



EXTENDING THE HORIZON OF DIGITAL FINANCIAL SERVICES: A FOCUS ON PEOPLE LIVING WITH DISABILITIES

Mutale Tasheni 

The Common Market for Eastern and Southern Africa (COMESA) Business Council,
COMESA Secretariat, P.O Box 30051, Lusaka, Zambia
tmutale@comesabusinesscouncil.org

Pinifolo Jonathan, PhD

The Common Market for Eastern and Southern Africa (COMESA) Business Council,
COMESA Secretariat, P.O Box 30051, Lusaka, Zambia
jpinifolo@comesabusinesscouncil.org

Soobramanien Teddy Y.

The Common Market for Eastern and Southern Africa (COMESA) Business Council,
COMESA Secretariat, P.O Box 30051, Lusaka, Zambia
tsoobramanien@comesabusinesscouncil.org

Abstract

In today's digitalized environment, digital financial services are becoming more and more essential. The current state of the globe is heading towards a cashless society. The majority of consumers discover that using digital financial services upgrades their entire quality of life by providing a more seamless manner of living. Norway has already accomplished this by having no unbanked population, implying that every Norwegian has an active bank account. The research also revealed that only 2% of the population uses cash. However, as the globe continues to embrace digital financial services, many demographics have been unable to benefit from current developments in digital banking. To investigate why, this study focuses on the inclusion of underserved demographics, with an emphasis on persons living with disabilities (PLWDs). Using a qualitative research design and secondary research, this study examined the

barriers people with disabilities face when accessing digital financial services. Research suggests that there is already an existing prejudice against persons living with disabilities (PLWDs) in digital financial services. The findings of this study are no different revealing that PLWDs are unable to fully utilize all the components of the already existing digital financial products on the market due to a lack of policy formulation, assistive technology, and financial literacy, to name a few. It was also discovered that digital financial service providers have difficulties when attempting to design their systems in a way that may be accessible to people with disabilities. The study suggests ways in which digital financial service providers can develop inclusive design systems.

Keywords: Digital Financial Services, Barriers, Accessibility, PLWDs, Inclusion

INTRODUCTION

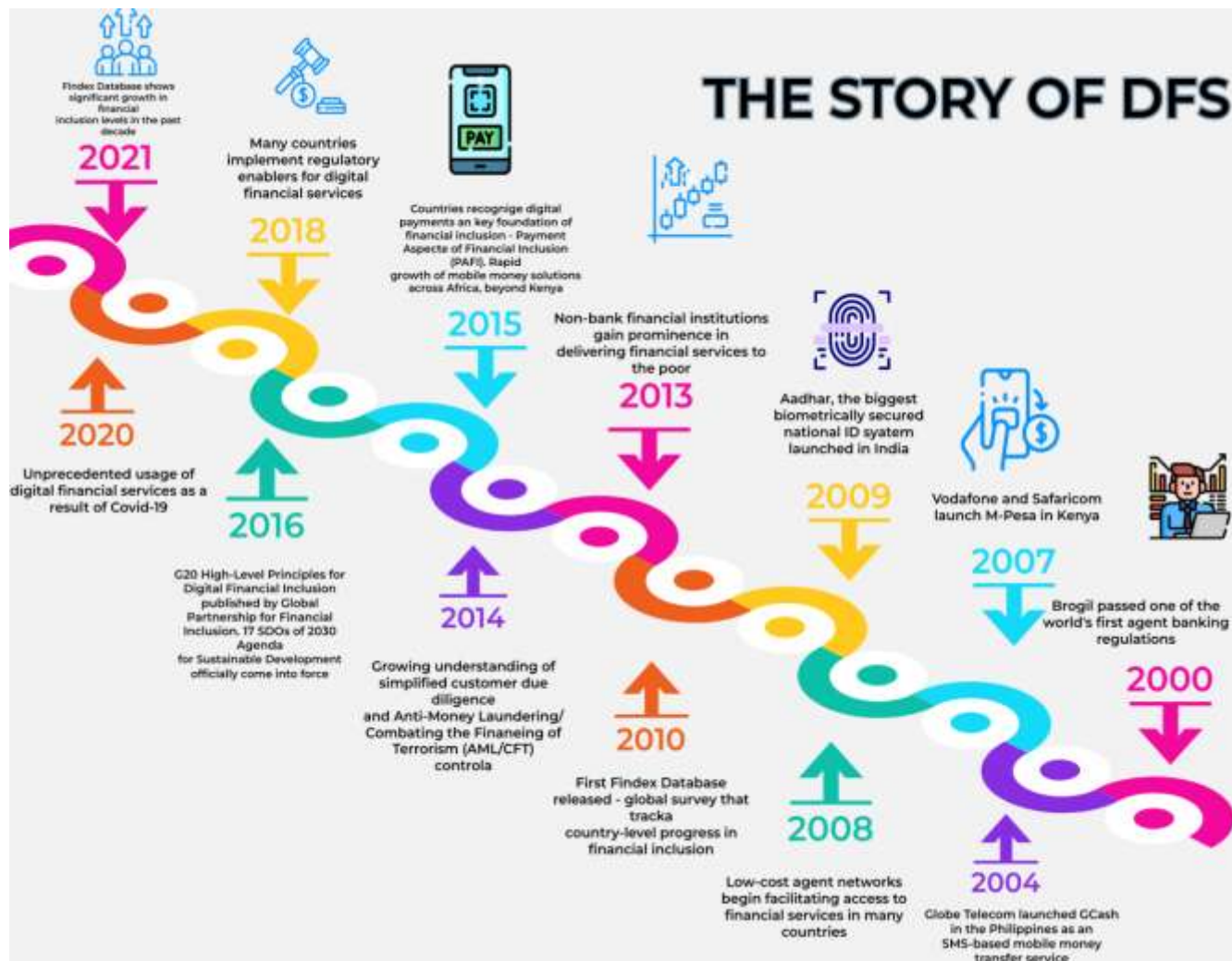
Technology is the cornerstone of digital financial inclusion since it drives the digitization of financial services. This encompasses IT, software, and communication technology. Together, these technologies have altered the financial industry from conventional to digital, resulting in the discussion of “Digital Financial Inclusion.”

Digital financial services have evolved significantly since their inception in the 1950s. As the world grows more digital, governments throughout the world have accepted DFS as the “new normal”. Throughout recent years, particularly around 2020, digital money become an integral aspect of daily life throughout Africa and beyond. The COVID-19 pandemic had a significant impact on this, as did the limitations that were imposed. An essay published on World Bank Blogs (2024) depicts the story of digital finance (see figure 1).

The history of DFS demonstrates both its development over time and its increasing significance. It’s also important to note that DFS is still evolving. It has moved from focusing only on the banking industry to including telecommunication service providers by embracing the frenzy for ‘mobile money.’ Mobile money has had a significant growth over the years, with Africa experiencing increased mobile money transactions. According to Statista (January 2024), Africa reported \$44.9 billion in mobile money transactions in 2022, with East Africa accounting for \$28 billion. This increase can be ascribed to better access to technology, difficulties in accessing traditional financial institutions, and the emergence of contactless payments during the pandemic. Telecommunication firms’ mobile money services have allowed financial transactions, fees, and peer-to-peer transfers, hence altering financial inclusion across the continent. In their 2023 research article, People With Disabilities and Access to Financial

Services: Evidence From Ghana, James Attah Peprah, Eric Atsu Avorkpo, and Evansa Kulu describe mobile money as a method for reaching the inaccessible and assisting the neglected.

Figure 1. The Story of digital finance



Adapted from: Embracing Disruption, Unveiling the Future: The Story of Digital Financial Services, World Bank Blogs (2024)

The growing use of mobile money and other digital payment systems highlights the need for digital financial inclusion for people living with disabilities in Africa for a variety of reasons. For starters, it integrates ideas of equality and social justice, guaranteeing that people with disabilities have unrestricted access to financial services, supporting human rights, and eliminating prejudices that prevent full participation in the economy and society. Second, it serves as a catalyst for economic empowerment by allowing PLWDs to manage their own accounts, invest and built assets. This promotes independence and general well-being.

Furthermore digital financial inclusion benefits healthcare and well-being by increasing access to key services, pharmaceuticals, and assistive equipment, thereby enhancing health outcomes and quality of life. Moreover, education and unemployment possibilities have expanded, including online learning platforms, vocational training, and entrepreneurship. By lowering poverty and vulnerability, it provides a safety net for savings insurance and credit choices, which is crucial during catastrophes. Incorporating PLWDs also promotes inclusive growth and innovation, resulting in creation of accessible and user-friendly financial solutions. Digital financial inclusion for people with disabilities in Africa is more than just a convenience. It's a basic right that is crucial to establishing a more equal and successful story.

