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Conceptualizing digital finance as a precursor for financial inclusion and financial service usage in Uganda

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ABSTRACT

This study conceptualizes digital finance as mobile banking, mobile money, and agent banking in the context of Uganda, and quantifies their influence on the usage levels of financial services. Data were collected from 290 lead households from 15 districts of Uganda, benefiting from the Uganda Multi-Sectoral Food Security and Nutritional Project (UMFSNP). Confirmatory factor procedures confirmed the digital finance structure, and individual path coefficients were determined to explain their relationship with financial inclusion and usage of financial services. These results indicate that mobile money and agent banking are significantly associated with financial inclusion. The results indicate that only agent banking influences the usage of financial services. Mobile banking does not impact financial inclusion and the usage of financial services. This study implicates financial institutions, funding interventions, and the government of Uganda to embrace the appropriate financial services that are affordable to vulnerable people.

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Introduction

Globally, the growth of digital technologies in the financial sector has attracted significant academic attention (CARE international, 2014; Mullis, 2019; Rekha et al., 2021). The proliferation of digital technologies has provided a platform for developing economies to integrate the unbanked into the recognized financial scheme (Gamze, 2019). Changing customer preferences have stimulated banks to develop innovative and efficient models for transferring funds. Indeed, IMF (2021) indicates that the introduction of mobile banking, microcredit services, and micro-insurance is changing the outlook and terrain of the financial sector. This invention has spanned academic spheres, while attracting the attention of scholars and policymakers within vast economies (Robert, 2021; Robinson, 1952). Research has indicated that the introduction of digital technologies stimulates huge amounts of income to be brought into the economy, thus transforming into other wealth-generating opportunities (Gamze 2019; Robert, 2021; Tawanda, 2022). These arguments conquer the postulations of Rekha et al. (2021) who indicate that when the number of account holders increases among adults, income disparities reduce, thus facilitating financial inclusion. However, this is contrary to the postulations of Robinson (1952) who claims that access to finance is an insignificant element in the process of economic growth. Perhaps his theoretical argument holds with the experience of the Indian economy rather than developing economies in Africa, which Uganda forms.

In the African context, the manifestation of financial inclusion is realized in terms of accessibility, affordability, quality, and capability (Demirgüç-Kunt et al., 2020; Gamze 2019; Morgan & Pontines, 2014). The principle drivers of this effect are broadly postulated to be the usage of ATMs, mobile money, bank agent outlets, and bank branches (Civil society Budget Advisory Group, 2021; Kim, 2016; Ministry of Finance and Planning and Economic Development, 2020; Rekha et al., 2021).

Mobile money services have been observed as the most fundamental channel for leveraging other digital financial services through connectivity. Other studies show that digital finance generally widens

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access to financially excluded people (Ogwang et al., 2022). This innovation has proliferated in Uganda through innovative banking, in which mobile money, mobile banking, and agent banking have played an essential role. Although different economic situations and financial aspirations call for different approaches to creating an inclusive society, financial inclusion continues to remain the global goal that all countries must attain (Iqbal & Sami, 2017).

Even though existing debates have given limited attention to digital finance and its contribution to the attainment of the financial inclusion agenda, the two continue to be inseparable and without vast segments in the context of Uganda. The antecedents of either remain unclear in the literature. The existing research does not paint clear pragmatic differences. Therefore, it is imperative to bring new insight into digital finance and financial inclusion and how they relate to bids to foster the use of financial services in the context of Uganda. This was achieved by addressing the following objectives:

- Exploring the underlying structure of digital finance in context of Uganda.
- Exploring psychometrical difference between digital finance and financial inclusion.
- To quantifiably evaluate the influence of digital finance on usage of financial services in Uganda.
- Establishing the mediating role of financial inclusion in the influence of digital finance on the usage level of financial services in Uganda.

The next section discusses the literature, particularly the theoretical underpinnings and previous empirical contributions to the body of knowledge. The following sections explain the methodological approach employed, followed by the results. The paper ends with discussion and recommendations.

Theoretical review

In this study, Roger's theory of diffusion was employed to explain the ideas and steps involved in adopting a financial inclusion agenda. In the event that information technology revolves, new innovations among private and public entities arise. These innovations come with opportunities and challenges for which the government should prepare. In this study, the theory of diffusion illuminates the rate at which society adopts to new innovation. According to Dearing and Cox (2018), this theory manifests in the fact that, for any person to adopt to innovative change, there must be developers who share and cede implementation control. This is witnessed in the diffusion of the inclusion strategy, where its implementation is allowed to evolve among economically disadvantaged households. In this age, when most people believe in imitation and mimicry, digital financial services are perceived as the best platform for financial inclusion. Dearing and Cox (2018), further advanced leading entities as key player in adoption criteria. Indeed, if the government focuses on transforming the transaction behavior of people through tax and other policies, then people would adopt the pattern of a social system in which they change from a normative tendency where poverty is unacceptable, to an informative state of accepting poverty reduction through financial inclusion agenda. Although, Rogers (2003) attributes innovation, adopters, communication channels, time, and a social system to new culture adoption, his theoretical prominence is limited to social capital. Yet, the diffusion manifests in different ways by different adopters in a decision network. Law (2024) provides a wider stance to culminate the adoptive behavior of prospective users of digital finance. In his theory 'Banking made easy', security conscience of users; regulators actions; transparency and historical background of the institutions in play, not forgetting social acceptance of technology as pointed out by Rogers (2003), are key transformational reagents for effective adoption of new digital system for self-sustainability. Although, Wayne (2019) criticizes the theory of diffusion based on its narrow focus on human behavior, as further illuminated by Law (2024), adults' adoption of inclusion culture perhaps is attributed to available digital framework in Uganda, a question that the current study seeks to address.

