

AFRICA UNIVERSITY

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ASSESSING THE ADOPTION OF SOFTWARE SOLUTIONS IN
IMPROVING ACCESS TO QUALITY EDUCATION FOR
PERSONS WITH DISABILITIES IN ZIMBABWE:
A CASE STUDY OF JAIROS JIRI ASSOCIATION, ZIMBABWE

BY

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Abstract

This study explored how software solutions are being utilized in an educational context by persons living with disabilities (PWDs). It focused on the factors that influence their adoption and how users of these tools perceive their effectiveness in enhancing access to quality education based on software attributes. The study was prompted by the realization of how Information Communication Technology (ICT) has gained massive popularity in all disciplines of life globally and particularly how it has had a great positive impact on education globally. The interest grew upon PWDs because technology is meant to be an assistive tool that enhances efficiency in our daily tasks, and the need for that assistance is even greater for individuals with special needs. This study drew from existing literature on the impact of educational technologies globally and how they are being utilized in their specific context. This research was carried out in order to address how software solutions are being utilized in a Zimbabwean context and to assess the effectiveness of these technologies. The study employed a mixed-methods approach to gain a holistic understanding of the impact of these tools and the experiences of the users. The research revealed that while technology is being used to support PWDs in education, its effectiveness is impacted by a range of factors, including usability, accessibility, and infrastructural limitations. User perceptions, particularly from students, highlight the importance of considering these factors in technology implementation. The study emphasizes the need for collaborative efforts from educators, developers, and policymakers to create inclusive and effective technology solutions. Recommendations include prioritizing user-centered design, providing adequate training, and addressing systemic barriers to ensure equitable access and positive educational outcomes for PWDs.

Key words: *Software Solutions, Persons with Disabilities, Education, Technology Adoption Accessibility*

Declaration

I declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.

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20 March 2025

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Dedication

This dissertation is dedicated to my parents, Benjamin and Edina Masawi, whose unwavering support, faith, and the opportunities they provided have been the foundation of all my endeavors. I am eternally grateful for their love and guidance. I also dedicate this work to my siblings BK, Blessing, Prince, Chantelle and Valerie, whose love and encouragement have been a constant source of strength throughout this journey. Finally, I dedicate this work to the Lord Almighty, whose grace and strength have sustained me throughout this challenging endeavor.

List of Acronyms and Abbreviations

PWDs	Persons with disabilities
AT	Assistive Technology
JJA	Jairos Jiri Association
ICT	Information Communication Technology
UNICEF	United Nations Children's Fund
UNESCO	United Nations Educational, Scientific and Cultural Organization
CRPD	Convention on the Rights of Persons with Disabilities
USF	Universal Services Fund
POTRAZ	Postal and Telecommunications Regulatory Authority of Zimbabwe
UN	United Nations
SDG	Sustainable Development Goal
ASD	Autism Spectrum Disorder
UX	User Experience
LMS	Learning management systems
AAC	Augmentative and Alternative Communication

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CHAPTER 1 INTRODUCTION

1.1. Introduction

In the 21st Century, Information Communication and Technology (ICT) plays a pivotal role in all aspects of life. It has disrupted, yet positively impacted how the world operates in all fields such as agriculture, banking, sport, and education just to name a few. Digital solutions have been a significant tool in fostering access to quality education. The role played by education is undeniably crucial in improving the quality of life of every citizen and research supports that education can be used as one of the drivers to eradicate poverty (OECD,2020). The intersection between ICT and education has been extremely profound, and has had a considerably positive impact on the way students learn as well as how educators teach. In a survey conducted by Project Tomorrow, it was reported that 99% of schools are using technology as a tool for teaching and learning (Project Tomorrow, 2020). To narrow it down to this nation, the government of Zimbabwe introduced an e-learning policy in (2020) which encourages the use of e-learning platforms in schools aiming for a widespread adoption of technology in the educational sector of Zimbabwe. It is apparent that there are strides that are being made in adopting digital solutions in the educational sector, with a clear intention of improving not only the access to education itself, but also for learners to have an education that is of a recognizably good quality. In this line of thinking, it is crucial to assess how marginalized groups, in this case Persons with Disability (PWDs), are affected by the phenomenon of adoption of software solutions in fostering access to this quality education.

1.2 Background of Study

A national survey was conducted by United Nations Educational, Scientific and Cultural Organization (UNESCO) on Living Conditions among Persons with Disabilities and the results suggested a prevalence of approximately 7% of disability, this translates to a population of approximately 914 287 people using the statistics from 2012 Zimbabwe population census (UNESCO,2021). To narrow it down further, according to the United Nations Children's Fund (UNICEF), as many as approximately 600 000 children under the age of 18 years live with some form of disability. This is a crucial age for preparing individuals for adulthood and into becoming valuable human capital in supporting and sustaining national development. It is imperative to consider what that can mean in light of the phenomenon of technology intersecting with education for PWDs. This number arguably has increased since then which might suggest an increase from the survey done by UNESCO.

In Zimbabwe, the right to education is not only articulated in the national constitution (Government of Zimbabwe, 2013) but also in the Education Act (Chapter 25:04) (Government of Zimbabwe, 1996). Furthermore, Zimbabwe's ratification of the Convention on the Rights of Persons with Disabilities (CRPD) (United Nations, 2006) reinforces its commitment to creating an inclusive education system that caters to the diverse needs of all learners, including PWDs.

It doesn't end here, to take a step further, Section 83 of the Constitution addresses the rights of persons with disabilities and mandates the State to take appropriate measures to ensure their full enjoyment of rights and freedoms. One of these measures include providing special facilities for their education. It is transparent that the state recognizes that PWDs require special needs to facilitate their well-being, and one of the ways through which this notion has been supported by

developers of educational software is developing tools that give them the ability to access quality education tailored to their special needs through the use of specialized software solutions.

Technology has been useful as a transformative tool in facilitating access to quality education for all including those with special needs. There have been numerous innovative and development driving software solutions that are bracketed under Assistive Technologies (ATs) that have been developed and made available in an attempt to transform the educational landscape for those with disabilities. For instance, there are solutions such as screen readers, text-to-speech softwares and speech input software amongst many others that can enable students with visual impairments to have enhanced educational experiences. These emerging ATs present a potential to address barriers by offering innovative avenues that enhance access, personalize learning experiences as well as foster an inclusive educational environment for PWDs (World Bank, 2020).

Jairos Jiri Association (JJA) is a leading non-governmental organization (NGO) that is dedicated to empowering PWDs in Zimbabwe. It was founded in 1950 by a man known as Jairos Jiri and has been accredited to be one of the largest organizations of this kind in Africa. It provides care, rehabilitation, and vocational training to the disabled. With its extensive network, it is ideally positioned to harness the power of technology inclusive education. The Postal and Telecommunications Regulatory Authority of Zimbabwe (POTRAZ) has been actively involved in administering ICTs for PWDs across the nation and one of the beneficiaries of this program has been JJA.. Through its Universal Services Fund (USF), POTRAZ has funded various ICT initiatives targeted to empowering PWDs with digital skills, promoting technological educational inclusivity. One of the ATs deployed in 2019 was fusion software that caters for students with visual impairments (The Herald, 2019).

The Sustainable Development Goals SDGs are 17 goals which have been taken up by all United Nations Member States in 2015 as part of the 2030 Agenda for Sustainable Development (United Nations, 2015). They are a representation of a call to action around the globe to end poverty, protect the planet and ensure all people live peacefully and in prosperity by 2030. The SDGs explicitly emphasize the importance of leaving no one behind and this includes PWDs. Goal 4 on quality education is particularly relevant in this context as it emphasizes inclusive and equitable education and promotes lifelong learning for all.

Despite the efforts made by the State and other international legal frameworks that protect PWDs to relay the message of inclusive education and opportunities, like other developing countries, Zimbabwe remains a work in progress in adopting software solutions that can foster access to quality education for PWDs. It appears a population of the disabled community continue to face disproportionate barriers to education, including physical inaccessibility of schools, lack of specialized teaching materials and ATs, negative attitudes and stigma, and inadequate teacher training in inclusive pedagogy (Chimedza & Peters, 2015; Mhlanga, 2018). Some of these challenges have brought about lower enrollment rates, higher rates of dropout and poorer academic outcomes for PWDs compared to their non-disabled peers. Knowing how crucial a role education plays in promoting more employment opportunities and independent living in society, it is inevitable to predict the undesirable consequences that result from these challenges. Considering how software solutions have been developed and adopted for teaching and learning of their well-abled peers, it is vital to do this assessment for PWDs.

1.3. Statement of Problem

Despite the strides in integrating technology in education, the reality for PWDs in Zimbabwe remains grim. Zimbabwe Disability Rights Commission revealed a report in 2019 which indicated that only 17% of PWDs have access to education, as opposed to the general population. This stark disparity highlights the need for solutions that can help bridge the educational divide and ensure that PWDs are not left behind in this evolving digital age. While there is abundant potential for ATs and adaptive software solutions in revolutionizing education for the disabled, their adoption and implementation in Zimbabwe continues to face immense obstacles. It appears to an extent there is a lack of awareness among some educators and parents about the benefits of these software solutions, coupled with limited financial resources and inadequate training, to have interfered with its widespread adoption.

Existing studies seem to focus on broader issues concerning inclusive education or the use of technology in general, without delving into how some of these software solutions have been effective in their specific contexts. This lack of evidence-based research hinders development of targeted interventions and policies that can effectively leverage software solutions in enhancing educational outcomes for PWDs through their adoption. Therefore, the statement of the problem is this: There is a pressing demand to probe into the adoption and impact of software solutions in improving access to quality education for PWDs in Zimbabwe, particularly in the context of JJA. This research enriches our understanding on how technology is being leveraged to overcome barriers to education, identify best practices and inform policy makers that can effectively drive inclusive technological and equitable education.

1.4. Research Objectives

1. To identify the range of software solutions adopted by JJA to enhance access to quality education.
2. To assess the impact of software solutions on the quality of education for PWDs at JJA , focusing on factors such as academic achievement, engagement, and overall learning experience.
3. To develop evidence-based recommendations for software developers, educators, and stakeholders on promoting the effective software solutions for inclusive education in Zimbabwe.

1.5 Research Questions

1. What types of software solutions has JJA adopted to enhance access to quality education for PWDs, and how are these solutions being integrated into the existing educational practices?
2. How effective are these software solutions in improving educational outcomes for PWDs at JJA, as measured by academic performance, and engagement?
3. How do PWDs at JJA perceive the functionality, usability and suitability of the software solutions implemented, and what are their experiences using these tools in their learning journey?
4. What challenges and barriers has JJA encountered in the use of software solutions for PWDs, and how have these challenges been addressed?

1.6 Significance of Study

This study is critical in promoting adoption of software solutions for inclusive education and it goes far beyond the immediate context of JJA and education of PWDs in Zimbabwe. It has profound potential implications for software developers, educators, policy makers as well as advocates for the disabled around the globe.

The findings of this study will be of great interest to software developers and innovators. By gathering information on the specific needs and challenges faced by PWDs in accessing and using educational software, this can guide the development of more inclusive software solutions with the targeted user in mind. To add on, this research can possibly contribute to the growing body of knowledge on how technology is being leveraged to enhance educational outcomes for PWDs. By carrying out this study and documenting the experiences at JJA, this will provide educators with practical examples of how to effectively integrate software solutions in learning environments. Furthermore, valuable empirical evidence can be derived from this study to inform development and implementation of policies aimed to support inclusive education for the disabled.