In the realm of understanding disability, a contentious debate persists, rooted in differing perceptions in both society and the medical field. According to the CPD Online article "What are the Different Types of Disabilities?" (2022) disability can be categorized into four types: behavioural or emotional, sensory, physical, and development. These divergent outlooks have led to the development of models that aim to justify or challenge these perceptions. Among these, medical and social models offer contrasting perspectives on the nature of disability.

In the 1970s and 1980s, disabled activities pioneered The Social Model, shifting the focus from individual impairments to the societal barriers and attitudes that hinder the full participation of PLWDs. It acknowledges that not only is disability a consequence of personal limitations, but also heavily influenced by environmental, social, and institutional factors. In contrast, the medical model views disability primarily as a medical condition or impairment within an individual, emphasizing diagnosis, treatment, and rehabilitation to enhance individual functioning and independence. While the social model advocates for societal changes to uphold inclusion and equal opportunities, the medical model prioritizes medical interventions that aim at addressing and treating the individual impairments, Neff M.A,(2022) 'Medical Disability Model vs Social Disability Model', Neurodivergent Insights. The continuous debate between the social and medical models underscores the complex nature of understanding disability. This study endorses a holistic and person-centered approach to define disability as the mental and physical limitations that may restrict individuals' full equal participation in various aspects of life. This recognizes the diversity surrounding disability, encompassing physical, sensory, cognitive, and psychological aspects.

The United Nations African Renewal findings, published in 2019 as A Double Challenge for the Disabled, highlighted a pressing challenge: over 80 million Africans live with disabilities. This figure is expected to rise due to a variety of factors, including ageing populations, malnutrition, conflicts, and diseases. However, many African disabled people do not have access to the necessary assistive equipment, formal education, or vocational skills, limiting their

work opportunities. As digital financial technology becomes more widely available, this marginalised minority group confronts yet another barrier, worsening their exclusion from financial services.

According to MasterCard (2022) findings, persons with disabilities perceive a significant portion of banks as inaccessible. There are several misconceptions and barriers that persist in the realm of digital financial inclusion for PLWDs, which hinder their access to essential services. One prevalent myth suggests that PLWDs are uninterested in digital financial services, yet the reality reveals the opposite: PLWDs seek access to financial services but often encounter a lack of tailored information and education about available digital options specific to them. Additionally, misconceptions surrounding technological barriers allege that PLWDs are not able to effectively utilize digital platforms due to their disabilities. Therefore, successful implementation and increased awareness are imperative to bridge this gap.

Moreover, misconceptions surrounding connectivity and infrastructure perpetuate the belief that PLWDs in rural areas lack access to digital services. Rural connectivity gaps impact everyone, highlighting the need to address infrastructure challenges to benefit the entire population, including PLWDs. Furthermore, the myth of PLWDs lacking digital literacy overlooks the potential for empowerment through tailored digital literacy training programs, which can help build confidence and essential skills among PLWDs. Finally, attitudinal barriers contribute significantly to the exclusion of PLWDs from financial services, as biases and misconceptions often undermine their financial capabilities. By challenging these attitudes and adopting inclusive practices, financial institutions can recognize PLWDs as capable customers deserving of equal access to financial services. Essentially, exposing and debunking these myths, and addressing barriers faced by PLWDs is crucial to paving the way for comprehensive digital financial inclusion for them.

The qualitative approach and secondary research case studies in this study endeavours to delve into the experiences, barriers, and opportunities encountered by individuals living with disabilities. The aim of this research is to provide a platform for those directly affected, shedding light on the unique challenges faced by persons with disabilities in navigating the digital financial landscape. Furthermore, this study seeks to go beyond merely identifying obstacles to exploring potential solutions and opportunities for enhancing inclusivity and accessibility in financial services. By contributing empirical evidence and insights derived from the real-world experiences of people directly affected, this research aspires to inform policy decisions, guide industry practices, and foster societal awareness toward building a more inclusive and unbiased financial ecosystem for all individuals, irrespective of ability. Through these efforts, this study

endeavours to play a pivotal role in advancing the agenda for social justice, equity, and dignity for persons with disabilities within the realm of digital financial services.

Problem Statement

People living with disabilities (PLWDs) face a number of significant challenges in accessing financial education and services tailored to their specific needs, contributing to their often-cited categorization as 'poor' and marginalized individuals. PLWDs constitute approximately 16% of the global population, equivalent to about 1.3 billion people according to the World Health Organization's Global Report on Health Equity for Persons with Disabilities (2022). However, these individuals are frequently overlooked in financial inclusion efforts. While campaigns have successfully focused on integrating women and youth into financial systems, PLWDs continue to encounter barriers in accessing digital financial services, mobile banking, online payment options, and ATMs. The lack of tailored financial products further exacerbates their exclusion. This problem is exacerbated by design barriers within digital financial service providers, which hinder the integration of PLWDs into financial products. Moreover, there is limited qualitative and quantifiable data on the number of unbanked disabled individuals, further underscoring the need for comprehensive research and targeted interventions to address the financial inclusion gap among PLWDs.

General Objective

To examine the impact of limited access to digital financial services on the inclusion of individuals living with disabilities, with the aim of identifying barriers and advocating for solutions to foster greater financial inclusivity and accessibility.

Specific Objectives

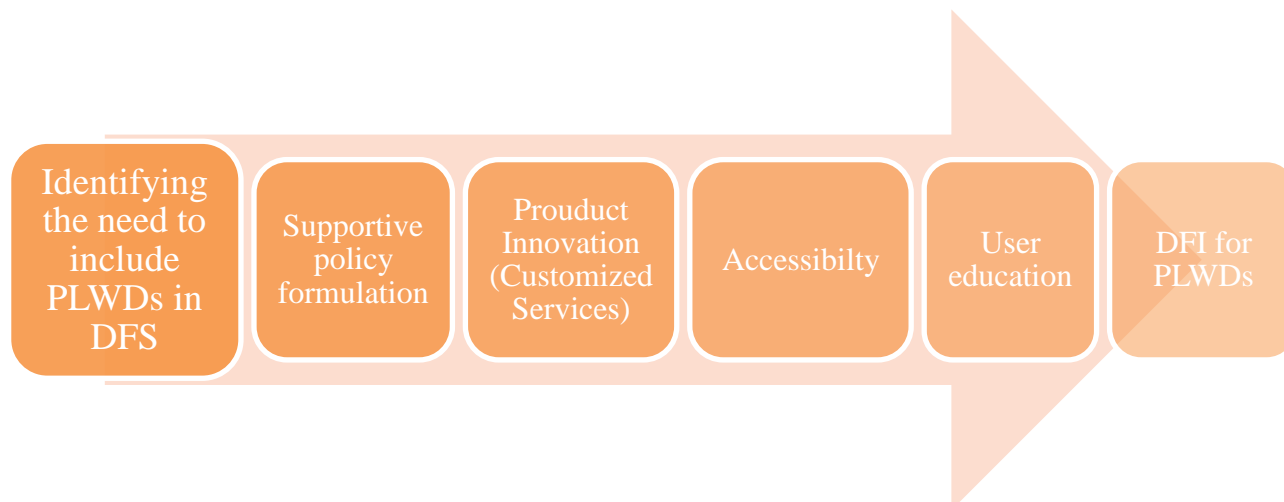
- i. To identify the specific and detailed obstacles that persons with disabilities have in obtaining digital financial services.
- ii. Offer proposed interventions, policies, actions, and strategies to include PLWDs that can be implemented by digital financial services, stakeholders, and the government.
- iii. Analyze the challenges faced by digital financial services in integrating PLWDs.

Study Hypotheses

To ensure a thorough examination of this topic, this research adopts a dual-hypothesis approach.