Overview of digital finance, financial inclusion and usage of financial services

Digital finance

Digital Finance is a comprehensive phenomenon that describes a set of global metrics for digitalized industries (The World Bank, 2022). It encompasses unique data sources from identified financial service

providers, mobile money operators, e-money issuers, branchless and agent banking services, and any other identified digital finance service provider defined by regulators or stakeholders in a jurisdiction. From an operational point of view, Peterson (2018) described digital finance as a financial service offered through mobile phones and computers. Several scholars have defined digital finance from different perspectives. However, the application of financial services, products, and infrastructure to facilitate transactions is common. In Africa, digital finance is taking shape first in low- and middle-income countries (Mark, 2016). A new wave of mobile schemes is currently sweeping African economies while focusing on payment transactions. This is not enough to celebrate victory over digital finance; rather, consistency in usage, super low transaction fees, and innovative digital financial products and services would render a piecemeal. The verdict on the viability of these schemes was traced to M-PESA in Kenya, launched in 2007. These new schemes have brought people from the cash economy into electronic book-entry money systems. As business models demand different schemes of electronic systems independent of bank systems, each system tends to twist the mechanism through which services and products can be combined to make retail providers of cash-in and cash-out more profitable. This experience has emerged across financial systems to address the business world's demands.

Consequently, several researchers have suggested different pathways to facilitate the digital economy. For instance, Menekse, (2010) decomposed the money service structure into mobile payments, mobile finance, and mobile banking. Klein and Mayer (2011) also indicated that technological developments have unbundled traditional banking services using telecommunication services in mobile banking and mobile money. In this particular context, Uganda's most frequently used services are mobile money, mobile banking, and agent banking (Musa & Annet, 2016). It is evident that such services have substantially allowed the poor to participate in digital systems. For instance, reports released in 2023 indicate that by the end of 2021, 10% (approximately 4 million people) of the population have formal bank accounts, while 53% (approximately 21 million people) use mobile money (Eugene, 2023). In 2019, an increase of 78% was reported (Ministry of Finance & Planning and Economic Development, 2020; Malango, 2020). This is still below the expected percentage of 95% of National Financial Inclusion Strategy II (NFIS II 2023–2028) (Republic of Uganda November 2023).

Other studies have continued to embed digital financial resources for financial inclusion. For instance, Salman et al. (2015) conceptualized financial inclusion using the three dimensions of mobile banking, banking services, and banking penetration while examining their mediating role in the success of small and medium enterprises. Despite the enormous contribution of digital finance to the contemporary economy, little attention has been paid to its constituents. A few studies that have focused on digital finance have not clearly explained its dimensionality. Therefore, the aim of this study is to derive composite indices for digital finance by hypothesizing that:

H₁: Digital finance is multidimensional in nature and is threefold (Mobile money, Mobile Banking, and Agent Banking).

Mobile money

Mobile money is a novel paradigm that has transformed the landscape of financial inclusion while leapfrogging the formal banking sector. This entails moving cash into electronic accounts. This provides a safer mode of transfer and money payment (Liao et al., 2019). Mobile money is relevant in the current study because of its benefits for the poor. The literature suggests two major benefits from mobile money compared to other digital financial services (Liao et al., 2019; Peterson, 2018; Wang & He, 2020). First, digital mobile money has significantly reduced transaction costs in rural areas. Relying on mobile money does not require establishing physical outlets. Second, mobile money facilitates online shopping platforms and social networks. Holding these advantages, Uganda is joining a club of its counterparts to ban the check mode of payment. Indeed, reports indicate that on February 24th, 2022, the Bank of Uganda released a mobile money daily transaction limit of 20 million and a maximum single transaction of 5 million, while lowering the bank check limit to 10 million (Republic of Uganda, 2023). This represents a significant paradigm shift. In addition, on the national agenda of increasing opportunities through digital services, some efforts have been made to combat money laundering and terrorism financing to financially include all the people.

Mobile banking

Traditionally, mobile banking has been a freestanding business that does not put the money of the account provider at risk. Unlike the branch banking functions, it simply stores and transfers money without extending credit to bank account holders. The Kenyan Central Bank used the term cash merchant to describe the mobile banking business (Kelikume, 2021). In this case, cash merchants facilitate the deposition and withdrawal of cash from the customer accounts. It allows people to store and send money in the form of Book-Entry Money (BEM) transmitted electronically. However, this system is guided by banking regulations, usually in partnership with prudentially regulated banks. These merchants invest their own money in business by acquiring the mobile banking accounts of their respective banks. In some countries like India, mobile banking is enhanced by the central bank or reserve bank through the introduction of the InterBank Mobile Payment System (IMPS) (Bhama et al., 2014). This central bank unifies the interoperable infrastructure and enables real-time money transfers between the customer accounts of different banks through mobile phones. The switching infrastructure enables interbank ATM transactions and mobile banking facilities.

Agent banking

'The word agent, together with the acts of depositing or withdrawing money, suggests that merchants perform services on behalf of the account provider.' (Salome & Ofunya, 2015) This simply refers to third-party banking. This is where customers can carry out bank transactions with any of the contracted agents. In Uganda, agents are selected and appraised by the bank and then approved by the Bank of Uganda in this study. Following the regulations passed in July 2017, agent banking was approved to extend services and expand its presence in rural areas. In this way, agent banking boosts the uptake of financial services among vulnerable groups characterized by low literacy levels and immobility. Besides being afraid of making mistakes, people enshrined in poverty have little knowledge of using such devices. Research conducted by the UN Capital Development Fund while supporting the roll-out of agent banking in Uganda emphasizes approachability alongside proximity as a key element in the banking sector (Panturu, 2019). Following the rollout of the agent banking model, various retail entities have been contracted to provide cash-in/cash-out transactions (Salome & Ofunya, 2015). Through this approach, the government can be able to generate an efficient and inclusive system for resource mobilization.