1.7 Assumptions , Delimitations and Limitations

1.7.1. Assumptions

- A. Participants will be honest and accurate with the information they share about their experiences and perceptions of software solutions.
- B. Participants have access to the necessary hardware and infrastructure to utilize the software solutions under investigation.

- C. The selected participants are representative of the broader population of PWDs served by JJA, allowing for meaningful generalizations within this context.

1.7.2 Delimitations

- A. Research is mostly focusing on software solutions that are currently available and have been implemented. It is not going to explore the development of an entirely new software solution.
- B. This study will exclusively focus on software solutions within the context of JJA. Furthermore, participants in this research will be selected from JJA.
- C. The study will define quality education in alignment with the UN Sustainable Development Goal 4 (SDG 4), which emphasizes inclusive and equitable quality education and promotes lifelong learning opportunities for all.

1.7.3. Limitations

- A. Measuring the impact of software solutions on educational quality can be complex and influenced by various factors beyond the technology itself such as teaching methods, curriculum design and many others.
- B. Limited access to internet connectivity and technological infrastructure in some schools may hinder the generalizability of the findings.
- C. The study may not be able to capture the experiences of all PWDs due to variations in disability types and severity.

1.8 Chapter Summary

This chapters' focus was chiefly to introduce the topic under study. It delved into the background of the study and identified the statement of the problem which propelled this research area to be of interest to the researcher. This chapter also explores the objectives and the main research questions which should be answered throughout this study. I also outlined the significance of the study highlighting why it is important to study the adoption of software solutions in impacting educational experiences for PWDs. Assumptions, delimitations and limitations that are related to this research study are also outlined in this chapter.

CHAPTER 2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

Imagine a world where education through the use of technology transcends physical limitations and where schools in Zimbabwe like JJA are not an exception but a standard. This chapter will take a deep dive into the exciting global tapestry of software solutions that have been implemented around the world and how they have revolutionized access to quality education for all including PWDs.

2.2 Theoretical Framework - Assistive Technology Approach

The Assistive Technology (AT) framework was developed through a series of several factors throughout the 20th century which were influenced by a growing recognition of the rights and potential of PWDs, advancements in technology as well as the changing attitudes of society towards PWDs. Early pioneers in this domain such as Helen Keller and Franklin D. Roosevelt, were evidence of the capacity that ATs hold in overcoming limitations related to disability as well as to accomplish resounding success in their personal and professional lives (Keller, 1903; Gallagher, 1994). These early examples coupled with advancements in new technologies such as Braille and hearing aids, paved the way for a realization of the potential of ATs in improving quality of life for PWDs. Through the disability rights movement in the 1960s and 1970s, activists advocated for greater access and inclusion for PWDs as a way to demand equal opportunities in education, employment and community life, which consequently played a crucial role in advancing the AT approach. (Scotch, 2001).

The AT approach gained momentum with the emergence of the personal computer and internet in the 1980s and 1990s. These advancements in technology uncovered a new path for communication, learning and access to information for PWDs (Edyburn, 2006). Software applications designed to improve accessibility were a valuable tool in revolutionizing the way PWDs interact with computers and digital content (Burgstahler, 2020). This approach continues to evolve with continued technological innovations that enhance the functional capabilities of PWDs (World Health Organization, 2023). The AT approach aims to promote the full participation of PWDs in all aspects of life by providing them the necessary enabling tools and support to overcome barriers related to disability.

2.2.1 Conceptual Framework-

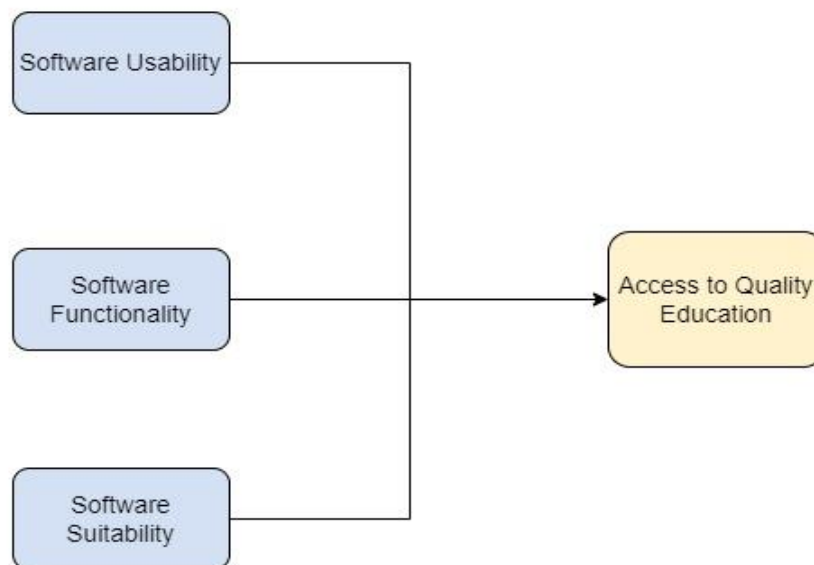


Figure 2.1: Conceptual Framework- Software Impact on Education Model (SIEM)

The conceptual framework developed to guide this research is illustrated in the diagram above known as the Software Impact on Education Model (SIEM). It looks at three main attributes which are namely software usability, functionality and suitability. Software usability refers to how effectively and efficiently users can interact with a software product to achieve desired goals (Nielsen, 1994). It looks at factors such as how easy it is to learn the software, ease of use and satisfaction of the user as well as overall experience. Software functionality looks at the features and capabilities of the software product (Pressman, 2005). It focuses mainly on what the software is able to do and the tasks it can perform. A software is considered functional if it provides the necessary tools to meet the users' requirements. Lastly the third attribute under study is software suitability. This is how well a software product fits in a specific context and requirements for its intended use (ISO.IEC 25010, 2011). It looks at factors such as the tasks performed by the software, the environment in which it operates in and organizational factors. This conceptual framework looks at how these three attributes play a role in enhancing access to quality education through the use of a software product. The framework will be relevant in developing a research approach as well as coming up with survey questions that directly address the research questions.

2.3 Literature Review

This chapter aims to review existing literature on the topic under study and identify gaps which can be filled through this research. I will explore three main areas in this literature review which mainly focus on technologies for PWDs, the use of technology in an educational context and lastly how technology is being used in education specifically for PWDs.

2.4 Assistive Technologies for PWDs

My belief is in anything we do as a people, we should aim to provide solutions that not only change the life of a person but improves the quality of life that people are living. These are the solutions that matter. Technology as a phenomenon is not an exception to this ground of belief. PWDs should not be perceived to be peripheral beneficiaries of technological inventions, but just like anyone else they should be targeted users. Technology innovators and software developers have understood this and as such we get to see the widespread software technologies that have been developed to assist this marginalized group of people. There is a broad spectrum of software tools designed to enhance accessibility, independence and participation in various activities for the disabled community. These tools address various needs depending on the disability type such as visual and hearing impairments, cognitive difficulties and physical disabilities.

There is a wide spectrum of technologies that have been developed with the intention to make life easier for individuals with special needs. Augmentative and Alternative Communication (AAC) devices are tools and systems which are designed to assist individuals who have difficulties with communication impairments to express themselves effectively to others. It leverages features such as speech generation and communication boards. Research has proven that AAC devices have a positive impact on communication skills, social participation and overall quality of life (Schlosser & Wendt, 2008). There are also devices designed for assistive listening for individuals with hearing impairments such as hearing aids, cochlear implants and sound amplifiers. Studies have proven that these devices have improved language development of the users, speech perception and communication in general (Ching & Dillon, 2012). There are also Screen readers and

magnifiers which assist people with visual impairments to be able to have access to digitalized content.

Zhang et al. (2019) researched on the factors that influence adoption of AT among people that live with disabilities. This research was drawn upon the Technology Acceptance Model (TAM) which emphasizes the roles of perceived usefulness, ease of use and facilitating other conditions that affect acceptance of a piece of technology. Another case is of Petrie and Bevan (2009) who explored accessibility, usability and user experience (UX) in the development of interactive electronic systems (eSystems). According to the authors these terms were defined as follows:

Usability: The extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specified context of use (ISO 9241-11, 1998).

Accessibility: The usability of a product, service, environment, or facility by people with the widest range of capabilities (ISO 9241-171, 2008b).

User Experience (UX): A person's perceptions and responses that result from the use or anticipated use of a product, system, or service (ISO DIS 9241-210, 2008c).

The researchers emphasized the cruciality of developing eSystems that are not only usable but also accessible to PWDs and should provide a positive UX to its user and additionally argued the interconnected nature of these elements in the design and development process. This research was grounded on the user-centered design.

2.5 Technology in Education

The use of technology in education is a broad subject which has ignited the interest of many including researchers. Much research has been conducted in a bid to enhance educational experiences as well as outcomes for learners through the use of technological interventions. Some of the solutions that have become prevalent in today's world are Learning management systems (LMS) such as Moodle, Google Classroom, Canvas and Blackboard. These platforms facilitate course management, delivery of learning related content as well as communication between learners and educators. Research has proven that LMSs have highly impacted the engagement of students, their collaboration and most importantly, their academic performance (Al-Busaidi & Al-Shihi, 2018). There are several educational applications that have also gained massive popularity in the past few years, for instance Khan Academy which offers free educational content such as instructional videos and exercises for practice purposes in various disciplines.

An analysis that was conducted by Cheung and Slavin (2013) examined the effects on technologies meant for educational purposes especially student achievement. This study uncovered those technological interventions had a minor but positive impact on student academic achievement especially in subjects like mathematics and science. Another study conducted by Tamim et al. (2011) looked at the impact of mobile learning on students' academics and it was discovered that it had a positive impact especially on students in developing countries.

2.6 Software Solutions for PWDs in Education

Much research has been conducted in order to gain insight on the use of ATs in enabling PWDs to gain better opportunities and experiences in the context of education. Particularly, Şahin et al. (2023) conducted a study to investigate the factors that influence the intention of educators in using ATs in inclusive education settings. The authors were able to identify a lack of acceptance of ATs especially among educators who were trained in special and inclusive education therefore the study aimed to address this gap by looking into the factors which impact their willingness to use these technologies. This research was grounded on an extended version of TAM which incorporated additional factors such as self-efficacy, facilitating conditionals, compatibility, social influence, innovativeness, enjoyment and anxiety. These factors were an addition on top of the traditional aspects that make up the TAM which namely are perceived usefulness and ease of use. Findings from this research revealed that the strongest relationship within the model existed between self-efficacy and perceived ease of use.

Goodell (2017) made emphasis on the idea of personalized learning. This phenomenon anchors on the idea of a “student-centered approach whereby instructions are tailored to suit individual needs, interest and pace” (McCarthy & Anderson, 2017, p. 45). This strategy was developed to improve student engagement by adapting the curriculum and teaching methods to suit each student's unique learning style. Research was carried out in South Africa, looking into the use of adaptive learning software for students with learning difficulties, Motala & Yoo (2018). Similarly, Oliveira et al (2019) in Brazil did comprehensive research assessing how impactful online learning platforms had become to learners with built-in accessibility features for students with special needs. This

study was anchored on the principles of Universal Design for Learning (UDL) which emphasizes how important it is to have flexibility and freedom of choice in learning environments.