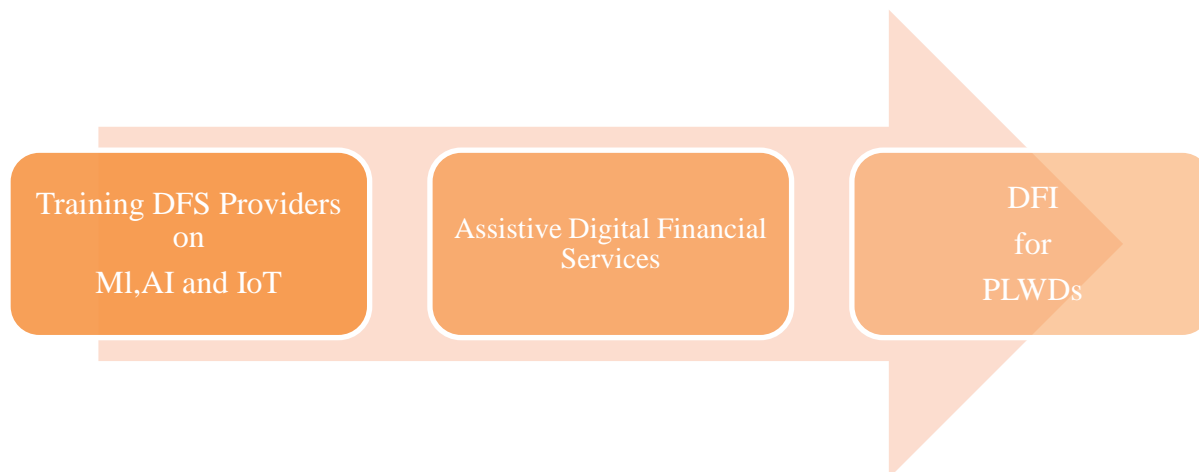
Hypothesis one

There is a positive relationship between identifying the need for inclusion, implementing supportive policies, innovating customized financial products, ensuring accessibility, and providing user education, ultimately leading to digital financial inclusion for PLWDs.



Hypothesis Two

This study hypothesizes that training financial service providers on the integration of machine learning (ML) models, artificial intelligence (AI), and the Internet of Things (IoT) into assistive technologies will significantly improve the lives of individuals with disabilities. This improvement will facilitate the development of accessible digital financial services, ultimately benefiting those living with disabilities.



Significance of Study

This study holds immense significance as it addresses a crucial aspect of financial inclusion particularly the accessibility of digital financial services for persons living with disabilities. By examining the barriers faced by this demographic group, we will identify niche specific challenges and barriers that affect persons with disabilities. Understanding the barriers

faced by PLWDs is essential for policymakers, financial institutions, and technology developers to design and implement inclusive solutions that cater to the diverse needs of individuals with disabilities. By doing so, we can empower this demographic group to participate more in economic activities, access financial services independently, and build their financial capabilities. Moreover, promoting digital financial inclusion will lead to enhanced financial security, increased employment opportunities, and improved quality of life for individuals with disabilities. Ultimately this study catalyses advocacy efforts aimed at creating a more equitable and accessible financial ecosystem for all members of society.

LITERATURE REVIEW

The emergence of digital financial services is currently changing the financial environment. This literature review explores theoretical perspectives based on the following three theories: the Diffusion Theory of Innovation, the Technology Acceptance Model, and the Capacity Theory. In addition, this study also adopted the practical literature review dedicated to examining literature from various sources.

Theoretical Review

Diffusion Theory of Innovation

The theory, which is based on Everett Rogers' groundbreaking work in his 1962 book "Diffusion of Innovations," emphasizes the significance of comprehending the process and rate of invention dispersion while offering fundamental insights into why and how new ideas spread. Diffusion, according to Rogers, is the process of innovation spreading through channels over time. In his book, he identified five critical components that affect the diffusion of new ideas: the innovation itself, adopters, communication routes, time, and the social structure. Rogers provides a framework for comprehending the stages of adoption within a social system by classifying adopters, including innovators, early adopters, early majority, late majority, and laggards.

Rogers' theory provides important insights in the context of this study, allowing development organizations, financial institutions, and policymakers to customize their approaches to get past adoption barriers. Stakeholders can gain a better understanding of how individuals with disabilities (PLWDs) adopt technology and how one adopter category affects others by putting diffusion theory's concepts to use. Making the most of already-existing networks and communication channels within communities is essential to boosting the uptake of digital financial services, especially for people with disabilities.

Overall, the Diffusion of Technology Theory offers a comprehensive framework for understanding the dynamics of technology adoption and guiding efforts to extend the reach and impact of digital financial services, ultimately empowering PLWDs to access and benefit from DFS. The theory can help accelerate the adoption of DFS and promote greater financial inclusion and empowerment. In addition, Rogers' theory emphasizes that to promote the spread of digital financial services, different stakeholders must work together and implement targeted interventions. This means actively including PLWDs in the co-creation and design of inclusive financial solutions, in addition to acknowledging their special demands and limitations.

Technology Acceptance Model

In 1986, Fred Davis developed the Technology Acceptance Model (TAM), which provides a thorough framework for comprehending the acceptance and uptake of new technologies. It implies that users' interactions and willingness to use new technology are greatly influenced by their impressions of its utility and usability, which in turn shapes users' actual usage behaviour. Perceived usefulness is the degree to which a person believes that a technology is relevant, effective, and useful. On the other hand, perceived ease of use is the degree to which a person believes that a technology is simple to use, considering elements like accessibility, user-friendliness, and ease of learning.

In relation to this study, the Technology Acceptance Model offers significant perspectives on how individuals with disabilities (PLWDs) assess technology according to its perceived utility and user-friendliness. PLWDs are more inclined to adopt technology with assistive functions, customization choices, and accessibility features that successfully meet their unique demands. Furthermore, because they increase freedom and lessen dependency on outside help, technologies that are viewed as simple and easy to use by people with disabilities are more likely to be embraced by them.

However, scepticism and resistance to adoption might result from badly designed technologies that do not satisfy the accessibility and usability requirements of people with disabilities. PLWDs might completely reject these technologies, which emphasizes how essential it is to provide inclusive, user-centered solutions. Stakeholders may encourage higher acceptance and use of digital solutions among this group by considering the specific needs and preferences of people with disabilities when designing and developing technology.

The theory provides insightful information about how PLWDs assess technology according to its perceived utility and usability. Stakeholders may improve the usability, accessibility, and acceptance of digital technology among people with disabilities (PLWDs) by

comprehending and addressing these elements, which will ultimately promote greater empowerment and inclusion (Burgess and Worthington, 2021).

The Capacity Theory

According to the study “*Attention and Effort*”, a pooled study by researchers from Filter theories, and based on Daniel Kahneman’s published 1973 study, people’s cognitive resources and capacity play a significant role in deciding how well they can accept and use new technology. In accordance with this hypothesis, people cannot completely interact with and profit from technological breakthroughs unless they have the requisite cognitive abilities, knowledge, and resources.

In context to this study, based on their cognitive capacities and the resources at their disposal, People Living with Disabilities (PLWDs) negotiate the adoption of digital financial services in the framework of this study, according to the findings of the capacity theory. Persons with disabilities (PLWDs) may encounter distinct obstacles stemming from cognitive limits, physical impairments, or socioeconomic disadvantages that may impact their ability to comprehend and utilize technology efficiently.

For people with disabilities, cognitive capacity includes not only mental aptitude but also aspects like motor skills, sensory awareness, and adaptive behaviour. The ability of persons with disabilities (PLWDs) to access and use digital financial services can be improved by technologies that are user-friendly, adaptable, and interoperable with assistive equipment. The Capacity Theory also emphasises how crucial it is to give PLWDs the resources and assistance they need to improve their technological ability. This could entail delivering assistive technologies and adapted devices, educating people about digital literacy, and making sure that accessible digital platforms are readily available.

The theory also emphasises how institutional support and sociocultural institutions help PLWDs interact with digital financial services more effectively. The technical competence of people with disabilities can be strengthened through collaborations between government agencies, financial institutions, and disability advocacy organisations, policies that support accessibility and inclusion, and financial incentives for technology usage.

Stakeholders may create more inclusive and empowering strategies to encourage the adoption of digital financial services among people with disabilities by considering the concepts of the Capacity Theory. Through the resolution of cognitive and resource-related obstacles, stakeholders can augment the ability of persons with disabilities to obtain and profit from digital financial solutions, consequently fostering increased financial inclusion and empowerment.