Financial inclusion

As elaborated in the theory, the impetus for financial inclusion can be explained by evolving digital financial services. These innovations are intended to translate into a societal transformation and poverty reduction. In this regard, even though financial inclusion has been defined diversely, all have analogous intentions in different contexts. This study attempts to identify key descriptions of concepts to build richer insights. First, Polloni-Silva et al. (2021) defined financial inclusion as the accessibility of financial services to all, including the most vulnerable people. Demirgüç-Kunt et al. (2008) further described financial inclusion as priceless access to financial services. This definition is in line with Amidžić et al. (2014) who describe financial inclusion as an economic situation in which nobody is denied access to essential financial services based on motivations other than efficiency criteria. Fransiskus and Denise (2021) argued that the key aspect of financial inclusion should be accessibility, regardless of the costs involved. They described financial inclusion as a situation that allows businesses and individuals to access financial services to meet their transaction needs. As long as people can access transaction accounts, they can save money and pay from anywhere. Fransiskus and Denise (2021) further envisaged that when the public is financially included, people will be able to make proper money management decisions. Using the same knowledge and comprehensive multidimensional definition of Sarma (2012), Omar and Inaba (2020) constructed a 3-composite index for financial inclusion, which included penetration/accessibility, availability, and usage of formal financial services. However, the World Bank (2014) identifies financial inclusion as the share of households and firms that can access financial services. Although analogous information is cited in the financial inclusion literature, the majority of existing studies lack empirical validation of the

distinction between usage and accessibility. However, accessibility takes precedence over usage. In other words, although accessibility and usage have been conceptualized as similar paradigms, the former determines the latter. Therefore, we hypothesize as follows:

H2: Financial inclusion significantly influences usage of financial services.

In other instances, two-way causality was decorated. Peterson (2018) demonstrated that more digital finance leads to greater levels of financial inclusion. This argument is premised on Rogers' diffusion theory (2003), where low-income users of digital financial services can persuade their friends in poor communities to use the same at their convenience. Thus, excluded people are persuaded to open bank accounts and register on mobile money services. These services automatically and grossly melt into financial inclusion. Conversely, financial inclusion can cause bank account holders to be aware of more digital financial products and services in the digital world that they can use for more convenience (Peterson, 2018). This paradigm is insightfully connoted by Law (2024) who eludes that social acceptance of digitalization contributes to the adoption network. With such a theoretical connotation, financial inclusion translates into a greater use of digital financial services. This aligns with Mu-Chen et al. (2022), who posit that digital financial services provide the premise for leveraging digital financial technologies to meet people's needs in an affordable manner. Even though clear benefits have been painted, the 'what influences what' notion remains unexposed. Although streams of research demonstrate theoretical landscapes on which digital finance interrelates with financial inclusion, this study provides rich pragmatic evidence by hypothesizing that:

H3: Digital finance and financial inclusion are distinctly different but related.

Due to the multiplicity of the mechanisms through which digital finance and financial inclusion interact, an attempt is made to examine the individual effect of digital finance on the usage of financial services in Uganda. To clearly and fully articulate their relationship and assess what influences the other, the current study is guided by the conceptual framework shown in Figure 1.

Usage of financial services

The usage of financial services is part of the five pillars of the financial inclusion agenda highlighted in the National Financial Inclusion Strategy (NFIS) 2019–2022 of Uganda. This approach is designed to broaden and formalize the saving culture (Bank of Uganda 2022). To this end, the use of financial services is reflected by an increase in the size and stability of the deposit base. One would expect increased usage of financial services to lead to better transmission of monetary policy, thus contributing to financial stability. As one of the key programs included in the Bank's strategic plan 2017–2022, a network of regulators involved in financial inclusion needs to be committed to developing and implementing an affordable financial system for all. The literature and theoretical connotations indicate that the commitment of critical stakeholders allows information to be provided to all households (Dearing & Cox, 2018; Rogers, 2003). Reports indicate that even though financial inclusion in Uganda was recorded at 78% of the adult population in 2019, the usage of formal financial services only accounted for 58% of 28% in 2006 (Republic of

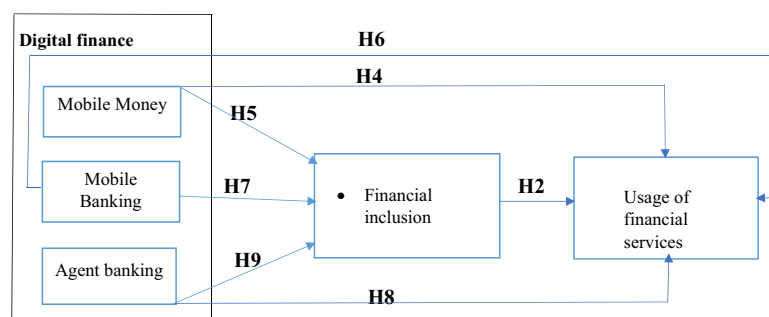


Figure 1. Conceptual Frame work: Adopted from Peterson (2018) and Wang and He (2020), and modified by the researcher.

Uganda, 2017). The implication is that not all banked categories of adults use financial services. Such discrepancies remain unclear in the existing literature. Therefore, this study seeks to examine whether financial inclusion guarantees the use of financial services, as hypothesized in the next section.

Empirical studies on digital finance, financial inclusion, and usage of financial services

The literature explains the contribution of digital finance to different contexts. Many studies have investigated the key elements of digital finance in facilitating financial inclusion and usage of financial services. This study seeks to unearth related knowledge on particular dimensions of digital finance to enrich the body of knowledge indicated in subsequent sections.

Firstly, Musa and Annet (2016) used 2013 Uganda FinScope data to assess mobile money and individual savings as a pathway to financial inclusion. Their findings indicated that the use of mobile money is more prevalent in urban and central Uganda than in rural areas. It was evident that the rate at which rural dwellers used mobile money to save was very low. The limitations to mobile money usage, including lack of interest, high costs, and poor infrastructure, were also revealed. It is based on this fact that more than half of the population saves by saving clubs, village groups, and rotating savings and credit associations. This is contrary to the findings of Tarna (2021), who affirmed that businesses generally use mobile money services weekly. The report indicates that a significant portion of rural households in sub-Saharan Africa use mobile money on a weekly basis despite their low voluntary rate of bank penetration. Regardless of these contradicting arguments, mobile money continues to be a significant driver of financial inclusion in sub-Saharan Africa. In this context of the study, we therefore, hypothesize that:

H4: Mobile money services significantly influence the level of usage of financial services.