As technology evolves, areas such as Artificial Intelligence and Machine Learning are presenting new improved potential solutions that give potential to personalized learning and adaptive support for PWDs. Research done by El-Qawasmeh et al. (2019) explored the use of systems that are powered by Artificial Intelligence for tutoring which can cater various individual needs and different learning styles. To add on, the field of neurotechnology is also advancing on innovative technologies which can bridge the communication gap that exists for PWDs. Research by Allison et al. (2017) explored utilization of Brain-Computer Interfaces (BCIs) which are able to translate brain activity into understandable communication signals. This rich literature provides evidence on the several works that are being carried out globally in order to improve the quality of life of individuals with special needs.

2.7 Research Gap

As I explored existing research, I realized that the global literature on educational inclusive technology is rich but it still presents an incomplete picture. Studies such as Goodell (2017) on computer assisted instructions in the United States of America offered extremely valuable information and frameworks, however a context specific research remains to be explored. This critical gap is meant to address the unique factors that affect an organization like JJA in developing countries like Zimbabwe. This has the potential to ignite innovation and development of software solutions tailored to Zimbabwean needs. This research also builds on the SIEM framework that looks into how certain software attributes have the potential to impact quality education for PWDs.

2.8 Chapter Summary

This chapter explored the theoretical and conceptual frameworks that will guide this study. It also touched on the existing literature on technology in education as well as technologies used to assist PWDs. Lastly this chapter identified a gap which is meant to be filled by this research.

CHAPTER 3 RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the methodology that will be employed in guiding this dissertation's exploration in order to achieve the outlined research objectives as well as to answer the research questions of this study. It will comprise of the appropriate research design, population and sampling, data collection and analysis techniques. After obtaining authorization from the relevant stakeholders, in this case JJA, the researcher will proceed to collect data from the identified population relevant for the study.

3.1 Research Design

Recognizing the multifaceted nature of this phenomenon, guided by the interest of how software solutions are transforming access to quality education for PWDs in Zimbabwe, it becomes clear that this research has to employ a mixed research approach. Such an integrated approach is able to maximally combine the precision of quantitative data with the depth and richness of qualitative insights (Creswell & Plano Clark, 2018). Employing both quantitative and qualitative protocols is most suitable for this particular study as it allows for comprehensive research into the complex interaction between the adoption of software solutions, individual experiences and the context of JJA as an organization.

To define quantitative research, it is a systematic study that gives focus on numerical data and statistical analysis. It aims to quantify relationships, patterns and behaviors using measurable variables (Creswell & Creswell, 2018). The quantitative nature of this study seeks to paint a clear

picture on the prevalence, usage patterns and potential impact of software solutions. Some of the questions that it seeks to answer include:

- What types of software solutions are most commonly adopted by the JJA?
- What is the perceived effectiveness of these solutions in improving educational outcomes?

In order to answer these questions, I intend to collect data from relevant records which I will be provided with at JJA with the hope that it will be sufficient and relevant for me to identify patterns. To explore the lived experiences and the perceptions of the intended beneficiaries of these software solutions, this is where the qualitative aspect of the research is of relevance.

3.2 Population and Sampling

The population for this research encompasses the multifaceted stakeholders that are involved in the area under study. Within the JJA, the population is composed of students with varying disabilities, the educators of these students across different disciplines, administrators and Information Technology (IT) personnel. By selecting a diverse group, this should provide a holistic perspective on the perceived value, impacts and challenges of software solutions from different angles.

Given the mixed approach I have employed for this study, the sampling technique employs a combination of purposive and stratified sampling. Purposive sampling is a non-probabilistic sampling technique used to select participants based on their knowledge, experiences or any other characteristics related to the research questions (Palinkas et al., 2015). This sampling technique will be utilized in selecting participants within the JJA such as educators, administrators and the PWDs themselves as it allows targeting of individuals who can give valuable insights based on

having direct knowledge and experience with the software solutions that have been implemented for PWDs.

Stratified sampling is a probabilistic sampling technique whereby the population under study is divided into subgroups based on relevant characteristics (Aron, A., & Counsilman, J. J., 2013). For this research study, I intend to incorporate stratified sampling mainly on the PWDs by coming up with stratum for students with varying disabilities and educators from different disciplines. It ensures proportional representation from various subgroups within the population.

3.3 Selection of the Case Study

In order to be able to meet the objectives of this study, the selection of JJA as a case study is the most suitable one, given that it is an organization, recognized for its pioneering efforts in empowering PWDs. Which is why it presents a unique and fertile basis to be able to investigate the transformative potential of technology in education for PWDs. Its dedication to inclusivity makes it ideal for it to be a choice as a case study for this research. The organization was founded by Jairos Jiri himself in 1950 who was a visionary leader who advocated for the rights of PWDs, and ever since the organization has been at the forefront in providing educational and vocational training amongst many other facilities, for individuals with diverse needs. Considering the organizations' reputation of inclusivity coupled with a profound understanding of the unique challenges faced by PWDs in accessing education, places JJA as a microcosm of the broader educational landscape for PWDs in Zimbabwe (Jiri, 1980). To add on, JJA has incorporated technology in its education programs which further solidifies its suitability to this case study.

To conclude, the selection of JJA as a case study is not merely a matter of convenience but a deliberate selection that is anchored on its rich history, commitment to empowering PWDs and adoption of technology in its educational programs.

3.4 Data Collection Instruments

For this study, a comprehensive and robust data collection strategy is of critical importance to be able to capture adequate data that is sufficient enough to address the research questions. In order to achieve this, the study will employ a multifaceted approach drawing from both primary and secondary sources of data and utilizing various data collection instruments tailored to address the research questions.

3.3.1 Primary data collection Instruments

At the core of this study lies the collection of primary data directly from stakeholders at JJA.

Structured questionnaires

As an instrument, structured questionnaires will be administered which serve as the bedrock of quantitative data collection. These instruments will be carefully crafted to suit specific measurable data from the appropriate sources. Tailored separately to the targeted population, these instruments will seek to uncover the software solutions that have been adopted, their use and perceived benefits as well as challenges, impact on learning outcomes and barriers to their adoption. Some of the questions will have to employ a Likert scale format in order to facilitate easy quantification and analysis of the responses, enabling identification of patterns and trends within the data (Creswell & Creswell, 2018).

Semi structured Interviews

In order to gain deeper insights into the dynamics of software adoption and its use, semi-structured interviews would be most appropriate and will be conducted to the target population. These interviews will be a platform to gain rich qualitative data, exploring the individual experiences gained by interacting with these technologies. The flexibility of semi structured interviews gives room for probing questions and follow up inquiries which will usher us into a comprehensive understanding of the lived experiences of the JJA stakeholders (Rubin & Rubin, 2012).

3.4 Primary Sources of data

For the study, PWDS enrolled at JJA in educational programs, the educators who instruct them and the administrators who oversee the educational programs will be the main actors who will be the primary data sources. These stakeholders are most suitable as they directly interact with the technologies relevant to this investigation, therefore making their insights key in understanding the impact and effectiveness of these tools in the context of this research.

3. 6 Data Collection Procedures

Data collection will take place within a period of 2-4 weeks. Questionnaires will be distributed both in person and electronically. I intend to do the interviews in person with consent of the rightful participants. I will ensure anonymity and confidentiality of the data which will be collected from this procedure.

3.7 Data Analysis

Data analysis is the systematic process whereby the researcher inspects, cleanses, transforms and models data in order to discover meaningful patterns, relationships and insights from the data which has been collected. For quantitative data, I believe statistical analysis will be used to analyze questionnaire responses, providing the researcher with insight on software usage and its perceived effectiveness. For qualitative data, thematic analysis will be employed to uncover deeper insights from interview narrative, revealing themes around the software used, their challenges and impact. Integration of quantitative and qualitative data types ensures a deeper understanding while the triangulation of multiple data sources will enhance validity and reliability of the research findings.

TABLE 1: Research Methods Outline

Research Questions	Research Method	Data Collection Instruments	Sample Population	Data Analysis Method
1. What types of software solutions has JJA adopted to enhance access to quality education for persons with disabilities (PWDs)?	Qualitative	Interviews (semi-structured)	JJA staff (educators, administrators)	Thematic analysis,
2. How effective are these software solutions in improving educational outcomes for PWDs at JJA, as measured by academic performance, attendance, and engagement?	Quantitative	Pre/post-intervention academic assessments (if available))	Relevant student records (if ethical approval is granted)	Statistical analysis
3. How do PWDs at JJA perceive the accessibility and usability of the software solutions implemented, and what are their experiences using these tools in their	Qualitative	Interviews with PWDs	a) JJA Students and staff	a) Thematic analysis
	Quantitative	Semi-Structured questionnaires	b) JJA Students and staff	Statistical analysis

learning journey?				
4. What challenges and barriers has JJA encountered in the adoption and implementation of software solutions for PWDs, and how have these challenges been addressed?	Qualitative	Semi-structured Interviews	Educators and administrators at JJA	Thematic analysis

3.8 Ethical Considerations

In a bid to pursue knowledge through research, it inherently carries a responsibility to uphold the highest ethical standards especially when involving vulnerable populations such as PWDs. This research study, adhering to the Africa University Research Ethics Committee (AUREC) (Africa University, 2014), places utmost priority in safeguarding the rights, dignity and wellbeing of all participants.

Informed consent is meant to ensure that all participants in this research understand the nature, purpose, and potential risks of the study before voluntarily agreeing to participate. Therefore, the researcher was able to obtain informed consent from JJA to use its organization as a case study in this research, as well as get approval to collect data. All participants informed will be provided with clear comprehensive information about the study's objectives, data collection procedures, potential risks and benefits and their right to withdraw at any time.

Protecting participants' privacy and confidentiality is of utmost importance in this research. All the data collected through the various instruments will be anonymous and stored securely ensuring it adheres to data collection regulations. Throughout the research process, the autonomy and dignity of participants involved will be respected, ensuring their right to self determination, valuing their perspectives as well as experiences and making sure their voices are represented in the findings of this study. The researcher aims to come up with an ethically sound study by following the AUREC guidelines for research.

3.9 Chapter Summary

This chapter outlines the research methodology that will be used in this study. It detailed the mixed methods approach by collecting quantitative and qualitative data through questionnaires and interviews with the rightful participants. It also touched on the population under study and the mixed sampling techniques employed namely purposive sampling and stratified sampling. It further explained the data collection procedures as well as the ethical guidelines that are followed in this research.

CHAPTER 4 DATA PRESENTATION, ANALYSIS, AND INTERPRETATION

4.1 Introduction

This chapter presents the data gathered, statistical and qualitative analysis done and interpretation of results of the study on the adoption of software solutions in facilitating access to quality education for persons with disabilities (PWDs) at Jairos Jiri Association (JJA). The data comes from structured questionnaires and semi-structured interviews with stakeholders who are directly part and parcel of the JJA like students, educators, and administrators. The research design is a mixed method approach that both utilizes statistical and non-statistical methodologies. Through the provision of a detailed analysis of qualitative and quantitative answers, this chapter seeks to analyze the effectiveness, challenges, and overall impact of the software solutions in the education system of PWDs.

4.1.1 Response Rate

The research involved the distribution of fixed questionnaires to a targeted sample of 100 respondents. The sample consisted of a heterogeneous group of stakeholders, educators, administrators, and students. Due to a variety of factors, including logistical challenges, time limitations, and availability of participants, there were only 55 participated in answering the questionnaires and semi-structured interviews. This represents a response rate of 55%. While a higher rate of response would have been ideal, this level of response still provides a valuable dataset to examine and allows for important conclusions to be drawn regarding the research

questions. The respondent breakdown by the different stakeholder groups for the quantitative phase is as follows: 11 educators, 5 administrators and 34 learners.