Practical Review

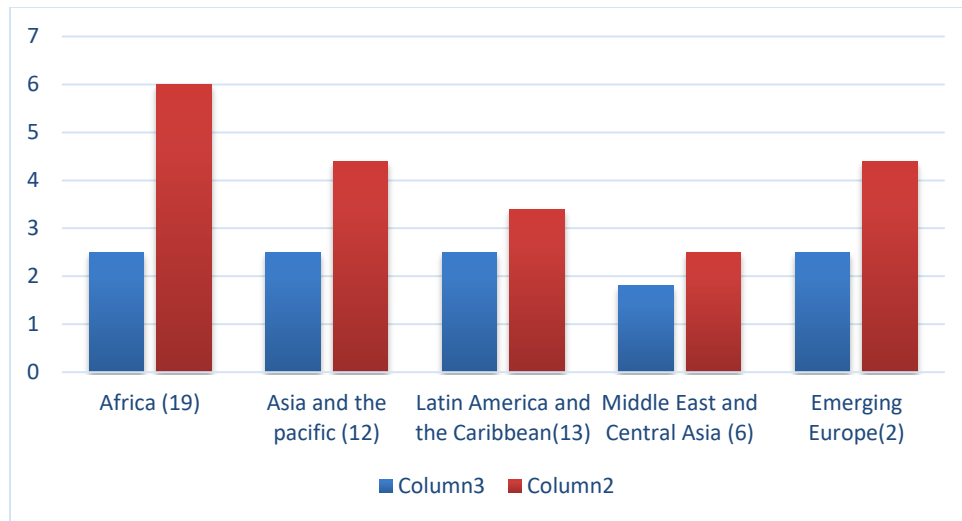
In Fernando H.F Botelho's 2021 publication "Accessibility and Digital Accessibility to Digital Technology; Virtual Barriers, Real Opportunities", the author explored the potential of digital technologies to assist persons living with disabilities with a particular focus on the blind. The author argued that altering the current hardware and software must be connected as they are an essential process to achieve long-term accessibility. The author also supports the argument presented in this study that persons living with disabilities are left behind in the ongoing transformation of digital technology which births digital financial services, further highlighting that the fast-paced changing technology landscape also makes it hard for PLWDs to catch up. The blind, for example, were able to access mainstream and microcomputers, but soon after that, personal computers with graphical user interface (GUI) were introduced and the blind and other persons living with disabilities are still trying to catch up to the never-ending race. This cycle underscores the need for a long-term solution, and the author highlights that this cycle exists because technology and accessibility are viewed as states and not processes and that is why when encashments are made the underserved cannot access the new technologies. Technologies are supposed to be "born" accessible and not tweaked ever so often to include the underserved, the author argues. Regarding this study, digital service providers need to view their technologies as a process, thus providing timeless technologies that are born inclusive, ensuring no one is left behind as we see it now.

In attempts to include persons with disabilities, Mattermost, an open-source technology messaging platform recently improved their interfaces to accommodate the blind, according to Jeff Link's 2021 publication "Accessible UI Basics for Users With Visual Impairments". The author argues that collaboration tools are designed for communication and creative ideas. However, when these tools exclude the blind, this defeats the purpose. The changes made to the platform include keyboard enhancements, regional navigation shortcuts, smart search fields, and shape-based iconography. The author also gives tips for interface accessibility: start at the compound level, minimize keystrokes, reduce reliance on colour, and conduct interviews. This development gives hope to digital financial service providers as this shows that it is possible to insert assistive technologies into their platforms like Mattermost has done. Their willingness and determination should be a push for digital services providers to go the extra mile in including persons living with disabilities.

Paul Khera, Stephanie Ng, Sumiko Ogawa, and Ratna Sahay published the International Monetary Fund (IMF) Working paper "Measuring Digital Financial Inclusion in Emerging Markets and Developing Economies: A New Index", 2021. In this paper, the impact of fintech on financial inclusion in emerging markets and developing economies is discussed, highlighting the potential

of digital technology to increase access to financial services. A novel index is introduced, combining access and usage of digital financial services (DFSs) based on data from 52 countries. This index provides a comprehensive view of financial inclusion through technology. The study finds significant regional differences in fintech adoption, with Africa and Asia leading in progress. The index serves as an analytical tool for researchers and policymakers to assess financial inclusion. The paper employs a three-stage principal component analysis (PCA) to construct the indices, focusing on payment aspects as the gateway to financial services. The study provides a foundation for understanding and addressing digital financial inclusion challenges faced by PLWDs. The study also suggests that digital financial inclusion is relatively high in countries in Africa, Asia, and the Pacific regions, highlighting that most countries saw an increase in the digital financial inclusion index between 2014 and 2017, driven both by access and usage dimensions. The improvement was particularly large in African countries. The figure below derived from their research paper supports the aforementioned.

Figure 2. Digital Financial Inclusion Index



Adapted from: Measuring Digital Financial Inclusion in Emerging Markets and Developing Economies: A New Index, 2021

In their later study that same year (2021), “Is digital financial inclusion unlocking growth?” The authors discuss the role of digital financial services in emerging markets and developing economies, highlighting the positive economic growth. In this study, they utilize new indices of financial inclusion development by Khera et. al (2021) to conduct a cross-country examination of 52 developing countries, employing cross-sectional instrument variable procedures to establish causality. It was found that digital financial inclusion is positively

associated with Gross Domestic Product (GDP) per capita growth and identifies financial and digital literacy and institutional quality as key drivers. The study offers recommendations to promote the digitization of financial services, emphasizing the importance of creating an enabling environment for innovation and competition in the financial sector.

In 2021, SightSavers, a non-governmental organization that focuses on developing countries to treat and promote avoidable blindness, in collaboration with United Disabled Persons in Kenya (UNPK), and the Association of Microfinance Institutions Kenya (AMFI-K) published a report “Financial Inclusion for Persons Living With Disability in Kenya: A Rapid Review and Qualitative Study Report.”

The study investigated the perception of financial services as well as the obstacles faced by PLWDs in Kenya, using a rapid literature review and qualitative methodology. The study acknowledged the gap between PLWDs and financial service providers emphasizing the disparity in access to financial goods and services between individuals with disabilities and those without. When examining the accessibility of digital services, it was found that in Kenya, there is a disparity in mobile money ownership. Specifically, 87% of individuals with disabilities own mobile money services, whereas 91% of individuals without disabilities own them. However, the disparity in Uganda was glaringly obvious, with only 46% of Persons Living with Disabilities (PLWDs) having ownership, while 79% of PLWDs did not have ownership.

To address this gap, the study provided practical recommendations for financial service providers and people living with disabilities on how to bridge the gap. Employing a comprehensive approach, dissemination workshops, and semi-structured interviews, the research examined why PLWDs and financial services providers are hesitant to adopt one another. The key findings of the study highlighted overwhelming challenges, such as design challenges from the perspective of the financial services they provide; complexity; a lack of financial literacy; and the fact that they are hard to adopt in the context of people living with disabilities. In addition to that, the study offered recommendations for overcoming the obstacles to individuals with disabilities, financial institutions, the government, non-governmental organizations that cater to their needs, and researchers.

An investigation into the preparedness and accessibility of financial services for people with disabilities in Malawi was published by the Hammill Institute of Disabilities in 2021. By supporting measures to offer financial services to individuals living with disabilities, the study highlighted the critical need for their immediate inclusion in Malawi’s newly emerging financial sector. Malawi, one of Africa’s poorest nations, grapples with significant poverty, with 65% of its population living below the poverty line. This economic hardship poses challenges to improving the lives of persons living with disabilities (PLWDs), a majority of whom face unemployment,

lack of education, and limited access to banking services. To address this issue, a study was conducted to assess the preparedness of Malawian commercial banks to integrate PLWDs into their initiatives as a means of tackling poverty. Employing a qualitative and exploratory approach, the study utilized semi-structured interviews with various commercial banks in Malawi. While the banks acknowledged the importance of including PLWDs, the study found that their needs were largely overlooked in existing initiatives.

In Bagus Santoso's 2023 study *Inclusive Digital Financial Services for Persons with Disabilities: Impact on Economic Empowerment and Financial Inclusion*, highlights the transformative potential of Digital Financial Services (DFS) in enhancing economic empowerment and financial inclusion for persons living with disabilities (PLWDs) was explored. Highlighting how digital financial services offer a paradigm shift from traditional banking methods, providing convenience and cost-effectiveness, driven by the widespread adoption of mobile phones, initiatives like the Divya Pay System in India and the BPAY System in Australia illustrate efforts to develop accessible digital financial products tailored for PLWD, featuring automatic payment options and bill reminders.

The author suggests collaborative efforts from governments and regulators to develop holistic policies and regulations conducive to the expansion of DFS, particularly for PLWDs. Financial education also plays a crucial role in enhancing knowledge and skills in utilizing these services. A robust and inclusive digital financial system is vital for fostering economic progress, attracting investments, and achieving sustainable development goals. By addressing barriers and harnessing technological advancements, financial institutions can empower vulnerable groups, including PLWDs, and alleviate poverty effectively.

In Sam Goundar and Miling Sathye's 2023 research paper *Exploring Access to Financial Services by Visually Impaired People*, the authors address the fact that digital accessibility in the banking sector is vital for ensuring financial inclusion and equal opportunities for all individuals, including those with disabilities. In Fiji, like many other countries, visually impaired individuals encounter significant challenges in accessing and utilizing digital banking platforms. Despite the recognition of these challenges, there is a lack of comprehensive research by other authors on the specific barriers faced by visually impaired individuals in the banking sector. The authors identify challenges that include difficulties in navigating complex interfaces, lack of compatibility with screen readers and assistive technologies, inaccessible forms and buttons, and security concerns. Furthermore, visually impaired users encounter additional barriers due to the reliance on visual cues and verification methods such as CAPTCHAs. These challenges contribute to a digital divide, limiting the ability of visually impaired individuals to fully participate in the digital economy and access essential financial services.