H5: Mobile money directly and significantly influences the level of financial Inclusion.

From a different perspective, other researchers shed light on the impact of mobile banking on financial inclusion. For instance, Stephen and Sibert (2014) adopted a qualitative research methodology and survey design while investigating the impact of mobile banking on financial inclusion in the Masvingo District of Zimbabwe. The sample of 270 respondents revealed that low-income people are willing to adopt mobile banking because of its accessibility, convenience, and ease of use. Consequently, unbanked people can enjoy financial activities at their convenience. Nur et al. (2014) add that several factors influence behavioral intentions to adopt mobile banking. 'In short, as we think of including unbanked people in the system, consideration should be given to perceived financial cost, perceived risk, and subjective norms.' The results from an effective sample of 555 respondents indicate that perceived financial cost is the most significant factor hindering people from banking via cell phones. Rolf and Darbellay (2010) add that the usage of mobile banking is not dependent on technological advancement, but rather on the user's confidence in the service provider. The oversight provided by competent and prudent financial institutions plays a significant role in attracting mobile banking users. In Uganda, the supervisory regime must be guaranteed to attract the use of financial services. To affirm this assertion, we hypothesized the following:

H6: Mobile banking significantly and positively influences the usage of financial services.

Regardless of the existing regulatory regime in Uganda, financial inclusion remains a national strategy aimed at having every Ugandan access a broad range of quality and affordable financial services anchored on four pillars: financial literacy, consumer protection, financial innovation, and financial service data and measurement. These pillars are complemented and supplemented by other national strategies that are likely to affect accessibility (Republic of Uganda, 2017). Other empirical evidence provided by Ezzahid and Elouaourti (2021) indicates that educational attainment and participation in the labor market raise the impetus for financial inclusion. Ezzahid and Elouaourti (2021) further indicate that, even though costs and remoteness are responsible for the usage of financial services, mobile banking continues to loosen all barriers to financial inclusion. In the current study, we therefore hypothesize as follows:

H7: Mobile banking has a direct and significant influence on financial inclusion.

On the other hand, Ebong and George (2021) used the rate-of-change approach to unravel the trend and momentum in banking and the uptake of financial services in Uganda. Secondary data obtained from the Financial Access Survey were used. It was discovered that digitizing payment channels through agent banking increased financial inclusion and the overall usage of financial services. Muoria and Moronge assessed the factors that affect the adoption of agency banking in Kenya (2018). The results derived from a sample of 120 agents in Kiambu City revealed that customer awareness stimulates the adoption of agency banking. The findings partly contribute to the level of financial inclusion within the scope of this study. They conclude that the branchless banking model enables the unbanked population to be financially inclusive. A related study on commercial banks was also conducted in Nyeri County, Kenya. These findings indicate that security and liquidity deter customers from using agent banking. In addition, customers are unwilling to pay extra charges to secure services from agent-banking outlets. Even though agent banking requires constant supervision and monitoring, which may increase costs, financial institutions must permit digital services while shrinking middle management and clerical workers. To enrich the knowledge of this phenomenon, the current study seeks to ascertain the extent to which the use of financial services is influenced by agent banking. Therefore, we hypothesize as follows:

H8: Agent banking directly and significantly influences on usage of financial service in the context of Uganda.

In addition to the benefits of agent banking in emerging markets, agent banking outlets provide a wider accessibility dimension in the formal banking system. As bank branches and ATMs are located in urban areas, unbanked rural dwellers remain undetermined. This creates a barrier for a significant population of unbanked people to access financial services. Although the objective of agent banking is to extend services to the unbanked, research shows that customers avoid using outlets because of perennial cash shortages (Nisha et al., 2020). On the contrary, the findings of Salome and Ofunya (2015) on three commercial banks and their respective agent banking outlets indicate that liquidity was not a problem for agency banking agents. Other studies in other countries, such as Bangladesh, highlight agent banking as an effective and credible way of entrenching financial deepening across unbanked areas despite the risks associated with outlets (Nisha et al., 2020). There is also upcoming evidence that transacting with agents deepens clients' experience with financial services, and thus improves their financial capabilities. From the providers' perspective, agents reduce transaction costs and expand service delivery, although they often have lower levels of training and accountability than branch staff, raising concerns about service quality. From the principal bank's side, Sinja et al. (2023) note that agent outlets reduce operational costs while expanding the scope of service delivery, despite raising concerns about service quality. In this context of study, we therefore hypothesize that:

H9: Agent banking positively and significantly impacts on financial inclusion in the context of Uganda.

Gianfrate et al. (2021) note that although accessibility is key to the financial inclusion landscape, it does not mean usage. Instead, the financial service accessibility of the unbanked is driven by a key player or leader called an earlier adopter. This is still based on segments of social groups and interactions. Musa and Annet (2016) further revealed that financial inclusion is anchored in the awareness and creation of synergies between commercial banks and telecom companies through digital finance. The implication is that when people use digitalized systems, financial inclusion trends must be realized first. However, research in other countries, such as China, indicates that intentional exclusion may limit the use of digital financial services. In this sense, exclusionary attitudes might emanate from socio-demographic factors and the quality of financial institutions (Aisaiti et al., 2019). Although the theoretical connotation of Rogers (2003) confirms this assertion, the narrow argument of Rekha et al. (2021) indicates that the accessibility of financial services is not about digitalized systems, but creates an environment conducive to economic growth. Their findings were based on panel data for a period of five years, from 2004 to 2017, for 22 emerging economies. The study shows that the nexus of ICT diffusion and economic freedom has a gradual impact on the usage of financial services. On the other hand, the findings of Candiya and Ntayi (2020) from 36,640 micro, small, and medium enterprises located in northern Uganda indicate that the use of financial services requires customers to have enough information to protect themselves from unfair service provider practices. Otherwise, fraudulent actions would deter customers from using

mobile devices. Indeed, Svensson and Gudrun (2010) clearly indicate that accessibility to mobile money does not inevitably decrease usage. There is a need to develop a progressive policy to nurture people in the system. In other words, the financial inclusion agenda may not be fully realized without users appreciating the use of financial services. The current study hypothesizes the following:

H10: Financial inclusion mediates the influence of digital financial services on usage of financial services.