The qualitative aspect of the study involved the distribution of semi-structured interviews to a smaller, purposefully sampled number of participants. These participants were key informants who were positioned to provide rich, in-depth information on the research problem. The sample for the qualitative aspect was planned to be 2 teachers, 2 students, and 1 administrator, and 5 of the planned participants were capable of finishing the interview process. The smaller sample size for the qualitative phase is consistent with the character of qualitative research, wherein depth of understanding is given preference over representational scope.

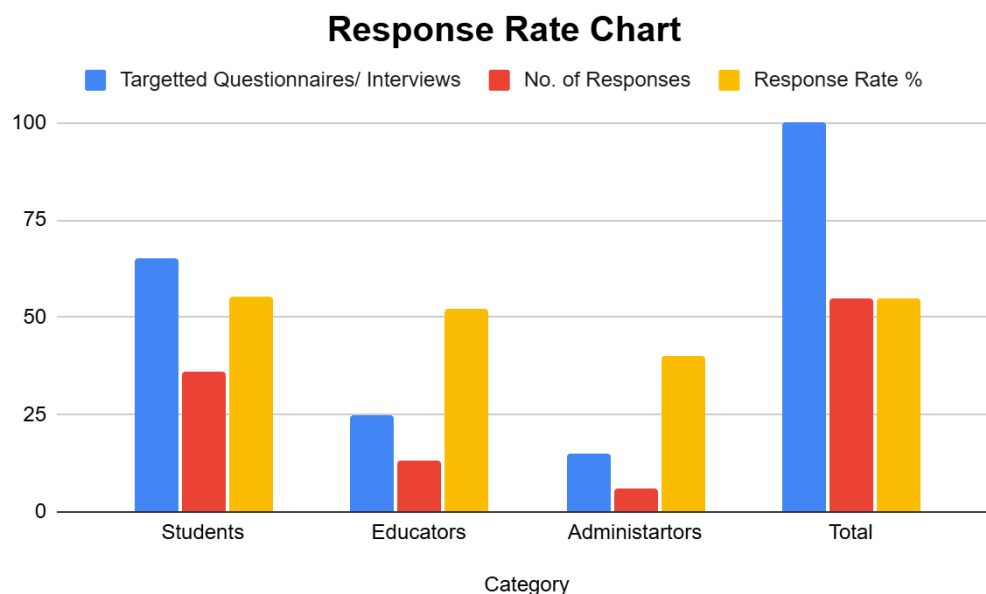


Figure 4.1: Response Rate

4.2 Data Presentation and Analysis of Quantitative Aspect

4.2. 1 Participants at PWD

The investigation into technology's function within special needs education is significantly shaped by the distribution of participant roles. A substantial majority of respondents identify as students (68%), with teachers constituting a smaller portion (22%), and administrators representing the smallest segment (10%). This demographic breakdown carries notable implications for the interpretation of the data. Given that student perspectives dominate, the findings inherently provide a robust view of technology's impact from the learners' standpoint. This is invaluable, as students are the primary beneficiaries by technology in educational settings. However, it is equally important to acknowledge that the viewpoints of teachers and administrators, who play crucial roles in the implementation, integration, and management of technology, are less prominent.

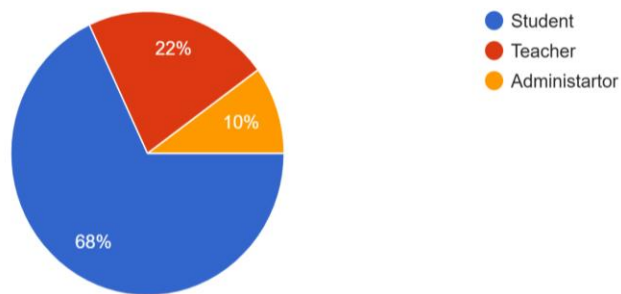


Figure 4.2: Quantitative Research Participants

4.2.2 Type of Disabilities

A fundamental aspect of this inquiry lies in understanding the range of special needs being addressed within technology-enhanced educational environments. The data reveals a diverse spectrum, with physical disabilities being the most frequently reported (52%). This high prevalence may suggest a targeted focus on technological solutions designed to support individuals with mobility, motor skill, or other physical challenges. Sensory impairments also command significant attention, with hearing impairments reported by 30% of participants and visual impairments by 28%. This underscores the critical role of accessible technology in facilitating communication and learning for individuals with sensory processing differences. Learning disabilities and autism spectrum disorder (ASD) are each represented by 22% of participants, indicating a comparable level of focus or technological intervention. Finally, speech and language impairments are reported by 22% of participants. This distribution highlights the heterogeneous nature of special needs and emphasizes the necessity for diverse technological approaches to cater to this population effectively.

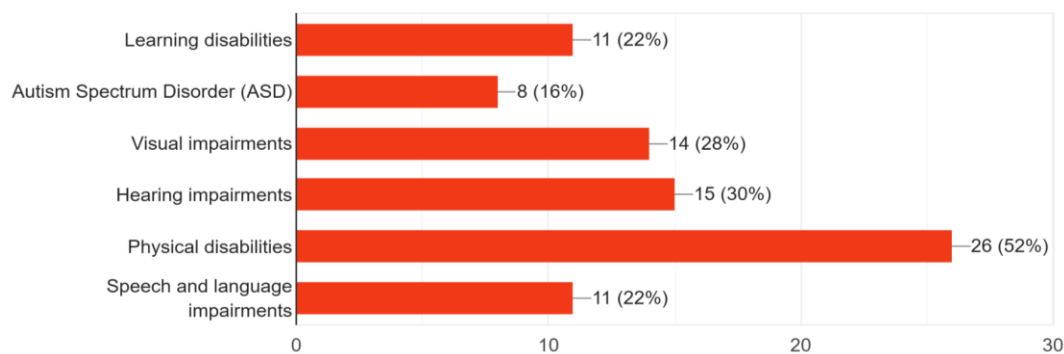


Figure 4.3: Types of Disabilities

4.2.3 Technological Tools

The analysis of technology and software usage reveals a clear preference for certain tools over others. Educational apps stand out as the dominant technology, with 76% of respondents reporting their use. This overwhelming reliance on educational apps likely reflects their perceived accessibility, user-friendliness, and often tailored design for specific learning objectives. The interactive nature of many apps, coupled with their availability on various devices, may contribute to their popularity. Video-based platforms, while holding a degree of relevance, are utilized by a considerably smaller proportion (24%). This differential in usage might stem from variations in pedagogical approaches, the perceived suitability of video content for diverse learning needs, or potential accessibility limitations. Assistive technology devices, audio-based platforms, and Microsoft Office packages all register relatively low usage rates (16%, 14%, and 14%, respectively). This constrained adoption may point to a range of factors, including limitations in access or availability, specialized training requirements, cost considerations, or perhaps a prevailing emphasis on more readily accessible and user-friendly software solutions. It compels us to consider whether a more diversified technological toolkit, encompassing a wider array of assistive technologies and productivity software, could better serve the heterogeneous needs of this student population.

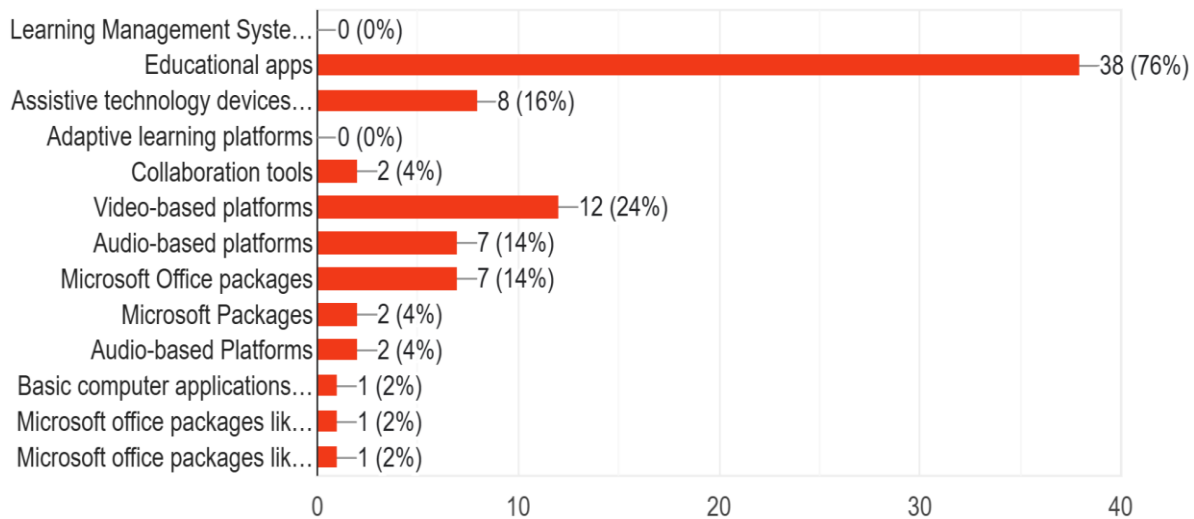


Figure 4.4: Software Solutions Adopted

4.2.4 Perceptions of satisfaction with the technologies adopted

Perceptions of technology satisfaction reveal a nuanced interplay of positive affirmation and critical concern, particularly in the realm of usability. Participants generally express satisfaction with the functionality, suitability, and learning impact of the technologies they employ. The data consistently shows "Satisfied" as the modal response across these three categories, with "Neutral" responses also contributing substantially. This suggests that when technologies function as intended, align with specific needs, and contribute positively to learning outcomes, they are largely viewed favorably. This affirmation of technology's core purpose is encouraging, indicating that it is, in many cases, fulfilling its intended role. However, the issue of usability introduces a significant caveat. While satisfaction and neutrality are present, a notable proportion of respondents articulate dissatisfaction. This finding carries considerable weight, as usability – encompassing ease of use and intuitiveness forms a cornerstone of effective technology

integration, especially for individuals with special needs. If technology is perceived as cumbersome, difficult to navigate, or unintuitive, its potential benefits may be undermined, leading to frustration, disengagement, and reduced effectiveness. This discrepancy between satisfaction with core functions and dissatisfaction with usability highlights a critical area for improvement in technology design and implementation.