The authors acknowledge that while some digital solutions exist to address the needs of visually impaired individuals in the banking sector, their effectiveness and accessibility vary widely. Research shows a lack of adequate accessibility features in many existing banking websites and mobile apps, making them difficult or impossible for visually impaired users to navigate independently. Moreover, improvements to digital accessibility in the banking sector is further compromised by the absence of standardized accessibility guidelines and regulatory requirements.

Governments and regulatory bodies play a vital role in promoting digital accessibility and financial inclusion for individuals with disabilities. However, the implementation of policies and guidelines related to digital accessibility in the banking sector faces numerous challenges. These challenges include limited awareness among financial institutions, insufficient resources for compliance, and the absence of enforcement mechanisms. Additionally, the lack of collaboration between policymakers, financial institutions, and disability advocacy groups hinders progress toward comprehensive digital accessibility in the banking sector.

METHODOLOGY

Research Design

A qualitative method of research was used for this study. To define qualitative design, Nassagi (2020) describes qualitative research as the focus on exploring the nuances and depth of human experiences, behaviours, and experiences within a natural context. By using the qualitative method, more expressive information on the barriers faced by PLWDs will be highlighted in this research paper which cannot be done with a quantitative approach, which is more numerical. Secondary research involved reviewing existing literature, reports, and studies on digital financial inclusion and disability to supplement and contextualize the primary findings.

Areas of Investigation

Area One

The study investigated twelve key areas that collectively contribute to understanding the impact of extending the horizon of digital financial services to persons living with disabilities based off the two hypothesis provided.

1. Identifying the Need to Include PLWDs in DFI: This research identified the challenges and gaps faced by Persons Living with Disabilities (PLWDs) in accessing digital financial services.
2. Supportive Policy Formulation: The study emphasized the need for policy formulation as policies act as the foundation for promoting inclusion. They ensure that there are guidelines and regulations that service providers must follow to accommodate PLWDs.

3. Product Innovation: The study emphasized the need to customize services to meet the needs of PLWDs by developing innovative products that are inclusive by design.
4. Accessibility: The study identified the need to make digital platforms and services accessible ensuring that PLWDs can use these services without barriers. This includes web accessibility standards, mobile app accessibility, and compatibility with assistive technologies.
5. User Education: To ensure that the platforms are more accessible and not underutilized, the study highlights the need to provide training and resources to ensure that PLWDs can fully leverage the available services.
6. Digital Financial Inclusion for PLWDs: The study looks at how when combined, all of the above 5 key areas successfully lead to the digital financial inclusion of persons living with disabilities.

Area Two

This study suggests the following model based on the hypotheses:

$$\Delta i(\alpha + \beta + C) = x = y$$

Where:

- *Δi Represents the change in training:* Stakeholders develop and deliver a training program for financial service providers that focus on the integration of machine learning models and artificial intelligence into their operations. The change in training will be assessed by pre- and post-training evaluations to measure knowledge and skill improvements.
- *α Signifies the interaction of machine learning:* Ensure that the training includes practical sessions on how to incorporate machine learning.
- *β Signifies the integration of artificial intelligence:* Ensure that the training includes practical sessions on how to incorporate artificial intelligence.
- *C Signifies the integration of the Internet of Things:* Ensure that the training includes practical sessions on how to incorporate the Internet of Things.
- *x corresponds to the integration of ML, AI, and IoT leading to Assistive Digital Financial services:* Implement the concepts learned during the training to create and enhance assistive digital financial services. Creating services tailored to the needs of individuals with disabilities, ensuring accessibility and ease of use.
- *y corresponds to ADFS which leads to digital financial services for PLWDs:* The impact of the newly implemented assistive digital financial services on digital financial services which lead to digital financial inclusion.

Sampling and Data Collection

This research paper relies on desk research, also known as secondary research, to investigate digital financial inclusion for persons living with disabilities. The sample section outlines the sources of information used for analysis and the methodology employed to select these sources.

The sampling approach for this study involved accessing existing literature, academic articles, reports, and other relevant publications related to including people living with disabilities in digital finance. The sources were selected based on relevance to the research topic and the credibility of the authors and publishing outlets. Sources were included in the sample if they met the following criteria:

- **Relevance:** The source provided insights into the relationship between digital financial inclusion and persons living with disabilities.
- **Publication Date:** Recent publications were prioritized to ensure the inclusion of recent findings and developments.
- **Credibility:** Preference was given to reputable journals, and reports from recognized organizations and institutions.
- **Accessibility:** Full-text access to the source was required to facilitate thorough analysis and citation. The selection process involved screening the titles, abstracts, and keywords of the search results to identify potentially relevant sources. Full-text articles were then retrieved and further assessed for eligibility based on the inclusion criteria outlined.

While efforts were made to include a diverse range of sources, the final sample size reflects the breadth and depth of existing research on the subject. To ensure the quality and reliability of the selected sources, efforts were made to assess the credibility of authors, verify the accuracy of data and information, and cross-reference findings from multiple sources. Sources from reputable journals and organizations were given preference. While limitations exist, the sampling approach employed aims to provide a comprehensive and reliable analysis of digital financial inclusion for persons living with disabilities.

Data Analysis

The data analysis for this desk research paper involved synthesizing information gathered from existing literature, academic papers, books, journal papers, and other relevant sources. Key themes, trends, and findings were identified through a comprehensive review of the literature on the topic of interest, which in this case focused on the inclusion of persons living with disabilities in digital finance. By following this methodology, the study aims to

synthesize existing knowledge and provide comprehensive insights into how targeted training and technological integration can significantly enhance digital financial inclusion for individuals with disabilities.

RESEARCH FINDINGS

By critically analysing existing literature, practical data, and theoretical frameworks, this study endeavours to provide stakeholders with actionable insights and evidence-based recommendations to address the pervasive issue of digital financial exclusion among PLWDs. Ultimately, fostering inclusive digital financial ecosystems necessitates collective commitment, innovative approaches, and concerted efforts from policymakers, financial institutions, disability advocacy groups, and civil society organizations. Through collaborative endeavours and a steadfast dedication to inclusivity, stakeholders can collectively advance the agenda of digital financial inclusion, ensuring that PLWDs are not left behind in the digital age of finance. The following are the findings:

- i. **Global Trend Towards Digital Financial Services (DFS):** The shift towards digital financial services is evident worldwide, driven by technological advancements and evolving consumer preferences. The integration of technology into the financial sector has catalysed the conversation around digital financial inclusion (DFI). Technology, encompassing information technology, software, and communication technology, has driven the transition from traditional to digital financial services. Mobile money has emerged as a transformative tool, facilitating financial transactions and peer-to-peer transfers, especially in regions like Africa. However, the rapid adoption of digital finance has also highlighted disparities in access, particularly among marginalized groups such as persons living with disabilities (PLWDs). Pazarbasioglu, C, Garcia Mora Et al, (2020)
- ii. **Inclusion Challenges for Underserved Demographics:** Despite the widespread adoption of digital financial services, certain demographics, particularly persons living with disabilities (PLWD), face significant barriers to accessing and utilizing these services. Existing research indicates a prevalence of prejudice and discrimination against PLWDs within the realm of digital financial services, resulting in exclusion and limited participation. PLWDs encounter various barriers when attempting to access digital financial services, including a lack of assistive technology, limited financial literacy, and inaccessible design features. These barriers restrict their ability to fully utilize digital financial products and services, perpetuating their financial exclusion. Angwenyi V Et al, SightSavers. 2023 study