Although several studies focus on digital finance and financial inclusion, the literature remains scant on drawing clear lines between the paradigms using empirical data. The theoretical narratives on innovation diffusion trending in the literature are silent about adopter characteristics, which this study seeks to unveil. On the other hand, although the extant literature reveals a significant contribution of digital finance in developing economies, the current study is limited to the establishment of viable unbundled services in the study context that are adoptable. To a greater extent, insights drawn from the literature are based on panel data. A few studies that investigated this phenomenon using empirical data paid attention to tax revenues in non-African countries. Therefore, the current study seeks to broaden this knowledge by pragmatically using data from households within 15 districts in Uganda that benefit from the Uganda Multi-Sectoral Food Security and Nutrition Program. In this regard, this study is expected to provide a reference for the government's financial inclusion strategies by curtailing digital systems to meet community needs.

Material and methods

Instrument development

Instrument development began with a theoretical development and literature review. The items generated from the literature were amended to fit the context of the study. The intent was to confirm the theoretical structure of digital finance and examine the extent to which it relates to financial inclusion and usage of financial services. Existing validated scales from the literature were suitably redesigned for the current study, and the other items were self-generated. The content of the instrument was validated by experts from the Faculty of Management Science at Muni University. Some items were adjusted to fit the context of the study, whereas others were excluded. New questions were posed during the session. A five-point Likert scale was applied in this study, in which 1 represents strongly disagree and 5 represents strongly agree. The questionnaire was piloted on 20 household heads to check for normality, suitability, and reliability. The results from the pilot indicated that all the data were skewed within ± 3 , and construct scales exhibited a high level of reliability. In all cases, Cronbach's alpha coefficients were above the threshold of 0.7. To examine the internal consistency of the content structure, exploratory factor analysis was also performed. All scale items for the constructs that loaded less than 0.5 were excluded. The eigen values for all constructs are greater than 1, and the cumulative percentage of variance explained is 62 percent. The results for reliability and factor loading for the measurement scales exposed to the large-scale survey are presented in [Table A1](#) in the appendix.

Population and research design

This study used a cross-sectional survey design. Quantitative data were collected at one point through face-to-face interactions with the head of the leading household. The fact that the households in question are diverse in terms of culture and behavior, their responses to digital financial services, and the adoption of financial inclusion differ (Van Everdingen & Waarts, 2003). This means that a cross-sectional survey of samples derived from each district would generate quality data for the national policy. In this study, lead households were those that participated in nutrition promotional activities in the catchment areas of government-aided primary schools located in 15 districts of Uganda. A total of 1451 lead households attached to a particular primary school benefiting from the Uganda Multi-Sectoral Food Security and Nutritional Project (UMFSNP) (Ministry of Agriculture 2021; The World Bank, 2022). These districts were Arua, Bushenyi, Kasese, Yumbe, Maracha, Kiryandogo, Ntungamo, Isingiro, Bugiri, Kabarole, Kyenjojo, Nebbi, Iganga, Kabale, and Namutumba. These district selection criteria were based on the 2011 regional

rankings of demographic and health surveys (Uganda Bureau of Statistics, 2011). The selection criteria were based on low dietary diversity, an indicator of the severity of non-monetary poverty for which financial inclusion is prioritized (Bob & Edoardo, 2002, Republic of Uganda November 2023). Financial inclusion opens blocked advancement opportunities for disadvantaged segments of the global population (Omar & Inaba, 2020). As noted by Tu et al. (2001) the success of a large-scale empirical survey depends on the quality of respondents. Therefore, in the current study, lead households are of great interest in generating valuable information on the key issues investigated.

Sampling and sample size

To identify manageable samples with a level of accuracy and precision and to provide exhaustive data about the phenomenon, sampling began by creating a database of all government-aided schools in the selected districts that participate in the UMFSNP. The schools in this study form a metric for identifying lead households. A stratified selection procedure was followed to allow equal participation by households in each district. Depending on the number of government-aided schools in the district that participate in the UMFSNP, a random sample of EMIS numbers (Education Management Information System Number) as provided by the Bureau of Statistics in collaboration with the Ministry of Education and Sport (MoES, 2020) was selected. A sample size of 308 was selected based on the Singh and Masuku (2014) approach, with a 95% confidence level. It should be noted that the randomized numbers removed all hints of bias while selecting the lead household attached to the school. Upon successful sample size determination, the snowball approach was employed to identify lead households retrospectively with their adult heads. Adults aged at least 18 years and under 60 years of heading lead households formed a unit of inquiry. This age range is legally applicable to financial inclusion clientele (Aisaiti et al., 2019; Chan, 2010).

Large-scale survey

The large-scale survey began with obtaining clearance from the Research Ethical Committee and Uganda National Council for Science and Technology. A research letter addressed to the production department of the district local government was provided by the Faculty of Management Science. In liaison with the production office, the project coordinator was contacted to identify lead households and their heads. The questionnaire was translated into five local languages (Runyakitara, Rukonjo, Lusoga, Lugbara, and Runyoro) from the five regions in which the target sample was located. A total of 308 questionnaires were physically distributed, and only 290 (94.2%) were successfully collected. Uncollected questionnaires were a result of non-compliance and excuses of not having time raised by the heads of lead households. Data collection was conducted over a period of two weeks in September 2023. In a situation in which the respondent was unable to read and write, care was taken to respect the informant's interests, sensitivities, and sentiments in answering the questions on his or her behalf. Nevertheless, Marshall (1996) warns that any difference in status between informants and researchers should be keenly considered; otherwise, bias may distort the quality of data elicited.