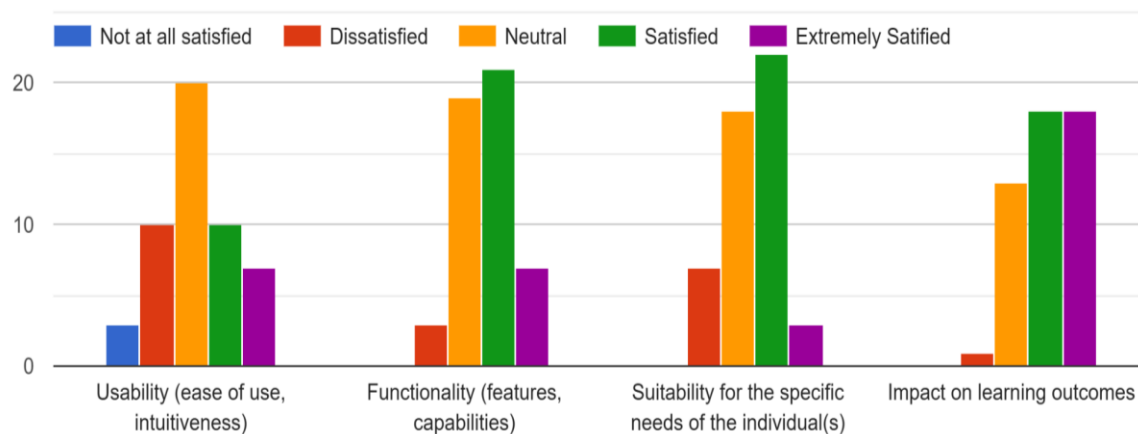


Figure 4.5: Perceptions

4.2.5 Impact of the software solutions on educational outcomes

Despite the challenges identified, the perceived impact of technology on access to quality education for individuals with special needs is overwhelmingly positive. A substantial 52% of respondents report that technology has "significantly improved" access, with an additional 40% indicating "somewhat improved" access. In stark contrast, only 8% perceive "no impact," and crucially, no respondents report a negative impact. This robust endorsement of technology's positive influence underscores its transformative potential in broadening educational opportunities, creating more inclusive learning environments, and facilitating access to information and resources for individuals with special needs. It suggests that technology is viewed

as a powerful tool for overcoming barriers and promoting equity in education. Nevertheless, this overwhelmingly positive assessment must be tempered by the recognition of persistent challenges. The data highlights concern regarding a lack of captions, outdated content, accessibility barriers, navigational difficulties, and limitations in catering to specific disabilities. While these challenges are based on a smaller sample size, their qualitative nature carries significant weight, pointing to tangible obstacles that impede optimal technology utilization and hinder the full realization of technology's potential. These challenges serve as a reminder that technology integration is not a panacea and requires ongoing attention to ensure that it is truly inclusive and effective.

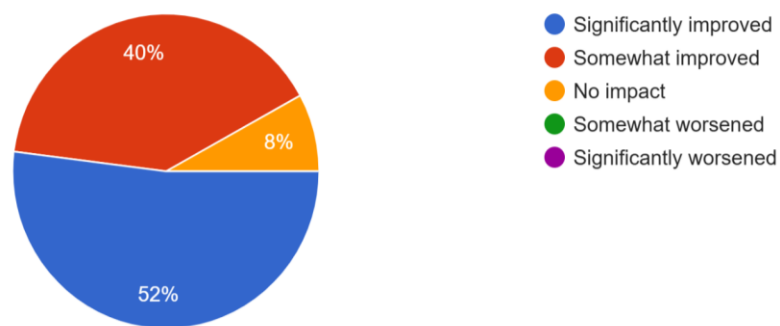


Figure 4.6: Impact of Software Solutions

4.3 Key Relationships

4.3.1 Relationship between Participant Role and Technology Use

The distribution of participant roles, with a strong emphasis on student responses (68%), suggests a salient relationship between the student role and the prevalent use of educational apps. This inference is grounded in the understanding that students, as the primary

consumers of educational content and the direct recipients of instruction, are likely to be the most frequent users of applications designed for learning activities. Educational apps, often characterized by their interactive nature, accessibility on personal devices, and focus on specific learning objectives, align well with student-centered pedagogy. Conversely, teachers, while also utilizing educational apps, may demonstrate a more diversified pattern of technology use. This could include the incorporation of video-based platforms for instructional delivery, demonstration, and content presentation, as well as the selective utilization of assistive technology devices to address the individualized needs of students with specific disabilities. Administrators, on the other hand, are likely to have the least direct usage of specific educational apps. Their involvement may be more focused on the overarching selection, procurement, management, and systemic integration of assistive technology devices, platforms, and educational software within the institution. This differential in technology usage across participant roles underscores the varying functions and needs within the educational ecosystem, with students heavily reliant on apps for learning, teachers integrating a range of tools for instruction and support, and administrators focusing on the broader technological infrastructure.

4.3.2 Relationship between Special Needs Diversity and Technology Application

The data's representation of a diverse range of special needs strongly implies a correlative relationship between the heterogeneity of these needs and the types of technologies employed. Different special needs necessitate distinct and tailored technological solutions

to address the unique challenges and facilitate effective learning. For instance, assistive technology devices, characterized by their specialized design and functionality, are likely to be strongly associated with physical and sensory impairments. These devices may include mobility aids, adapted keyboards, screen readers, and other tools designed to enhance independence and access for individuals with motor, visual, or auditory challenges. Video and audio-based platforms may demonstrate higher relevance and utility for students with sensory processing challenges, auditory processing disorders, or visual processing difficulties. These platforms can offer alternative modes of information presentation, allowing for multimodal learning experiences and catering to individual sensory preferences. Educational apps, while potentially applicable across all special needs categories due to their versatility and adaptability, may exhibit varying levels of effectiveness and require specific tailoring or customization to meet the individualized needs of students with different disabilities. This necessitates a nuanced approach to technology selection and implementation, ensuring that the chosen tools are appropriate, accessible, and effective in addressing the specific needs of each learner.

4.3.4 Relationship between Educational Software Reliance and Usability

The data's strong emphasis on the reliance on educational apps, with 76% of participants reporting their use, suggests a potential correlative relationship with their perceived usability. This inference is based on the understanding that usability, encompassing ease of use, intuitiveness, and accessibility, plays a crucial role in technology adoption and

acceptance, particularly within special needs education. Educational apps are often designed with user-friendly interfaces, intuitive navigation, and interactive elements, which may contribute to their widespread adoption and perceived effectiveness. The emphasis on visual learning, gamification and simplified interactions within many educational apps can enhance engagement and facilitate learning for diverse learners. This high usability could be a key factor driving their prevalence compared to other technologies, such as assistive technology devices, which may be perceived as more complex or require specialized training. Therefore, the observed reliance on educational apps might be, in part, a reflection of their user-centered design and accessibility, making them a preferred tool for both students and educators.

4.3.5 Relationship between Usability Challenges and Technology Effectiveness

The data reveals a critical relationship between usability challenges and the perceived effectiveness of technology, regardless of its inherent functionality. While participants generally express satisfaction with the functionality, suitability, and learning impact of technology, a significant proportion also report dissatisfaction with usability. This discrepancy highlights the crucial role of ease of use and intuitiveness in determining the overall effectiveness of technology integration. If technology is perceived as cumbersome, difficult to use, navigate, or understand, it can create significant barriers for both students and educators. These barriers can manifest as frustration, disengagement, reduced motivation, and ultimately, a diminished capacity to achieve learning outcomes. Even if

the technology possesses robust features and capabilities, its potential benefits may be undermined if users struggle to interact with it effectively. This underscores the importance of prioritizing user-centered design, accessibility, and intuitive interfaces in technology selection and implementation, particularly within special needs education, where usability is paramount for maximizing the technology's empowering potential.

4.3.6 Relationship between Positive Impact on Access and Technology Adoption

The data's overwhelmingly positive perception of technology's impact on access to quality education for individuals with special needs (92%) is likely intrinsically linked to the adoption and use of technology, particularly educational apps. The strong belief that technology enhances and improves access to educational opportunities may serve as a significant driver for the increased adoption and integration of technology in special needs settings. This perception is grounded in the understanding that technology has the potential to overcome traditional barriers to learning, providing access to information, resources, and learning experiences that might otherwise be unavailable. The effectiveness of this positive impact, however, is contingent upon addressing the persistent usability and accessibility challenges identified in the data. If technology remains difficult to use, inaccessible, or poorly implemented, its potential to enhance access and create truly inclusive learning environments may be compromised. Therefore, the positive perception of technology's impact on access must be coupled with a concerted effort to optimize its usability, accessibility, and overall effectiveness.

4.3.7 Relationship between Accessibility Challenges and Specific Technology Types

The data suggests that different technology types may present distinct and specific accessibility challenges. This highlights the need for a nuanced and tailored approach to technology selection and implementation, recognizing that accessibility is not a uniform issue but rather a multifaceted concern that varies depending on the technology in question. For instance, the reported lack of captions is specifically and directly related to video and audio-based platforms. This deficiency creates a significant barrier for individuals with hearing impairments, limiting their access to auditory information and potentially hindering their learning. Navigation difficulties, on the other hand, might be more prominently associated with complex software applications or assistive technology devices, which often require specialized knowledge or training to operate effectively. These navigational challenges can create obstacles for individuals with cognitive impairments, motor skill difficulties, or visual impairments. Outdated content is a challenge primarily associated with educational apps and online platforms, where the currency and relevance of information are critical for effective learning. This highlights the need for ongoing content updates and maintenance to ensure that learning materials are accurate, engaging, and aligned with current educational standards. Therefore, the identified accessibility challenges are not uniformly distributed across all technology types, necessitating a targeted and context-specific approach to addressing these issues.

4.4 Conclusion on Quantitative Data

In synthesizing these findings, it becomes clear that technology holds considerable promise in special needs education. Educational apps are currently the mainstay, but a more diversified and strategically implemented technological ecosystem could further enhance learning experiences. While functionality, suitability, and learning impact are generally viewed positively, usability demands urgent attention. Addressing the reported challenges, particularly those related to accessibility and content quality, is paramount to ensuring that technology truly empowers and facilitates equitable access to education for all learners.

4.5 Data Presentation and Analysis of Qualitative Aspect

4.5.1 Qualitative Data Presentation

The data is derived from responses to five semi-structured interviews. These interviews were designed to investigate the use of technology within Zimbabwe's primary and high school education systems, with a particular focus on accessibility and practicality. The respondents, selected to provide diverse perspectives, include two students, two teachers and one school administrator overseeing an inclusive education program at a government school. This variety of viewpoints offers a rich and nuanced understanding of the multifaceted challenges and opportunities associated with technology integration in this specific educational context.

4.6 Qualitative Data Analysis and Interpretation

The interview responses, when considered collectively, reveal several interconnected and critical themes that significantly shape the landscape of technology use in special needs education within Zimbabwe. These themes highlight both the potential of technology to enhance learning and the systemic barriers that hinder its effective and equitable implementation.

4.6.1 Accessibility and Affordability as Foundational Barriers

A prominent and recurring theme throughout the interview responses is the identification of accessibility and affordability as foundational barriers to effective technology integration. Respondents across all stakeholder groups – students, teachers, and administrators consistently underscore the significant challenges posed by financial constraints. Students articulate the prohibitive cost of internet data, which severely limits their access to online learning resources and digital tools. This financial burden creates a stark digital divide, disproportionately affecting students from low-income families and hindering their ability to participate fully in technology-enhanced learning environments. Teachers echo these concerns, expressing difficulties with the affordability of smartphones and other personal devices, noting that many students lack the necessary equipment to engage with digital learning materials. This disparity in access creates inequitable learning environments and limits the potential of technology to provide effective support for all students. The scarcity and high cost of specialized assistive technology devices, such as advanced text-to-speech software, further exacerbate the challenges faced by students with disabilities. This lack of access to appropriate assistive technologies significantly impedes

their ability to access and engage with educational content in a meaningful and effective way. The administrator's perspective reinforces the systemic nature of this issue, highlighting the lack of funding for special needs technology at the school level. This funding deficit limits the school's capacity to invest in necessary resources and infrastructure, hindering the implementation of inclusive education practices and creating a significant obstacle to progress. In essence, affordability and accessibility are not merely logistical challenges, but fundamental equity issues that profoundly shape the educational experiences of students with special needs in Zimbabwe. The financial barriers create a digital divide that mirrors and potentially amplifies existing socioeconomic inequalities, requiring systemic solutions, including government intervention, targeted funding, and innovative approaches to providing low-cost or free access to technology and data.