- iii. **Challenges for Digital Financial Service Providers:** Digital financial service providers also face challenges in designing inclusive systems that accommodate the diverse needs of PLWDs. Designing accessible platforms and integrating assistive features pose significant hurdles for service providers, highlighting the need for innovative solutions and collaboration with disability advocacy groups (Supported by the Angwenyi V, Muuo El al, SightSavers. 2023 study).
- iv. **Proposed Interventions and Strategies:** Research suggests several interventions, design suggestions, policies, and strategies to enhance the inclusion of PLWDs in digital financial services. These include tailored financial literacy programs, accessible design features, policy reforms to enforce accessibility guidelines, and collaboration between financial institutions and disability advocacy organizations (Mastercard. 2022, May; Technology Can Accelerate Financial Inclusion for Persons with Disabilities, Finds Mastercard Study).
- v. **Theoretical Perspectives:** Theoretical frameworks such as the Diffusion of Innovation, Technology Acceptance Model, and Capacity Theory offer insights into the adoption and acceptance of digital financial services among PLWDs. Understanding these theoretical perspectives can inform the development of inclusive strategies and interventions to promote digital financial inclusion. (Rogers, E. M. (2003). 'Diffusion of Innovations', Marikyan, D. & Papagiannidis, S. (2023) Technology Acceptance Model: A review. In S. Papagiannidis (Ed), TheoryHub Book, Burgess, & Worthington. (2021). Technology Acceptance Model. In Persuasion Theory in Action, Neil Charness, Walter R. Boot, (2016) Chapter 20 - Technology, Gaming, and Social Networking and ResearchGate (2016). Interpretation of Kahneman's 1973 Capacity Model for Attention in relation to listening).
- vi. **Policy Implications:** The findings underscore the importance of policy interventions to address challenges faced by PLWDs to digital financial inclusion. Governments, regulators, and financial institutions play a critical role in implementing inclusive policies, fostering collaboration, and promoting technological innovations to enhance accessibility and inclusion (Mastercard. 2022, May).
- vii. **Collaborative Efforts for Inclusive Financial Ecosystem:** Addressing the digital divide and improving access to financial services requires collaborative efforts from various stakeholders, including policymakers, businesses, and civil society organizations. By working together to prioritize accessibility and inclusivity in digital platforms and policies, stakeholders can create a more equitable and inclusive financial ecosystem for all individuals, including those with disabilities (Santoso, B. (2023). Inclusive Digital

Financial Services for Persons with Disabilities: Impact on Economic Empowerment and Financial Inclusion (Universitas Gadjah Mada, Indonesia)

Building upon these foundational insights, the study proposed a validated model aimed at integrating machine learning (ML) artificial intelligence (AI), and the Internet of Things (IoT) into assistive digital financial services (ADFS) for PLWDs. This implies that implementing training programs will successfully enhance digital financial service providers' knowledge and skills in ML, AI, and IoT integration, the study suggests pre- and post-training evaluations and practical sessions to equip financial service providers with hands-on experience in deploying ML, AI, and IoT solutions, facilitating the development of prototypes and case studies. Subsequently, the implementation of ADFS will demonstrate considerable advancements in meeting the accessibility needs of PLWDs, leading to enhanced service usability and adoption rates. Evaluation of ADFS will further validate its positive impact on digital financial inclusion metrics, including improved accessibility and financial literacy among PLWDs. Overall, the desktop research findings highlight the complex nature of digital financial inclusion for PLWDs and underscore the need for concerted efforts from stakeholders to address barriers and promote inclusive practices in the digital financial ecosystem.

INTERPRETATION OF RESULTS AND DISCUSSION

i. Identifying the Need to Include PLWDs in DFI:

Thorough research serves as the bedrock for understanding the multifaceted challenges faced by Persons Living with Disabilities (PLWDs) in accessing digital financial services. This process involves not only examining the technical aspects of accessibility but also delving into the lived experiences and perspectives of PLWDs themselves. Understanding the barriers they encounter, whether they are physical, cognitive, or systemic, is crucial for crafting effective solutions that truly cater to their needs. Additionally, recognizing the intersectionality of disability with other factors such as gender, age, and socio-economic status is essential for designing inclusive interventions. Studies by Botelho and Link emphasize the importance of integrating accessibility features and practical design improvements into digital financial services, while Khera et al. and the SightSavers Report reveal significant disparities and call for targeted interventions. Goundar and Sathye highlight specific challenges faced by visually impaired users, advocating for improved digital accessibility and standardized guidelines. Collectively, these studies stress that inclusive design is crucial for ensuring PLWDs can fully participate in the digital economy and achieve greater financial inclusion and empowerment.

ii. Supportive Policy Formulation:

Effective policy formulation is instrumental in creating an enabling environment for digital financial inclusion. Policies need to go beyond mere lip service and embody concrete measures that mandate accessibility, non-discrimination, and equal opportunities for PLWDs. This requires close collaboration between governments, regulatory bodies, financial institutions, and disability advocacy groups to ensure that policies are not only comprehensive but also enforceable. Moreover, ongoing monitoring and evaluation mechanisms are necessary to assess the impact of these policies and make necessary adjustments based on feedback from PLWDs and stakeholders. Regulatory frameworks must be fortified to enforce accessibility standards and incentivize compliance among financial service providers, thereby reducing systemic biases and fostering an inclusive environment. The literature review provided in this study underscores the critical need for supportive policy formulation to ensure Digital Financial Inclusion (DFI) for Persons Living with Disabilities (PLWDs). Theoretical frameworks such as Rogers' Diffusion Theory of Innovation, Davis' Technology Acceptance Model, and Kahneman's Capacity Theory provide valuable insights into the adoption of digital technologies by PLWDs, highlighting the importance of accessibility, usability, and cognitive support. Practical reviews further emphasize the need for policies that address design barriers and promote inclusive technology development.

iii. Product Innovation:

Innovating financial products and services to meet the diverse needs of PLWDs requires a human-centered design approach. This involves actively involving PLWDs in the design process to gain insights into their unique challenges, preferences, and capabilities. From developing intuitive user interfaces to incorporating alternative communication methods such as sign language interpretation and text-to-speech functionalities, there is a wide spectrum of possibilities for creating inclusive financial solutions. Moreover, fostering a culture of innovation within financial institutions can lead to continuous improvement and refinement of these products over time. The challenges encountered by digital financial service providers underscore the exigency for a paradigm shift in design thinking and collaborative innovation. While strides have been made in incorporating accessibility features, a chasm persists between theoretical frameworks and practical implementation. Bridging this gap mandates interdisciplinary collaboration between financial institutions, disability advocacy groups, and technology experts to co-create accessible solutions. Drawing upon design thinking methodologies and human-centered approaches, stakeholders can iteratively prototype and refine digital platforms that cater to the diverse needs and preferences of PLWDs. Innovations

must incorporate accessibility features from the start, ensuring digital financial products are inclusive for PLWDs without retroactive adjustments. As emphasized by Fernando H.F. Botelho and Jeff Link, technologies should be "born" accessible. Products should also feature adaptive design and compatibility with assistive technologies to address diverse disabilities, as seen in enhancements like Mattermost's platform updates.

iv. Accessibility:

Accessibility is the cornerstone of digital financial inclusion for PLWDs. It encompasses not only technical considerations such as web and mobile app accessibility but also factors like physical access to banking facilities and customer service accommodations. Ensuring that digital platforms and services are fully accessible requires adherence to international standards such as the Web Content Accessibility Guidelines (WCAG) and proactive engagement with assistive technology developers. Furthermore, financial institutions should invest in ongoing accessibility audits and user testing to identify and address any barriers that may impede PLWDs' access to financial services. Accessibility in digital financial services requires designing platforms that are usable by PLWDs from the outset, rather than retrofitting them later. Jeff Link highlights practical steps like keyboard enhancements and simplified navigation to improve access. Ensuring compatibility with assistive technologies and addressing diverse needs, as seen in platforms like Mattermost, is essential for creating truly inclusive digital financial solutions.

v. User Education:

Building digital literacy and financial capability among PLWDs is essential for maximizing the benefits of digital financial inclusion. This involves providing tailored training programs, educational resources, and peer support networks that cater to the diverse needs and preferences of PLWDs. By empowering PLWDs with the knowledge and skills to navigate digital financial services independently, financial institutions can enhance their confidence, autonomy, and decision-making capabilities. Moreover, ongoing support and follow-up are crucial to ensure that PLWDs can overcome any challenges they may encounter along their digital financial journey. The literature provided highlights the need for tailored education initiatives that improve digital literacy among PLWDs, enabling them to navigate and benefit from accessible technologies. Both Fernando H.F. Botelho and the IMF working papers emphasize the importance of equipping users with the knowledge and resources to adapt to rapidly evolving digital platforms. Enhanced digital literacy fosters independence and empowers PLWDs to engage with financial products confidently and effectively.

vi. Digital Financial Inclusion for PLWDs:

The culmination of inclusive policies, innovative product design, accessibility standards, and user education efforts results in greater digital financial inclusion for PLWDs. This not only expands their access to financial services but also fosters their economic empowerment, social inclusion, and overall well-being. By removing barriers and creating opportunities for PLWDs to participate fully in the digital financial ecosystem, stakeholders can contribute to building a more equitable and inclusive society. Moreover, recognizing the diverse needs and preferences of PLWDs and continuously striving to improve accessibility and usability standards is essential for ensuring sustained progress toward digital financial inclusion for all. Moreover, regulatory frameworks must be fortified to enforce accessibility standards and incentivize compliance among financial service providers, thereby reducing systemic biases and fostering an inclusive environment.