Analysis

The analyses were performed using SPSS version 23 and AMOS version 22. The structural equation modeling procedure was followed to assess the measurement model and construct the structural equation model. This is preferred because it allows the simultaneous assessment of a series of dependent relationships. Confirmatory Factor Analysis (CFA) was conducted to justify the content theoretical structure of the study constructs (Gerbing & Anderson, 1988) and to validate the measurement models. Convergent validity, composite reliability, and discriminant validity were assessed by determining fit indices (Bentler, 1990). Appropriate fit indices were obtained for all the cases. As indicated in the literature, unidimensionality and reliability are important for establishing valid constructs (Yan & Yanyun, 2019). Finally, a full-fledged Structural Equation Modeling (SEM) procedure was performed to assess the model fit and calculate the prediction estimates.

Ethical consideration

This study was approved by research ethical committee of Makerere University College of Humanities and Social Science. Data collection procedures that involved human participation complied with ethical standards as laid down by the ethical committee.

Consent statement

The study was conducted in 15 districts of Uganda that are embodied with four different languages. The informed consents template provided by the research ethical committee was translated into four languages using professional translators. The translated informed consent forms were provided to the individual household benefiting in Uganda Multi-Sectoral Food Security and Nutritional Program (UMFSNP) to fill; in their most fluent manner. The participants were requested to indicate whether they agree to participate in the study. Written consent was first obtained from the Program coordinator at the district and later filled consent forms were obtained from individual's heads of households.

Results

Validation of digital finance measurement model

The first and third hypotheses necessitate the assessment and validation of the multidimensionality of digital finance and how distinctive it is from financial inclusion (Figure 2). A measurement model was established, and the fit indices were assessed for 290 responses. The results for the three-factor model indicate that the model-to-data fit indices were within the acceptable ranges: the relative chi-square (χ^2/df) = 1.596, comparative fit index (CFI) = 0.962, and Tucker Lewis Index/Non-Normed Fit Index (TLI/NNFI) = 0.957. The root mean square error of the approximation (RMSEA) = 0.045. The χ^2/df ratio shows a rough estimate of the statistical fit of the model versus the estimated number of factors. In this case, χ^2/df should be less than 3. The cutoff point of RMSEA is 0.08, while NNFI and CFI should be greater than 0.8 (Daire et al., 2008; Hair et al., 1998; Yan & Yanyun, 2019). In addition, the results indicate that mobile money, mobile banking, and agent banking are significantly related and their residual values do not reveal any significant problematic sequences. During analysis, a few problematic cases were identified and eliminated. mm1, mm8, mm9, mb1, fa6, fa7, and fa8 are deleted from mobile money, mobile banking, and financial inclusion, respectively. This is because they have extremely high error terms.

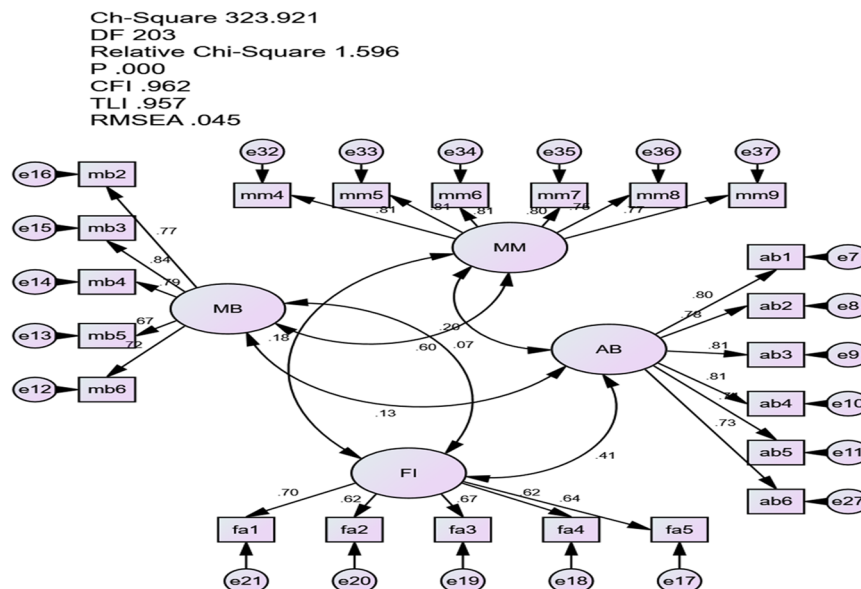


Figure 2. Measurement model for Digital finance.

Further steps were taken to validate the model constructs by examining their distinctive characteristics. Composite reliability, convergent validity, and discriminant validity were calculated. This was achieved by first extracting the standardized coefficients of the observed variables from their latent constructs. Convergent validity was first examined by computing the average variance extracted. The results in Table 1 show that the Average Variance Extracted (AVE) for each construct exceeded the threshold of convergent validity of 0.5. To check whether the observed variables explain their construct better than others, the square root of the variance extracted for each construct was compared with correlations of other latent constructs.

In this case, if digital finance and financial inclusion are discriminant in nature, all square root values of AVE for each service indicated along the diagonal in Table 1 should be larger than their correlations with other constructs indicated below the diagonal. Zait (2011) adds that discriminant validity exists if the observed variables share more common variance with their respective latent constructs than any other interconstruct variances. Indeed, the AVEs are larger than the shared variances above the diagonal. In addition, the composite reliability of individual services was assessed and indices were computed. In all cases, the indices were significantly high (above the threshold of 0.7) (Yan & Yanyun, 2019). Mobile Banking: 0.869; Mobile Money: 0.882; Agent Banking: 0.9; and financial inclusion: 0.7871. The CFA confirms the first hypothesis (*H1*). The results indicate that the three dimensions of digital finance in the context of Uganda are distinct, although related in nature.

