AI technologies. These frameworks will offer direction and support to banks seeking to integrate AI solutions securely, fostering trust and transparency within the sector.
- Utilizing AI for Enhanced Data Management and Analytics: Explore how AI advancements have transformed data management and analytics in Zimbabwean Banks, analysing their impact on improving decision making processes and operational efficiency. By understanding the full potential of AI in enhancing data utilization, financial institutions can optimize their analytical capabilities and achieve operational excellence in the banking sector.

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APPENDICES

APPENDIX 1: SAMPLE INTERVIEW GUIDE

Section 1: Background and Experience

1. What is your current role in the banking sector in Zimbabwe?

2. How familiar are you with the application of Artificial Intelligence in banking?

3.Have you received any specialized training relating to the applications of Artificial Intelligence in the banking industry?

Section 2: Challenges and Opportunities

4. From your perspective, what are the key challenges faced by banks in Zimbabwe when it comes to interoperability and management?

5. Have you observed any specific areas within the banking sector where Artificial Intelligence has been implemented to optimize integration of banking systems and management processes? If so, could you provide some examples?

6. In terms of customer experience, how has Artificial Intelligence served to enhance the services provided by banks in Zimbabwe? What specific AI-applications have been deployed?

7. In your opinion, what are the main benefits of using Artificial Intelligence for integration of the banking systems and it's management?

Section 3: Practical Experience

8. Have you personally worked with or been involved in any projects that have utilized Artificial Intelligence for integration of banking systems and management of banks? If yes, could you share your experiences and the outcomes achieved?

9. Could you describe any specific use cases or applications of Artificial Intelligence that you have witnessed in the banking sector in Zimbabwe?

10. What were the results or impacts of implementing Artificial Intelligence in those use cases?

Section 4: Risks and Limitations

11. What are the potential limitations associated with the use of Artificial Intelligence to transfer funds or accessing accounts across different banks in Zimbabwe to ensure seamless customer experience? Have you encountered any of these challenges?

12. Are there any ethical considerations or concerns that need to be addressed when implementing Artificial Intelligence in banks?

Section 5: Future Outlook

13. Based on your knowledge and experience, what do you think is the future potential of Artificial Intelligence in enhancing further innovations to ensure interoperability and improve the overall customer experience?

14. What do you believe are the key recommendations for successful implementation and utilization of Artificial Intelligence in this domain?

INFORMED CONSENT

My name is Varaidzo Dambudzo, a final year studying Software Engineering at Africa University. I am carrying out a study on "Analysis of interoperability optimization and management of Zimbabwean banks using Artificial Intelligence." Iam kindly asking you to participate in this study by engaging with me in the interview online to answer a few questions regarding the study.

The purpose of the research is to explore the transformative impact of Artificial Intelligence (AI) in the banking sector. It aims to analyze how AI has enhanced banking practices by increasing efficiency, perfomance, improving customer experience, and minimizing risks and fraudulent activities. The study intends to compare traditional banking methods with the current AI-driven approach and determine the necessity of this shift. You were chosen as a participant in this study due to your relevant work experience, and your occupation and organization are well-suited for this research. Approximately 50 other participants, including individuals from both within and outside your organization, are also involved in the study.

If you choose to participate, you will engage in a personal interview with the researcher, during which the conversation will be recorded for assessment purposes. The objective of the interview is to gather firsthand experiences from participants regarding their utilization of AI-based banking methods and traditional approaches. Additionally, expert opinions on the future direction will be sought. The anticipated duration of the interview is approximately 15-20 minutes.

Participating in this study will offer participants several benefits. Firstly, it allows them to contribute to the existing knowledge base regarding the utilization of AI in Zimbabwean banks, positioning them as pioneers in this field of study within Zimbabwe. Additionally, participants will have the opportunity to expand their understanding of the subject matter through discussions with the researcher, where diverse perspectives and findings can be explored.

To facilitate the sharing of the final document, the researcher will require an email address from participants. Rest assured that this personal information will be treated with strict confidentiality and will not be disclosed to any external entity or personnel. Furthermore, no names or other identifying information will be requested during the interview process.

Participation in this study is voluntary. If you decide not to participate in this study, your decision will not affect your future relationship with the organization. When you do choose to participate, you are free to withdraw consent and to discontinue participation without penalty.

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

If you have decided to participate in this study, please sign this form in the space provided below as an indication that you have read and understood the information provided above and have agreed to participate.

---------- ----------

Name of Research Participant(Please Print) Date

Signature of Research Participant or legally authorised representative

If you have any questions concerning this study or consent form beyond those answered by the researcher including questions about the research, your rights as a research participant, or if you feel that you have been treated unfairly and would like to talk to someone other than the researcher, please feel free to contact the Africa University Research Ethics Committee on telephone (020) 60075 or 60026 extension 1156 email aurec@africau.edu

Name of Researcher: Varaidzo Dambudzo

Participant Email:----------

Researcher Email:----dambudzov@africau.edu-------

APPENDIX 2: AUREC APPROVAL NOTE

"Investing in Africa's future"

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

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Ref: AU 3406/24 6 August, 2024

VARAIDZO DAMBUDZO
C/O Africa University
Box 1320
MUTARE

RE: **EXAMINING HOW ARTIFICIAL INTELLIGENCE HAS BEEN USED TO OPTIMIZE THE INTEROPERABILITY AND MANAGEMENT OF BANKS IN ZIMBABWE**