4.6.2 Usability, Training, and Effective Integration

The ease of use of technology and the availability of adequate training for both students and teachers are identified as crucial factors determining the effectiveness of technology integration. Students express varying degrees of comfort and proficiency with different technologies. While some technologies are perceived as user-friendly and readily accessible, others, like Google Docs and PDF readers, require more training and support to be utilized effectively. This highlights the importance of user-centered design and the need for technologies that are intuitive and easy to navigate, especially for students with diverse learning needs and varying levels of technological literacy. Teachers emphasize the lack of training as a significant obstacle to effective technology integration. They report a pressing need for professional development opportunities that equip them with the skills and knowledge to use digital tools and assistive technologies effectively in their teaching

practices. This lack of training limits their ability to leverage technology to support diverse learners, differentiate instruction, and create inclusive classroom environments. The administrator's perspective corroborates the need for teacher training, recognizing it as a key challenge in implementing inclusive education programs and ensuring that all students can benefit from technology-enhanced learning. This lack of training not only affects teachers' ability to use technology effectively but also their capacity to adapt materials, differentiate instruction, and provide appropriate support to students with special needs. Consequently, usability and training are intertwined factors that significantly influence the successful integration of technology in education. Technology that is perceived as complex or difficult to use will likely be underutilized or implemented ineffectively. Similarly, even user-friendly technologies will not reach their full potential without adequate training and support for both students and teachers. Effective technology integration, therefore, requires a holistic approach that considers both the technological tools themselves and the human capacity to use them effectively.

4.6.3 Adaptability to Learning Styles and Individualized Needs

The responses consistently highlight the importance of adapting technology and learning materials to suit the diverse learning styles and individualized needs of students with special needs. Students with hearing impairments express a preference for visual and written content, emphasizing the importance of visual aids, written summaries, and captioned videos to enhance their learning experience. This underscores the need for multimodal learning approaches that cater to the visual processing strengths of these learners and provide them with accessible alternatives to auditory instruction. Students with visual impairments rely heavily on audio-based learning, highlighting the importance

of text-to-speech apps, audiobooks, and voice recordings as essential tools for accessing and engaging with learning content. This emphasizes the need for accessible formats that allow these students to access information and engage with learning materials through auditory channels, accommodating their specific learning preferences and needs. Teachers and the administrator acknowledge the need to adapt materials and differentiate instruction to accommodate the diverse learning needs of students with disabilities. However, they also express limitations in their capacity to do so, often citing a lack of resources, training, and support. The principle of individualized education is paramount in special needs education, and technology can play a crucial role in facilitating this. However, effective technology integration requires a deep understanding of diverse learning styles and needs, coupled with the capacity to adapt and personalize learning experiences. This necessitates flexible technologies, accessible formats, and a commitment to differentiated instruction to ensure that all learners can access and benefit from technology-enhanced learning.

4.6.4 Infrastructure Limitations and Digital Divide

Inadequate infrastructure, including limited access to electricity and internet connectivity, emerges as a major impediment to technology integration in education. Students and teachers highlight the challenges posed by unreliable electricity supply, which severely limits access to technology and hinders the use of digital devices. This is particularly concerning for students in rural areas or those from disadvantaged backgrounds, who may lack consistent access to power, creating significant barriers to their participation in technology-based learning. The high cost of internet data is consistently cited as a barrier to online learning and access to digital resources. This data cost creates a digital divide, disproportionately affecting students from low-income families and limiting their ability

to participate fully in technology-enhanced learning experiences. The administrator's perspective reinforces the systemic nature of these infrastructure limitations, acknowledging the challenges of implementing technology-based programs in resource-constrained environments. These infrastructure limitations represent a significant challenge to equitable technology integration. Unequal access to electricity and internet connectivity creates a digital divide that mirrors and exacerbates existing socioeconomic disparities. Addressing these infrastructure challenges is crucial for ensuring that all students, regardless of their background or location, can benefit from the potential of technology to enhance their learning and access educational opportunities.

4.6.5 The Complex Role of Mobile Technology

Mobile technology, particularly WhatsApp, plays a complex and multifaceted role in facilitating communication, sharing learning materials, and delivering instruction. Students and teachers acknowledge the user-friendliness and accessibility of WhatsApp, making it a popular tool for communication and information sharing. However, they also recognize its limitations as a comprehensive learning platform, noting that it is not a substitute for robust educational software or learning management systems. Concerns are raised about the accessibility of WhatsApp for students without smartphones, highlighting the potential for this technology to exacerbate inequalities and create disparities in access to information and learning opportunities. Teachers use WhatsApp for sharing notes, facilitating discussions, and providing support to students, but they also express a preference for live teaching and more robust learning management systems that offer a wider range of

functionalities and tools. Mobile technology, therefore, holds both promise and challenges in special needs education. While it can facilitate communication and access to information, it is not a panacea. Its effectiveness depends on equitable access to devices and data, as well as the availability of appropriate pedagogical strategies and support to ensure that it is used effectively and inclusively.

4.6.6 Critical Need for Assistive Technology

The interviews underscore the critical need for specific assistive technologies to support students with disabilities and promote their inclusion in the learning process. Students with visual impairments highlight the importance of text-to-speech apps, audiobooks, and Braille materials for accessing and engaging with learning content. The limited availability of these resources hinders their ability to participate fully in the curriculum and access information in a meaningful way. Students with hearing impairments emphasize the need for captioning software for local languages, which would significantly improve their access to video and audio content and make learning materials more accessible and inclusive. The lack of assistive technology is identified as a significant barrier by teachers and the administrator, who recognize its crucial role in supporting students with diverse needs and ensuring their full participation in the educational environment. Assistive technology is not simply a supplementary tool but a fundamental requirement for ensuring equitable access to education for students with disabilities. The lack of assistive technology creates significant barriers to learning and inclusion, limiting the potential of these students to reach their full potential and participate fully in the educational process.

4.6.7 The Centrality of Teacher Training and Support

Teachers consistently express a strong need for training and ongoing support in using digital tools and assistive technologies effectively in their teaching practices. They highlight the importance of professional development opportunities that equip them with the skills and knowledge to adapt materials, differentiate instruction, and provide appropriate support to students with diverse needs. The lack of training is identified as a major obstacle to effective technology integration, limiting teachers' ability to leverage technology to its full potential and create inclusive learning environments. The administrator corroborates the need for teacher training, recognizing its crucial role in implementing inclusive education programs and ensuring that all students can benefit from technology-enhanced learning. Teacher training is not merely a logistical concern but a central pillar of successful technology integration. Teachers need to be adequately prepared and supported to use technology effectively, adapt materials, and provide individualized instruction to students with diverse needs. Investing in teacher training is therefore an investment in equitable and effective education for all learners.

4.6.8 The Imperative for Government Intervention and Systemic Change

There is a strong consensus across all stakeholder groups regarding the need for government intervention to address the systemic challenges of technology integration in special needs education. Students, teachers, and the administrator call for government funding for assistive technology, teacher training, and the development of accessible e-learning platforms to create a more supportive and inclusive educational environment. The

lack of resources and infrastructure is identified as a major obstacle to progress, highlighting the need for government support to create a more equitable and inclusive educational system for all learners. Addressing the challenges of technology integration in special needs education requires systemic change and government leadership. Piecemeal solutions are insufficient to overcome the pervasive barriers of inequality, lack of resources, and inadequate infrastructure. A coordinated and comprehensive approach, driven by government policy and investment, is essential to create a truly inclusive and accessible educational system for all learners.

4.7 Conclusion on Qualitative Data

The qualitative data derived from the semi-structured interviews offers a rich and nuanced understanding of the complexities of technology use in special needs education within Zimbabwe. The analysis reveals a landscape characterized by both challenges and opportunities. While technology holds significant potential to enhance learning and promote inclusion, its effective integration is contingent upon addressing systemic barriers related to accessibility, affordability, usability, training, and infrastructure. The findings underscore the urgent need for a multi-faceted approach that prioritizes equity, accessibility, and user-centered design, coupled with robust teacher training and government intervention. Ultimately, the goal is to create a more inclusive and equitable educational system where technology empowers all learners, regardless of their abilities or backgrounds.

4.8 Triangulation Quantitative and Qualitative

The triangulation of qualitative and quantitative data offers a more robust understanding of technology's role in special needs education. Quantitatively, educational apps are heavily used, but qualitatively, there's an emphasis on mobile technology alongside a gap in assistive technology availability. Both data types highlight the importance of mobile technology, but the qualitative data underscores the limitations of relying solely on apps and the need for assistive tech. Usability is a key concern across both datasets, with the qualitative data reinforcing the quantitative findings by highlighting challenges related to ease of use and the need for training. Both data types point to the need for more intuitive technology and better training. While the quantitative data shows a positive perception of technology's impact on access, the qualitative data adds nuance, suggesting this impact is contingent on addressing affordability, accessibility, and infrastructure limitations. Both acknowledge technology's potential, but the qualitative data provides crucial context. The quantitative data identifies challenges like a lack of captions and accessibility issues, while the qualitative data expands on these, emphasizing affordability, infrastructure such as electricity, and internet, and the need for accessible formats. The qualitative data provides a richer understanding of systemic barriers. Both datasets acknowledge stakeholder perspectives, with the qualitative data highlighting the need for teacher training, government intervention, and support structures.

The triangulation reveals that while technology has the potential to enhance inclusion, its effectiveness is contingent on addressing affordability, accessibility, and usability. User-centered design, accessible formats, and assistive technology are crucial. Systemic factors like poverty and infrastructure pose significant barriers. Government intervention and teacher training are vital for maximizing technology's benefits and creating a more inclusive educational system.

4.9 Key Findings

- **Mobile Technology Dominance and Assistive Technology Gap** - Mobile technology, particularly educational apps, is prevalent, but there's a significant gap in the availability and affordability of assistive technology, highlighting a disparity in access and resources.
- **Usability as a Critical Barrier** - Poor usability is a major concern, hindering the effective integration of technology, even when it has the potential to be beneficial. This emphasizes the need for user-centered design and adequate training.
- **Technology's Potential vs. Implementation Challenges** - Technology is perceived to have a positive impact on access to education, but this potential is often unrealized due to challenges related to affordability, accessibility, infrastructure limitations, and inadequate training.
- **Systemic Factors as Impediments** - Systemic factors, including poverty, inadequate infrastructure such as lack of electricity and internet access, and limited resources, pose significant barriers to equitable technology integration.
- **The Need for Holistic Solutions** - Effective technology integration requires a holistic approach that addresses not only the technology itself but also the broader context, including user-centered design, accessibility, affordability, teacher training, and government intervention.

4.9.1 Challenges, Risks and Opportunities

Challenges

Challenges in integrating technology for special needs education include the potential for a digital divide, where the high cost of technology and internet access exacerbates existing inequalities, limiting access for many students with disabilities. Usability and accessibility barriers also pose a significant challenge, as technology is often not designed with the diverse needs of these students in mind. Inadequate infrastructure, such as limited access to reliable electricity and internet connectivity, further hinders technology adoption and implementation. Moreover, the lack of sufficient teacher training and support impedes effective technology integration into teaching practices. Finally, the limited availability and affordability of assistive technology devices and software restricts access to specialized tools that could support students with specific disabilities.