The third hypothesis (*H3*) is also supported by the data. The results clearly show that financial inclusion is conceptually different from digital finance, although a relationship exists. This finding is important because a number of researchers have not empirically tested this assertion. The existing literature ambiguously presents the two while relating them independently to taxes and other fiscal elements. Although causality has been tested in some studies, awareness, accessibility, and usage of financial services continue to appear in financial inclusion realms.

Results of the structural equation model

To assess the path coefficients, the measurement model shown in Figure 2 was established and tested for model-to-data fit. On fitting 'usage of financial services' as a dependent variable in the model, a few problematic cases with error terms surpassing 0.08 were witnessed. This led to the deletion of some observed variables from the usage of the financial service variables and financial inclusion. After eliminating problematic cases, the overall structural model was improved. Thereafter, all data-to-fit indices were within acceptable ranges, as shown in Figure 3. Indeed, Yan and Yanyun (2019) posit that the NNFI and CFI should be above 0.9, while χ^2/df of less than 3 is appropriate. In addition, RMSEA was 0.055, which is within the acceptable range. As illustrated in the conceptual framework, six additional hypotheses were developed and tested. This framework indicates that financial inclusion mediates the influence of digital finance on the usage of financial services. The effects of individual digital finance dimensions on the use of financial services were hypothesized. Structural equation modeling was performed to assess these relationships.

Based on the structural equation model, the standardized beta coefficients and their respective p-values were examined. The path coefficients were determined and tested at a 95 percent confidence level. Of the eight hypotheses (*H2, H4, H5, H6, H7, H8, H9, and H10*) tested in this section, four (*H4, H7, H8, H9, and H10*) were supported, as indicated in Table 2.

Table 1. Average Variance Extracted, Discriminant Validity and Composite reliability.

	MM	MB	AB	FI
Mobile money (MM)	0.757	0.372	0.044	0.137
Mobile Banking (MB)	0.603	0.781	0.026	0.04
Agent Banking (AB)	0.199	0.16	0.739	0.311
Financial Inclusion (FI)	0.177	0.068	0.408	0.652
Composite reliability	0.882	0.869	0.908	0.7871
Average Variance Extracted (AVE)	0.547	0.573	0.611	0.558

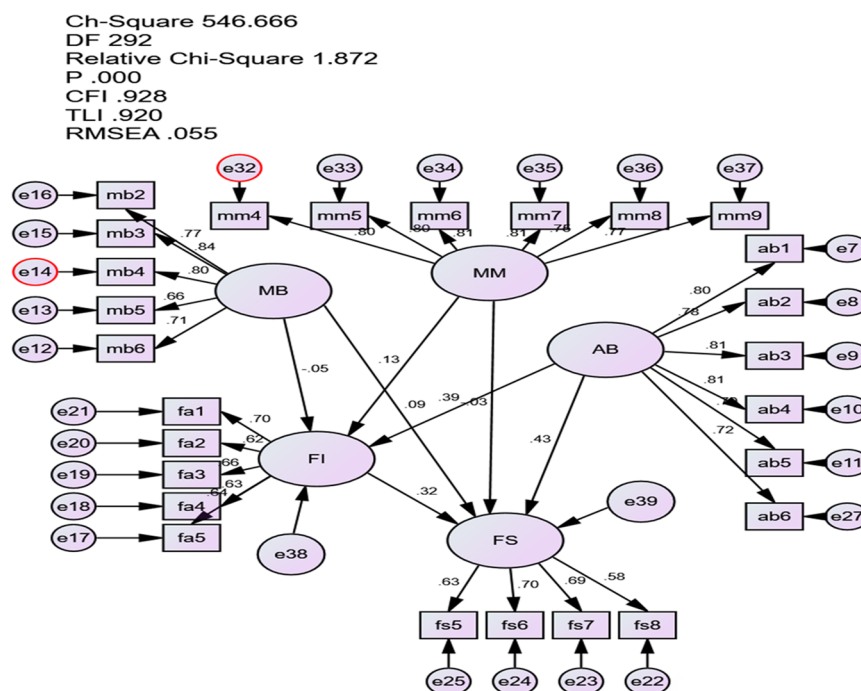


Figure 3. Structural equation model.

Table 2. Standardized Beta Coefficients, Standard Error (S.E), CR, and p -values of structural equation model.

Hypothesis	Path	β	S.E	C.R	p	Remark
H4: Mobile money services significantly influence the level of usage of financial services	FS < -MM	-0.034	0.038	-0.551	.581	Not significant
H5: Mobile money directly and significantly influences the level of financial inclusion (b)	FI < -MM	0.135	0.039	2.04	.041	Significant
H6: Mobile banking significantly and positively influences the usage of financial services (c)	FS < -MB	0.092	0.051	1.465	.143	Not significant
H7: Mobile banking has a direct significant influence on financial inclusion (d)	FI < -MB	-0.052	0.051	-0.78	.436	Not significant
H8: Agent banking has a direct and significant influence on the usage of financial services (e)	FS < -AB	0.43	0.05	5.32	.000	Very significant
H9: Agent banking positively and significantly impacts financial inclusion (f)	FI < -AB	0.391	0.043	5.316	.000	Very significant
H2: Financial inclusion influences the usage level of financial services (g)	FS < -FI	0.32	0.088	3.837	.000	Very significant
H10: Financial inclusion mediates the influence of digital finance on the usage of financial services	b*g=0.043 (>a) d*g=0.017 (<c) f*g=0.125 (<e)					Full mediation Partial mediation Partial Mediation

Discussion

The first hypothesis ($H1$) sought to establish the underlying factor structure of digital finance. This was achieved by first performing an exploratory factor analysis to observe the loading patterns of the observed variables. The three-component structure was empirically tested for convergent and discriminant validity and composite reliability. Although some researchers posited different factor structures that explain digital financial services (Klein & Mayer, 2011; Omar & Inaba, 2020), others paradoxically decomposed them from financial inclusion. This study provides more insightful evidence derived from Uganda, indicating that the three-factor structure model of digital finance is empirically valid. These facts were established by asking questions about existing financial services, affordability of the services, requirements for registration, the nitty-gritty of the financial system, and possession of mobile gadgets. In this context, mobile money, mobile banking, and agent banking align to explain digital finance.