vii. Training Program Design and Implementation

The development and implementation of a training program aimed at integrating machine learning (ML) models, artificial intelligence (AI), and the Internet of Things (IoT) into digital financial services (DFS) represents a significant step towards the enhancement of accessibility and usability for Persons Living with Disabilities (PLWDs). Pre- and post-training evaluations will reveal significant improvements in the knowledge and skills of financial service providers. Practical sessions, including hands-on activities, case studies, and prototype development, are instrumental in equipping participants with the necessary expertise to effectively incorporate ML, AI, and IoT technologies into existing or new DFS platforms. This capacity-building initiative will not only bolster technical competencies but also foster a culture of product innovation and adaptive learning among industry professionals. This aligns with Capacity Theory, which highlights the need to address cognitive and resource barriers. Training modules should be tailored to different disabilities, ensuring inclusivity. Collaboration with disability advocacy groups, financial institutions, and government agencies is essential to ensure content reflects the real challenges faced by PLWDs, as suggested by SightSavers and other studies. Technology Acceptance Model (TAM) and Capacity Theory both emphasize digital literacy as key to adopting digital financial services. Training should teach PLWDs how to use smartphones, computers, and the internet for financial access. Khera et al. also highlight regional disparities, so training programs must be locally adapted to address specific financial access gaps.

viii. Integration of Machine Learning, Artificial Intelligence, and the Internet of Things

The integration of machine learning (ML), artificial intelligence (AI), and the Internet of Things (IoT) into digital financial service platforms needs to be approached through practical training sessions, emphasizing the application of these technologies to enhance service delivery and user experience for people living with disabilities (PLWDs). Participants will gain insights into leveraging ML algorithms for data analytics, risk management, and personalized customer interactions. Additionally, AI techniques such as natural language processing (NLP) and computer vision need to be explored to improve accessibility features and user interfaces.

Additionally, the integration of IoT will enable the gathering of real-time data and provide seamless connectivity across devices. This data can be analysed by ML algorithms to offer more accurate and timely financial insights. IoT devices can also enhance the user experience for PLWDs by enabling more intuitive and responsive interactions with financial platforms.

The hands-on approach in training programs will enable financial institutions to prototype and deploy innovative solutions that cater specifically to the diverse needs of PLWDs. By incorporating IoT, these solutions will be able to leverage real-time data and connectivity, thereby advancing digital financial inclusion efforts and ensuring that services are not only smart but also accessible and user-friendly. AI-driven tools can provide personalized financial advice and assist with navigating digital platforms, making them more intuitive and accessible, as highlighted in the Technology Acceptance Model (TAM). This integration also aligns with the Capacity Theory and the call for "born inclusive" technology, ensuring that digital financial services are adaptive and inclusive from the outset, eliminating the need for retroactive adjustments.

ix. Development of Assistive Digital Financial Services

Implementing insights from the training program, financial service providers will be able to successfully develop and enhance assistive digital financial services tailored to address the unique accessibility challenges faced by PLWDs. These services are to be designed with a user-centric approach, incorporating features such as screen readers, voice recognition, and intuitive navigation interfaces. By prioritizing accessibility and ease of use, the deployment of assistive DFS will empower PLWDs to manage their financial transactions independently and securely. The iterative development process ensures continuous refinement based on user feedback, further optimizing service accessibility and functionality. Based on the literature review, the development of assistive digital financial services for Persons Living with Disabilities (PLWDs) must prioritize several key elements. First, digital services should be designed with accessibility as a core feature from the outset, incorporating adaptive interfaces and

compatibility with assistive technologies, reflecting the need for technology to be "born" inclusive, as highlighted by Fernando H.F. Botelho and Jeff Link. AI-driven tools can enhance these services by offering personalized financial advice and improving user navigation, thereby making platforms more intuitive and accessible, in line with the Technology Acceptance Model (TAM). Additionally, Machine Learning (ML) algorithms should be employed to tailor interfaces to various disabilities, ensuring flexibility and responsiveness to individual needs. The integration of Internet of Things (IoT) devices can further streamline access by connecting everyday objects to financial services, facilitating tasks like bill payments and transactions. Continuous improvement through feedback from PLWDs is crucial for refining services and addressing cognitive and resource-based challenges, as emphasized by the Capacity Theory. Finally, addressing regional disparities by customizing solutions to local contexts ensures broader accessibility and inclusion, as noted by Khera et al. Together, these approaches can significantly enhance the usability and effectiveness of digital financial services for PLWDs, fostering greater financial inclusion and empowerment.

x. Digital Financial Inclusion for PLWDs

The introduction of assistive digital financial services will have a profound impact on digital financial inclusion for PLWDs. Thematic and secondary research on accessibility, usability, and adoption rates underscored the positive outcomes of these initiatives. Enhanced accessibility features and tailored user interfaces contribute to improved service uptake among PLWDs, fostering greater financial independence and inclusion within the digital economy. The successful integration of ML, AI and IoT technologies into DFS platforms will not only expand access to financial services but also pave the way for future innovations in inclusive finance.

In synthesis, the findings underscore the imperative for a multi-dimensional approach to digital financial inclusion that transcends technological determinism. By amalgamating technical expertise with socio-economic insights and regulatory imperatives, stakeholders can co-create an inclusive financial ecosystem that affords equitable access and fosters financial resilience among PLWDs.

RECOMMENDATIONS

In view of the in-depth analysis done on the complex and unique challenges facing PLWDs regarding digital finance inclusivity, it is important that these develop into practical and implementable recommendations toward a financial landscape more accommodating to their needs, hence promoting their inclusion. This section highlights a few strategic recommendations toward breaking systemic barriers, fostering collaboration, and catalysing innovation to improve

accessibility and participation in digital financial services for PLWDs. The study recommends as follows:

Enhanced Assistive Technologies: Stakeholders should ensure priority in Research and Development for the betterment of Assistive Technologies on PLWDs. This calls for better improvement, functionality, compatibility, and usability of assistive tools such as screen readers, voice command interfaces, and haptic feedback systems. During technology development, collaboration between technology developers, in terms of partnerships and innovation explorations, has tremendous advantages to stakeholders and People Living with Disabilities. Assistive touch has the following features: gesture control, easy navigation, voice commands, custom-made actions, and haptic feedback. The features mentioned above help PLWDs to conduct financial transactions and access other services more independently compared to the manual systems. But these devices are rather expensive; therefore, stakeholders should look into other ways or partnership to make it affordable for everyone.

Integrate universal design principles: Individual financial institutions, governments, and digital service providers need to ensure that universal design is a business requirement for designing digital financial products or developing platforms. This simply means that the interfaces and functionalities designed are usable by all users, whether in a condition of ability or disability to use. In view of the preceding phase, training programs and guidelines on the implementation of the practices of inclusive design shall be provided for the developers and designers in order to build capacity and raise awareness.

Financial Education Initiatives: This involves a harmonized effort of governments, financial institutions, and non-profit institutions in the design of target financial education programs and structuring them to ensure that they are tailor-made to the needs and capabilities of PLWDs. Such programs should aim at improving financial literacy, building trust in the use of DFS, and empowering PLWDs to make informed decisions financially. Specialized resources and an optionally available support service should be provided to PLWDs to negotiate the complexities in digital finance.

Regulation and Enforcement of Accessibility Standards: The role of regulatory bodies and policy makers towards regional and international accessibility standards of digital financial services cannot be underemphasized. They should be very clear in specifying elements that address compliance with accessibilities guidelines and regulations, ensuring that concerns from PLWDs components are taken on board by all the financial institutions and service providers in designing digital services. Penalties and incentives could be given for enhanced compliance and instituting perpetual accessibility standards.

Improvement and regulation of policies: Digital financial inclusion should be a core policy objective among the policymakers, laying special emphasis on PLWDs at the level of the national strategy for financial inclusion. Policymakers find it hard to include PLWDs into their policies since most of the policies currently address general financial inclusion. This calls for informed consideration from policymakers to craft policies that target PLWDs in respect to digital financial inclusion. Upgrading of regulatory frameworks is important to require accessibility compliance in digital financial services with robust monitoring and enforcement mechanisms that can assure accountability. WCAG use can help set standards of accessibility for websites and apps so users of any ability can use them. This, therefore, is where the regulatory bodies should enforce compliance with WCAG to make sure that digital financial services are accessible to PLWDs.

Organize awareness and advocacy forums whenever necessary to help the public understand why PLWDs should be placed under a regime of digital financial inclusion and engage in the fight against stigma and discrimination. This may be done through positive attitudes on disability and accessibility, which are promoted through campaigns in media, outreach programs, and educational initiatives that have been embarked on to dispel such misconceptions. PLWDs should, therefore, be empowered to advocate for their rights and to actively participate in all decision-making processes to entrench meaningful change and foster a society that prioritizes inclusivity.