Risks

The risks associated with technology in special needs education involve the potential for increased marginalization if technology is not implemented equitably and accessibly, which could widen the gap between students. There's also the risk of ineffective learning outcomes if usability and accessibility challenges are not addressed, as technology could hinder learning if it is difficult to use. Implementation may also be unsustainable if the context of limited resources and infrastructure is not considered. Additionally, there's a risk of over-reliance on technology, which should be used as a tool to support, not replace, effective teaching and human interaction. Finally, the use of technology brings up concerns about data privacy and security, requiring careful attention to ethical considerations.

Opportunities

However, technology also presents significant opportunities in special needs education. It can enhance access to education by providing alternative learning formats and breaking down barriers. Technology facilitates personalized and differentiated learning experiences, catering to individual needs and learning styles through adaptive software and assistive technology. It can also promote inclusion by removing learning barriers and creating more accessible learning environments. Furthermore, technology improves communication and collaboration between students, teachers, parents, and specialists. Lastly, technology aids in developing essential skills like digital literacy, problem-solving, and critical thinking.

4.9.2 Chapter Summary

This chapter has provided an in-depth presentation, analysis, and interpretation of data gathered from structured questionnaires and semi-structured interviews. The findings reveal that while technology has played a pivotal role in enhancing educational access for PWDs, significant gaps remain in terms of suitability, accessibility, and institutional support. The study underscores the urgent need for increased investment in assistive technologies, comprehensive teacher training, and policy interventions to ensure the effective integration of digital tools in special needs education. These findings set the stage for the final chapter, which will provide conclusions and recommendations based on the study's insights.

Chapter 5 Summary, Conclusions, and Recommendations

5.1 Introduction

The chapter summarizes the research results, drawing conclusions from data analysis and providing recommendations to software developers, instructors, and stakeholders in special needs education in Zimbabwe. The general purpose of this research was to evaluate the scope and impact of software solutions adopted by the Jairos Jiri Association (JJA) to enhance access to quality education for Persons with Disabilities (PWDs). The research question and goals focused on comprehending the nature of the software used, their impact on learning outcomes, PWDs' attitudes towards such solutions, and the challenges faced in implementing and adopting them.

The representation of students in the demographic statistics in the study was strong at 68%, with students forming the majority of the respondents. This high student representation highlights the

importance of taking note of the opinion of the students while measuring software adoption and its impact on education. Students are the primary users of such technologies, and their experience is an asset in determining the effectiveness, usability, and accessibility of the solution. The 22% teacher presence also reflects their influence in facilitating technology integration, and the 10% administrator presence also reflects their influence on decision-making and implementation processes of educational technology.

5.2 Discussion

The study showed that JJA has adopted various software solutions to support the education of PWDs, with an emphasis on mobile technology, learning apps, and assistive software. This conforms to global digital learning trends where mobile and adaptive learning tools are becoming increasingly important. However, though quantitative data within the research highlighted a widespread interest in and positive orientation towards educational technology, qualitative data pointed to more nuances where effective deployment and integration into the learning system of JJA occurred.

The first observation made is that yes, educational apps and software-driven solutions are there, but there is a sporadic application within routine teaching-learning processes. The conversation highlights the importance of scrutinizing critically the implementation of these technologies and if they are part of the greater curriculum and learning objectives. Participants among the students frequently mentioned usability problems, for example, difficulties in navigating software interfaces, low accessibility features, and inconsistency in the performance of software. These

problems highlight the need for designers of software to create more user-friendly and accessible interfaces that cater to the specific needs of PWDs.

Furthermore, the study examined the impact of software solutions on educational outcomes such as academic performance, engagement, and skill development. While the quantitative results showed that most of the respondents believed that technology had a positive influence on their studies, qualitative data showed a mixed image. Some of the students raised issues of inflexibility in software, technical support, and inadequate training of teachers on effective use of the tools. This therefore means that while software has the ability to augment learning, it can only do this at maximum effect if issues of usability are addressed and sufficient support is given to both the instructors and the learners.

The forum further delved into challenges that face JJA when trying to procure and apply software solutions. Such challenges include costs constraint, constrained infrastructure, ineffective training of teachers, and accessibility hindrances for persons with disabilities. Affordability was the main issue, whereby most PWDs and their families cannot afford to buy the devices and software necessary, hence causing inequalities in accessing digital learning content. Infrastructure shortcomings, such as irregular internet connectivity and the lack of electricity in some areas, add to making such issues even more daunting. Teachers also require extensive training so that they may successfully integrate technology in their teaching. The 22% representation of teachers in the study underscores their initiative in overcoming such obstacles, but also highlights the importance of institutional intervention in facilitating them to acquire the needed skills and resources.

5.3 Conclusions

Based on the results of the study, several significant conclusions are obtainable. To begin with, laudable efforts by JJA towards adopting software solutions for PWDs have been made, though the success of the solutions will heavily rely on addressing usability and accessibility concerns. The high percentage of students in the study underscores the necessity of incorporating their feedback into the development and implementation of educational technologies.

Secondly, while software solutions have been promising to enhance learning outcomes, their efficacy continues to rely on proper integration into the learning environment. The study found that usability issues, poor technical support, and a lack of teacher training hold back complete realization of the benefits of these solutions. Addressing such challenges will require a collective effort from educators, software developers, and policymakers.

Thirdly, affordability barriers and infrastructure shortcomings are still major obstacles to successful technology integration. The 10% representation of administrators in the study highlights their position in disassembling these barriers through decision-making and resource distribution. More effort must be put into ensuring equitable access to quality learning technologies among all PWDs, irrespective of socio-economic standing.

5.4 Implications

The findings of this study have several important implications for different stakeholders in the education and technology sectors in Zimbabwe. To developers, there is a need to emphasize user-centered design in software development to ensure that solutions are accessible, simple to use, and

tailor-made to serve the needs of PWDs. Developers should engage with students, instructors, and administrators directly to learn from them and enhance their products accordingly. Focus should be on developing software that is capable of working optimally even under low-resource environments, considering the infrastructure shortages that have been witnessed in this research.

For instructors, the study highlights the need for adequate training on how to effectively utilize learning software to gain its maximum advantages. Student feedback must be taken into account in selecting and adopting software solutions to ensure that they meet learners' requirements. Teaching methods must be adjusted to include effective integration of software tools to maximize a more interactive and engaging learning environment for PWDs.

For the stakeholders, policymakers and administrators need to make an extra effort in removing systemic hindrances such as affordability and infrastructural limitations. Investment in assistive technology should be a priority to bridge the digital divide and enable equal access to educational facilities for all PWDs. Interagency coordination among government bodies, private entities, and non-profits should be pursued in order to broaden access to quality educational technology.

5.5 Recommendations

To combat the challenges listed here and capitalize on the potential presented by education software, various recommendations are proposed. Software developers should care about developing software programs that are usable and easy to use by PWDs, considering input from students and instructors. They should also care about designing software programs that

accommodate the specific needs of PWDs in the Zimbabwean context, e.g., support for local languages and offline capability.

Teachers should be provided with comprehensive training and ongoing support in the correct application of software programs for PWDs. Student feedback should be integrated into the selection and usage of software programs by schools to guarantee ease of use and effect. Instructional strategies should be adjusted to optimize the usage of software tools and maximize student participation.

Stakeholders, including administrators and policymakers, must overcome institutional barriers such as infrastructure and cost barriers to make PWDs equally accessible to technology. Further investment must go into the production and availability of assistive devices and software tailored to the environment. Strategic partnerships must be created to enable more access to technology, including international organizations and donors. Additionally, the special needs education budget should be increased to fund technology adoption in a sustainable way.

5.6 Future Research Recommendations

The current research presents several topics to be investigated through future research. Longitudinal studies are required to examine the long-term impact of software solutions on academic performance and engagement of PWDs at JJA. Future studies would have to explore the effectiveness of specific packages of software, contextual factors of the adoption of technology, and the development of culturally sensitive assistive technologies. Research would have to explore the ethical implications of the use of technology in special needs education, particularly in the

Zimbabwean context. Another most important area of research is the long-term consequences of the lack of assistive technology, and the impact of teacher training on the effective implementation of digital learning tools. Through studies in these areas, future studies can help frame a more inclusive and effective technology-based education system for PWDs.

References

- Africa University (2014). *Africa University Research Ethics Committee guidelines*. Africa University.
- Al-Busaidi, K. A., & Al-Shihi, H. (2018). The effect of using learning management systems on students' academic performance in higher education institutions: A systematic review. *International Journal of Educational Technology in Higher Education*, 15(1), 1-18.
- Cheung, A. C., & Slavin, R. E. (2013). The effectiveness of educational technology applications for enhancing mathematics achievement in K-12 classrooms: A meta-analysis. *Educational Research Review*, 9, 88-113
- Ching, T. Y., & Dillon, H. (2012). Effectiveness of assistive listening devices for children with hearing impairment: A systematic review. *Journal of Educational Audiology*, 18(1), 1-23
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage Publications.
- El-Qawasmeh, E., Ziauddin, S., & Jararweh, Y. (2019). A review of intelligent tutoring systems for students with disabilities. *Journal of King Saud University-Computer and Sciences*, 31(7), 1324-1335
- Government of Zimbabwe. (2020). *e-Learning Policy*. Ministry of Primary and Secondary Education.
- Jiri, J. (1980). *Jairos Jiri: The man and his work*. Longman Zimbabwe.
- Mhlanga, D. (2021, November 12). Zimbabwe: Govt to roll out e-learning in schools. *The Herald*.

- Newsday. (2023, April 28). Breaking digital barriers: POTRAZ empowers visually impaired individuals with ICT skills.
<https://www.newsday.co.zw/technology/article/200017884/breaking-digital-barriers-potraz-empowers-visually-impaired-individuals-with-ict-skills>
- Nielsen, J. (1994). Usability engineering. Academic Press.
- OECD. (2020). *Education at a Glance 2020: OECD Indicators*. OECD Publishing.
- Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*.
- Pressman, R. S. (2005). Software engineering: A practitioner's approach (6th ed.). McGraw-Hill Education.
- Project Tomorrow. (2020). *Speak Up 2020 Research Project for Digital Learning*. Retrieved from <https://tomorrow.org/speakup/>
- Republic of Zimbabwe. (2013). *Constitution of Zimbabwe*. Harare, Zimbabwe: Government Printers.
- Rubin, H. J., & Rubin, I. S. (2012). *Qualitative interviewing: The art of hearing data*. Sage Publications.
- Schlosser, R. W., & Wendt, O. (2008). Effects of augmentative and alternative communication intervention on speech production in children with autism: A systematic review. *American Journal of Speech-Language Pathology*, 17(3), 212-230.