Thank you for the above-titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

a) Research proposal

- **APPROVAL NUMBER** AUREC 3406/24
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** August 6, 2024
- **EXPIRATION DATE** August 6, 2025
- **TYPE OF MEETING**: Expedited
  After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be submitted a month before the expiration date for renewal purposes.
- **SERIOUS ADVERSE EVENTS** All serious problems concerning subject safety must be reported to AUREC within 3 working days on the standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

Yours Faithfully

MARY CHINZOU
ASSISTANT RESEARCH OFFICER: FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE

APPENDIX 3: APPROVAL NOTE FROM FBC BANK

FBC Holdings Limited
You Matter Most

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26 June 2024

To Whom It May Concern

Dear Sir/Madam,

AUTHORITY TO CARRY OUT RESEARCH

This serves to advise that Varaidzo Dambudzo is a final year student at the Africa University studying towards a Bachelor of Science Honours in Software Engineering. She has been authorized to research on the title; "Examining how Artificial Intelligence has been used to optimize the Integration of banking systems and management of Banks in Zimbabwe. A case study of FBC Bank"

Kindly assist her with the information required.

Yours faithfully

Roy Nyakunuwa

Head of Group Marketing

APPENDIX 4: APPROVAL NOTE FROM STEWARD BANK

STEWARD BANK
Everyday Banking For Everyday People
A Registered Commercial Bank

ADDRESS
79 Livingstone Avenue
P.O Box 5220
Harare, Zimbabwe

+ 263 8677020267

+263-242-791444 / 8
791450 / 60
791461
732408
792032
793290
253672 / 3 / 5

www.stewardbank.co.zw

02 July 2024

Varaidzo Dambudzo
C/o Africa University
Harare

Dear Varaidzo,

RE: REQUEST TO CONDUCT RESEARCH WITHIN STEWARD BANK LIMITED

Thank you for your interest in conducting research within Steward Bank. Your request to conduct a research on the topic**, Examining how Artificial Intelligence has been used to optimize the interoperability and management of banks in Zimbabwe,** has been approved.

You are required to provide the final copy of the research document, which is duly stamped by your university with a clear executive summary, comprehensive research findings and recommendations to:

The Talent Development Manager,

lorraine.muchenjekwa@stewardbank.co.zw

Kindly get in touch with Lorraine on 0771222415 for any additional support.

For and On Behalf of Steward Bank

Lorraine Muchenjekwa
Talent Development Manager

APPENDIX 5: APPROVAL NOTE FROM CBZ BANK

APPLICATION FOR CARRYING OUT RESEARCH IN CBZ HOLDINGS

Thank you for applying to conduct research at .....CBZ HOLDINGS..... complete the below form and return to the Human Resources Department.

Please ensure that all required attachments are included in the application.

Name & Surname **(List all researchers)**	VARAIDZO DAMBUDZO
Email address	dambudzov@africau.edu/ varaidzo.dambudzo@gmail.com/ vdambudzo@cbz.co.zw
Phone number	+263712744840/ +263773851583
Are you currently employed by CBZ Holdings?	Yes
If yes, list your job title and department.	Group IT - Intern
If no, have you ever been employed by CBZ Holdings or CBZ Holdings related company?	
Current employment **(List employment of all researchers)**	CBZ Holdings - Student Intern
Institution	Africa University
Academic Research Level	Undergraduate Final Year Research
Program	Software Engineering

Name and contact details of research supervisors	Mrs Lovely Tembani-Fundisi +263774212950/ +263713935255 tembanil@africau.edu/ ltembani35@gmail.com / lovelytembani@yahoo.com
Research Topic	Examining how Artificial Intelligence has been used to optimize the Integration and Management of banks in Zimbabwe.
Brief Objective / Research Question **-research context**	Theoretical context- which makes use of theories and models related to the technological adoption of Artificial Intelligence in banks. Empirical context- which examines the current state of AI adoption and use cases within the Zimbabwean banking sector. It also explores the challenges and opportunities associated with integrating and managing AI-powered systems in the banking environment. Methodological context- which makes use of qualitative and quantitative data collection techniques. These techniques are then used to study how banks adopt change and new technologies. It then looks into ethical concerns that come with studying sensitive technological and financial information.
-research intent and objective	To assess the effectiveness of Artificial Intelligence in the banking industry whilst identifying the potential risks and concerns that AI brings to banks

-population and sample **-data analytic techniques** **-proposed value add to your area of research**	Population- Entire Banking Sector Sample- IT staff members and managers from CBZ, Steward Bank, Stanbic and NMB Thematic analysis-by reading through interview transcripts to identify and analyse recurring ideas, patterns and themes in the responses provided by the participants. Content analysis- examining the questionnaires and documents after getting feedback from participants To get full knowledge on how Zimbabwean banks are using AI to improve their operations and integration. This is achieved by getting an overview of the current state of AI adoption in Zimbabwean banking, compare it to the indigenous way of banking, speculate on future AI trends, provide practical implementation guidance, and assist with data analysis.
Method of Data Collection	Questionnaire and Interviews
Research Timelines	August to December 2024 – Data Collection January to February 2025- Write up of the research findings

REQUIRED APPLICATION ATTACHMENTS

1. Letter for support from research supervisor
2. List of all interview or questionnaire questions (with references)
3. Research Informed Consent form for participants
4. Commitment letter from researcher that the final research paper will be submitted to CBZ Holdings prior to publication.

Approved/Not Approved _____ p.p. _____

Head, Talent Development

Approved/Not Approved _____

Head, Legal

Approved _____ Compliance Officer

Head, Legal

Approved  Compliance Officer

✓ pp N Mukubvu on behalf of CHRO

Not Approved/ Approved 

Chief Human Resources Officer

Approved/Not Approved 

Divisional Director/Principal Officer/Managing Director