Continued Investments in Research and Product Innovation: It is important to continue investing in research and product innovation to come up with new technologies, tools, and solutions that aide in addressing the changing needs of PLWDs within the digital finance space. Funding opportunities should be opened for supporting research projects, pilot initiatives, and technology startups involved in digital accessibility and inclusion. Given collaboration at all levels, it will facilitate knowledge sharing between academia, business, public agencies, or individuals, thus motivating inventiveness in this area.

CONCLUDING REMARKS

Conclusion

How the digital financial landscape looks today has been shaped by various nuances, from examination to global trends and system barriers through theoretical frameworks to empirical evidence and dimensions of technological innovation. The findings give more insight into the need for a multi-dimensional approach that adds up to much more than technological determinism, bringing socio-economic insights and regulatory imperatives into an inclusive financial ecosystem through collaborative endeavour.

Going forward, this calls for determined efforts on the part of policy framers, financiers and developers of technology, disabled people organizations, and civil society if insights are to be turned into action. It is in this light that stakeholders can collaborate in knocking down barriers, facilitating equal access, and developing resilience in PLWDs by applying universal design, strengthening regulatory frameworks, increasing financial literacy, encouraging interdisciplinary collaboration, and focusing on security. That's why the imperative of inclusive digital financial ecosystems echoes beyond the plain moral imperative to the pragmatic imperatives that continue to build development, economic empowerment, and social cohesion.

This simply means that the road to digital financial inclusion of PLWDs is one that requires constant effort, innovation, and continuous commitment from all actors. Getting on board from insights this review has managed to provide, and adopting the holistic approach for stakeholders to catalyse transformative change whereby this digital financial revolution truly leaves no one behind.

Critique of Literature

Where theoretical frameworks like Diffusion of Innovation, Capacity Theory, and Technology Acceptance Model remain very strong, they entail the explanation of adoption dynamics. Their application to varied contexts of use and intersectional identities would require refinements and nuanced adaptations. Future research in this respect must formulate context-specific theoretical frameworks to help explain distinctive socio-cultural, economic, and technological scenarios that set digital financial inclusion for PLWDs.

Fernando H. F. Bophelo, in a 2021 publication, provided quite an extensive review and in-depth analysis of different components involved in the process of digital accessibility. This paper talks about hardware and software, contents, and standards. It provides a holistic approach by showing that accessibility within a product is not solely a technical problem but involves an interplay of factors in complexity. Though the paper presents an overview of the subject, the empirical data used is completely theoretical, hence not presenting any real-life in-depth case studies to illustrate successful digital accessibility initiatives. It frames what is undoubtedly a solid framework of digital accessibility and a chain of dependencies to illustrate all factors are interlinked, and how a breakdown in one can be expected to affect the overall accessibility. While the paper identifies such a breakdown and does in itself provide some solutions, these appear to be more general and broad solutions. Therefore, it would also have been suitable if user-centered designs included an addition of solutions to the paper. However, the paper compensates for the lack of depth in the route the author intends to take in giving the

historical perspective; he shows how the advancements and setbacks in technology have made the subject more accessible or less so over time. The historical perspective is indeed necessary, but the paper overemphasizes this perspective at the expense of contemporary challenges and innovations. The paper refers to economic factors but fails to address cost barriers for both the developers in implementing accessibility and, on the part of the user, access to these assistive technologies. The roles played by various stakeholder holders, like policymakers, industry leaders, and advocacy groups, are not addressed in the paper.

In the publication, Jeff Link presents real examples of making the Mattermost platform accessible to visually impaired persons. It must be noted though that these are not backed by empirical data, quantifying the impact of the improvements in accessibility, like performance metrics or case studies. What the article instead brings out clearly, then, is the issue of compliance—the fact that Mattermost is compliant with WCAG: it shows that Mattermost meets recognized accessibility standards, creating credibility and seriousness in dealing with issues of inclusivity. In technical depth, moreover, the article was not quite rich because it relied heavily on quotes. Quotes are good, but the paper could have been much wider in focus, with a deeper perspective or approach, hence the lack of technical depth. This looks much like promotional material for Mattermost and not like a discussion or a study.

A paper by Stephanie Ng, Sumiko Ogawa, Ratna Sahay, and Paul Khera of the IMF Working Paper: *Measuring Digital Finance Inclusion in Emerging Markets and Decision Economies: A New Index* provides new indices and comprehensive data on the new indices, which are comprehensive in capturing multiple aspects of DFI across 52 markets of the emerging economies. It provides a granular understanding of digital versus traditional financial services. The time frame for this study is limited, and it is even considered outdated for today's studies because it scopes from 2011 to 2018, and many developments have taken place since then. Their other working paper published in 2021 also identifies the key drivers of DFI; however, it simplifies the complexity of financial inclusion by categorizing traditional and digital aspects. The interplay of the two types of combined effect in economic growth could be explored in greater depth.

SightSavers, with United Disabled Persons in Kenya, Association of Microfinance Institutions Kenya published a report *Financial Inclusion for Persons Living with Disabilities in Kenya: A Rapid Review and Qualitative Study Report*. It adopts a holistic approach to rapid review of literature and a qualitative design, drawing on perceptions and barriers interfacing with PLWDs in Kenya. Practical recommendations are actioned for financial service providers and PLWDs, with the major ones touching on better financial literacy, product accessibility, policy reforms, and partnerships. Whereas the paper does provide valuable recommendations, it may

continue to discuss potential challenges or barriers that could deter the implementation of the recommendations and strategies used to overcome them.

The study *Achieving Financial Inclusion for Persons with Disabilities: Exploring Preparedness and Accessibility of Financial Services for Persons With Disabilities in Malawi* focused on a country with high rates of poverty, entailing specific difficulties for PLWDs to access financial services within such a context. This implies that, while this study could have entailed more specific recommendations, the available paper underscores that financial institutions in Malawi efficiently accommodate their PLWD clients rather than just acknowledge the importance of including such people. The semi-structured interviews conducted on a number of commercial banks in Malawi brought about very fine elements on what the financial institutions view in regard to the inclusion of PLWDs. However, limited information concerning the methodology and the sample size for the semi-structured interviews makes the results less reliable and generalizable.

The 2023 study by Bagus Santoso on *Inclusive Digital Financial Services for Persons with Disabilities: the impact on economic empowerment and financial inclusion*, researches the effect of digital financial services on the economic empowerment and financial inclusion of PLWDs. It provides an insight into potential benefits accompanied by respective challenges.

However, the paper could have more in-depth analyses of specific digital financial products with regard to accessibility features, and the effectiveness of their reaching and serving PLWDs. Examples and strategies inoculating inclusive digital finance come up through various initiatives from distinct countries. Sam Gounda and Miling Sathye, 2023 study paper on *Exploring Access to Financial Services by Visually-Impaired people* highlights the critical challenges visual-impaired population face in accessing digital banking platforms as indeed only a special segment of PLWDs. It identifies the major barriers in digital accessibility, including very complex interfaces and lack of compatibility with assistive technologies. In addition, while government policies and regulatory frameworks have been mentioned, there should be a further analysis of the policy landscape and opportunities for advocacy and reform. Although the overview of findings does illustrate that a truly significant intellectual concern is the need for such an interdisciplinary approach and co-innovative study, there really needs to be stronger frameworks and definitive models to help steer such studies. Formulation of frameworks assisting knowledge sharing, co-creation, and stakeholder engagement would be of foremost interest in future research with a view to making concerted efforts for digital financial inclusion. Finally, while the reviewed literature offers useful insights and perspectives, in the future, research efforts need to focus on minimizing these limitations toward robustness and nuance in the understanding of digital financial inclusion for PLWDs. Therefore, by adopting

interdisciplinary approaches, leveraging new technologies while observing a premium principle in line with inclusivity, stakeholders would collectively drive the agenda of digital financial inclusion forward and help in extending financial inclusion and resilience to all.

Limitations

The study encountered several limitations, largely centred around data collection. Due to the newness of this study, the existing data focusses on and favours financial inclusion, or digital financial inclusion, without addressing persons living with disabilities. Furthermore, despite active attempts to engage financial service providers for information, the majority went unresponsive, and others declared that this was something they could not discuss, hence the reliance on desk research methodologies. Additionally, attempts to solicit input from PLWDs were also flops; the participants seemed reluctant to engage and were not comfortable speaking on this topic. Compounded by the scarcity of available data, most of the accessible information was limited to abstracts, constraining the depth of the analysis. However, the study navigated these limitations by leveraging desk research methods.

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