- Schlosser, R. W., Wendt, O., Angermeier, K., & Shetty, M. (2011). Evidence-based practice and augmentative and alternative communication: Applications for clinicians, researchers, and teachers. *Augmentative and Alternative Communication*, 27(2), 117-130.
- Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study. *Review of Educational Research*, 81(1), 4-28.
- The Herald. (2023, May 1). ICT skills for people with disabilities. <https://www.herald.co.zw/ict-skills-for-people-with-disabilities/>
- The Sunday Mail. (2023, April 2). ICT training for persons with disabilities. <https://www.sundaymail.co.zw/ict-training-for-persons-with-disabilities>
- UNICEF Zimbabwe. (2022). *Education in Emergencies Situation Report*.
- UNESCO. (2021). Comprehensive situational analysis on persons with disabilities in Zimbabwe, 2021. <https://unesdoc.unesco.org/ark:/48223/pf0000381967>

APPENDICES

APPENDIX 1: Structured Questionnaire Guide

Section 1: Participant Information

1. What is your role in the education of individuals with special needs?
 - Teacher
 - Student
 - Administrator
 - Other (please specify)
2. Which type(s) of special needs do you primarily work with? (Check all that apply)
 - Learning disabilities
 - Autism Spectrum Disorder (ASD)
 - Visual impairments
 - Hearing impairments
 - Physical disabilities
 - Speech and language impairments
 - Other (please specify)

Section 2: Software Use and Experience

3. Which technologies or software do you currently use for educational purposes with individuals with special needs? (Check all that apply)
 - Learning Management Systems (LMS)
 - Educational apps
 - Assistive technology devices (e.g., AAC devices, screen readers)
 - Adaptive learning platforms
 - Collaboration tools
 - Other (please specify)
4. On a scale of 1 (Not at all satisfied) to 5 (Extremely satisfied), how satisfied are you with the following aspects of the technology you use:
 - Usability (ease of use, intuitiveness) 1□ 2□ 3□ 4□ 5□
 - Functionality (features, capabilities) 1□ 2□ 3□ 4□ 5□
 - Suitability for the specific needs of the individual(s) 1□ 2□ 3□ 4□ 5□
 - Impact on learning outcomes 1□ 2□ 3□ 4□ 5□
5. Have you encountered any challenges or barriers when using technology for educational purposes with individuals with special needs? If so, please describe.

Section 3: Impact on Access to Quality Education

6. In your experience, how has the use of technology impacted the access to quality education for individuals with special needs?
- Significantly improved
 - Somewhat improved
 - No impact
 - Somewhat worsened
 - Significantly worsened
7. Please explain your response to the previous question, providing specific examples if possible.

8. Please share any additional comments or suggestions you have regarding the use of technology for educational purposes with individuals with special needs.

APPENDIX 2: Semi-Structured Questionnaire Guide

1. Please describe your role.
2. What specific software or technologies do you currently use for educational purposes?
3. How easy or difficult is it for you (or the individual you support) to learn and use these technologies?
4. Do you feel these technologies offer the features and functions you need to support effective learning?
5. Have you encountered any challenges related to the usability or functionality of these technologies? If so, how have these challenges impacted the learning experience?
6. How well does the software cater to the unique learning styles and needs of the individual(s) you work with?
7. Are there any specific features or functions you wish the software had to better support their learning?
8. In your experience, how has the use of technology impacted the quality of education for the individuals you support?
9. What do you think are the most important factors to consider when selecting and implementing educational technologies for individuals with special needs?
10. Thank you for sharing your valuable insights. Is there anything else you would like to add regarding technology's role in special needs education?

APPENDIX 3 : Africa University Research Ethics Committee Proof of Payment



Confirmation of Cash Deposit

UTILITY PAYMENT ADVICE

Beneficiary Name: AU2270429 22704290031

Amount Paid: USD 20.00

Transaction Date: 2024-06-21 09:29:55

Narrative: RUVARASHE DOROTHY MASAWI 210710 AUREC REVIEW FEE

Branch and Ref: 33LKALINO 0338PCH241730011

TICK WHERE APPLICABLE

USD	ZAR	GBP	EURO	BWP
☐	☐	☐	☐	☐

OTHER SPECIFY

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

Customer Copy

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

Signature: 0775-317818

APPENDIX 4: AUREC Approval Letter



AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 Website: www.africau.edu

Ref: AU 3432/24

3 September, 2024

RUVARASHE DOROTHY MASAWI

C/O Africa University
Box 1320
MUTARE

RE: ASSESSING THE ADOPTION OF SOFTWARE SOLUTIONS IN IMPROVING ACCESS TO QUALITY EDUCATION FOR PERSONS WITH DISABILITIES IN ZIMBABWE: A CASE STUDY OF JAIROS JIRI ASSOCIATION, 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 3432/24
This number should be used on all correspondences, consent forms, and appropriate documents.

☒ AUREC MEETING DATE

NA

☒ APPROVAL DATE

September 3, 2024

☒ EXPIRATION DATE

September 3, 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 5 :Supervisor Approval Letter



COLLEGE OF BUSINESS, PEACE, LEADERSHIP AND GOVERNANCE

31/07//2024

Africa University Research Ethics Committee

Ref: Approval for AUREC Proposal Submission

Ruvarashe Dorothy Masawi has worked on the proposal with the assistance of the supervisor and I confirm that it is ready for review by your esteemed committee.

Respectfully submitted,

Dr. Tendai Zengeni
Supervisor's Name



Supervisor's Signature

APPENDIX 6: Application for Initial Approval



For office use only	
Protocol no.	Type of
review: Full Committee	Office stamp
Expedited	☐
Exempted	☐
Fees paid/receipt	number:

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

APPLICATION FOR INITIAL REVIEW

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

Check list

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

CONTACT PERSON'S NAME :	<u>Ruvarashe Dorothy Masawi</u>
CONTACT ADDRESS:	<u>63 Wyvern Avenue, Belvedere, Harare</u>
EMAIL ADDRESS :	<u>masawir@fricau.edu</u>
CONTACT NO:	<u>+263775317818</u>

Undergraduates

		Applicant	AUREC
1	Application form duly completed	✓	
2	Electronic version of research proposal to aurec@fricau.edu	✓	
3	Consent forms in English and local language of study population	✓	
4	Advertisement or letter or card used for recruiting participants and any supplementary information (if applicable).		
5	Data collection tools being administered during the study in English and local language of study population (if applicable) included in the proposal		
6	Budget and timeframe included in the proposal.	✓	
7	Approval letter from your academic supervisor/college or institution	✓	
8	Approval letter from authorities where study will be conducted	✓	
9	Application fee paid at AU Business Office and receipt (or copy) attached to application form.	✓	

Post graduates and other researchers

		Applicant	AUREC
1	Application form duly completed		
2	Electronic version of full research proposal (chapter 1 – 3 completed) to aurec@fricau.edu		
3	Proposal summary (see guidelines below)		
4	Consent form in English and local language of study population		
5	Advertisement or letter or card used for recruiting participants and any supplementary information (if applicable).		
6	Data collection tools being administered during the study in English and local language of study population (if applicable)		
7	Budget and timeframe		
8	Approval letter from academic supervisor/college or institution (if you are a student)		
9	Approval letter from authorities where study will be conducted		
10	Application fee paid at AU Business Office and receipt attached to application form.		
12	CV's for D Phil and Phd candidates.		



Ruvarashe Dorothy Masawi 31/07/2024

Signature: Investigator/Researcher

Name

Date

1. General information

1.1. Study title: ...ASSESSING THE ADOPTION OF SOFTWARE SOLUTIONS IN IMPROVING ACCESS
TO QUALITY EDUCATION FOR PERSONS WITH DISABILITIES IN ZIMBABWE: A CASE STUDY OF
JAIROS JIRI ASSOCIATION, ZIMBABWE

1.2. Name of Principal Investigator(PI)/ Researcher: Ruvarashe Dorothy Masawi

1.3. Nationality of Investigator/Researcher: Zimbabwean

1.4. Proposed date of start of study: 01/09/2024

1.5. Expected duration of study: 5 months

1.6. Study site(s) in Zimbabwe: Jairos Jiri School, Waterfalls

1.7. Sites outside Zimbabwe: N/A

1.8. Study budget: \$150 Source of Funding: Self

1.9. Is the researcher a student? Yes

1.10. If Yes, indicate the following:

1.10.1. Name and address of institution: Africa University 1 Fairview Road Mutare

1.10.2. College: College of Engineering and Applied Sciences

1.10.3. Level of study: Undergraduate

1.10.4. Name of Supervisor: Dr. Tendai Zengeni

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

1.11.1. Name and address of institution: _____

1.11.2. Academic Title of PI: _____

1.11.3. Existing Qualifications: _____

1.11.4. Co Investigators:

Names: Qualifications Institution

2. Statement by the investigator

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



Signature _____ Date: 31/07/2024

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

3.1. Introduction

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

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

3.4. Literature review

4.0 Methodology

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

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

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

4.4 Devices, Tests, Questionnaires, and Interview Guides:

4.5 Research participants/subjects

4.5.1 State the total number of human participants to be enrolled

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

4.5.3 Age range and sex of participants to be recruited.

~~4.5.4~~ 4.5.4 Special or vulnerable populations (*state if vulnerable populations e.g. pregnant*

4.5.5 ~~4.5.5~~ women, adolescents, children, prisoners, refugees etc are involved)

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

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

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

4.7 Potential Risks

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

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

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

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

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

5. Reference List

6. Attachments

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

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

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

6.4 Budget and timeframe

6.5 Proof of payment of the review fees.

APPENDIX 7: Clearance from Institution under study



Jairos Jiri Association
National Office
17791 Tredgold Drive
Belvedere, Harare

29 July 2024

Dear Ruvarashe Masawi,

RE: REQUEST TO CONDUCT RESEARCH WITHIN JAIROS JIRI ASSOCIATION

We are writing to formally acknowledge receipt and approval of your research proposal entitled "Assessing the Adoption of Software Solutions in Improving Access to Quality Education for Persons with Disabilities in Zimbabwe: A Case Study of Jairos Jiri Association, Zimbabwe".

The Jairos Jiri Association is pleased to grant you permission to conduct your research within our organization. To facilitate your research, we have designated Jairos Jiri Waterfalls Centre as the most suitable location based on the scope and objectives outlined in your proposal.

We anticipate that your research will contribute significantly to the body of knowledge on inclusive education and inform our strategies for enhancing the educational experiences of persons with disabilities. We look forward to collaborating with you on this project and receiving a copy of your dissertation upon completion.

Should you require any additional support or information, please do not hesitate to contact our human resources department.

Mary Muchingamidzwa
Human Resources Officer
Jairos Jiri Association

+263 772114205
jjano@jairosjiriassoc.org

APPENDIX 8: Informed Consent Letter

RESEARCH INFORMED CONSENT

My name is Ruvarashe Masawi, a third year Software Engineering student from Africa University. I am carrying out a study on assessing the adoption of software solutions in improving access to quality education for persons with disabilities in Zimbabwe. I am kindly asking you to participate in this study by answering a questionnaire/participating in an interview.

The purpose of the study is to assess how software solutions are being used to improve the quality of education for persons with disabilities (PWDs) at Jairos Jiri Association in Zimbabwe. Jairos Jiri Association was selected for the study because of its commitment to providing quality education for PWDs.

If the Jairos Jiri Association decides to participate, I will collect data through questionnaires and interviews with PWDs, teachers, and administrators involved in the educational programs. It is expected that this will take about 10-15 minutes of your time.

There are no known risks or discomforts associated with participating in this study. The questionnaire and interview questions are designed to be respectful and non-intrusive. However, if you feel uncomfortable answering any question, you are free to skip it or stop the interview at any time.

While there is no direct compensation for participating in this study, your participation will contribute to a better understanding of how technology can be used to improve the quality of education for PWDs. This information can be used to inform the development and implementation of more effective software solutions, ultimately benefiting the PWD community.

Any information that is obtained in the study that can be identified with you will not be disclosed without your permission. All data collected will be kept confidential and anonymous. Your name and any other identifying information will not be asked for in the questionnaires, and any personal details shared during the interview will be kept confidential.

Participation in this study is voluntary. If you decide not to participate in this study, your decision will not affect your future relationship with Jairos Jiri Association or Africa University. If you

choose to participate, you are free to withdraw your consent and to discontinue participation at any time 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):

Mary Muchingamudzwa

Date:

29/07/2024

Signature of Research Participant or legally authorized 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: Ruvarashe Dorothy Masawi