The second hypothesis ($H2$) aimed to establish the distinction between digital finance and financial inclusion. This was achieved by modifying the digital finance model and adding the financial inclusion measurement model. The model indices improved with modifications. These results suggest that digital

finance differs from financial inclusion. Financial inclusion was explained by the extent to which adults were aware of financial services and whether they could access them. Further insights were generated by the results, suggesting that the existing digital finance systems do not mean accessibility. Evidence of this effect was provided by the fit indices of the overall measurement model. Therefore, the validated structure strengthens the existing theoretical structures provided by Musa and Annet (2016). The findings further support Morgan and Pontines' claim (2014) that financial inclusion is about increasing the opportunities for the unbanked to access financial services. To this end, the first and second objectives are achieved.

The third and fourth objectives examined the effect of digital finance on financial inclusion and usage of financial services. Six hypotheses (*H4*, *H5*, *H6*, *H7*, *H8*, and *H9*) were developed and tested.

The fourth hypothesis (*H4*) examines whether mobile money significantly influences the usage of financial services. However, this claim was not supported in any way. This implies that the introduction of mobile money services does not influence the usage of financial services. In this context, although mobile money is recognized as a vital mechanism that facilitates transactions, these services do not provide an impetus to use financial services. Although telecommunication companies foster SIM card registration and mobile money usage, it is likely that the acquisition and possession of mobile phones does not translate into the usage of financial services. Service providers, in conjunction with financial institutions, need to provide advisory services to communities. This reliance on the findings is supported by the fact that the instructional guidelines provided by financial institutions through mobile services are probably not explained to the bank account holder. Otherwise, 'mobile money movement' would be expected to create an opportunity for the unbanked to frequently use financial services at their convenience. Despite the lack of support for the role of mobile money in stimulating the use of financial services, one should not ignore its substantial potential to alter the economic path of the poor in emerging economies. The implication is that financial institutions must clearly identify user bases and create clear synergies with both private and public institutions to manage SIM registration, security, and authenticity. These policy concerns are likely to play an important role in stimulating the use of financial services.

The fifth hypothesis (*H5*) asserts that mobile money directly and significantly influences financial inclusion. The result supported Menekse's claim (2010) that mobile money creates an opportunity for the financial inclusion of the unbanked. Despite the challenges inherent in developing economies such as Uganda, the results provide more affirmative evidence on the positive impact of mobile money services on financial inclusion. This is done in terms of accessibility, ease of use, and awareness. Even though Musa and Annet (2016) claimed that mobile money usage in rural areas is very low compared to urban areas, it is likely that mobile money has undoubtedly facilitated transactions in rural areas and, most importantly, amongst the poor. Surprisingly, the majority of respondents indicated that mobile money is a viable option for sending and receiving money. On an average, a score of 4.2 on a scale of 5 was obtained, indicating that mobile money is becoming affordable and efficient.

The sixth hypothesis (*H6*) seeks to establish the extent to which agent banking impacts and influences the usage of financial services. These findings indicate that agent banking enables financial inclusion. This finding accurately explains the reason for the establishment of agent banking outlets. Their ability to stretch working hours beyond what principal banks offer ideally provides usage opportunities for customers. Although bank agents are regulated by their principal banks, they are privately managed, along with other cashless transfer businesses. Therefore, their operating time is solely determined by business owners. Probably, owing to the increased availability of services, people are able to transact any amount at any time. The rate of transactions with banks depends highly on the availability of bank agents. It is also likely that these bank agents provide extra services that raise awareness of other services provided by their principal banks. The implication is that banks need to allow agency businesses to stretch their arms to cheque-cash conversions, foreign currency conversions, and other mega-international transactions. This finding is important for policy formulation by financial institutions. When agents are allowed to operate and facilitate transactions such as a branch, the usage of financial services is likely to be broadened among the beneficiaries of the UMFSNP.

The seventh hypothesis (*H7*) predicts that mobile banking significantly influences financial inclusion. However, this claim was not supported by the data. The path coefficient of -0.052 is insignificant at $p < .1$

($t = -0.78$). Even though the use of mobile phones has sprouted in Uganda, it is probable that mobile banking services are not known among rural dwellers, especially the beneficiaries of the UMFSNP. Thus, mobile banking has not affected the accessibility, safety, or affordability of financial services. Because mobile banking is an interface between financial institutions and telecommunication companies, it is likely that participants in the UMFSNP do not appreciate its role. As indicated and connoted by Michael and Colin (2011) for customers to benefit from mobile banking, they must have bank accounts with the financial institution. Failure to support the hypotheses in this study may not be unusual. The findings support the theoretical position of previous studies, which indicate that uncertainty and insecurity ushered in by a lack of awareness delude adoption behavior (Changchit et al., 2017; Sandip and Md Nazirul 2021). It is likely that the majority of the UMFSNP participants did not have bank accounts. This process also requires registration of the SIM card and submission of a national identity card, which seems tedious. On the contrary, it is likely that mobile banking benefits those who transact large volumes of money other than airtime transfers. Nonetheless, the respondents indicated that they were not knowledgeable about buying airtime from their bank accounts, with an average of 3.02 on a five-point Likert scale. The results suggest that mobile money services can be used independently through money transfer and savings. However, registration in mobile money does not translate into the use of digital finance.

The eighth hypothesis (*H8*) predicted the influence of financial inclusion on the usage of financial services. The results strongly support this prediction with a high level of significance. This implies that accessibility, affordability, and security are guaranteed when the financial inclusion agenda is cherished. Thus, people can open accounts with financial institutions and save them. Absolutely, from an ideal point of view, one would expect accessibility to enable usage. Although some researchers such as Gianfrate et al. (2021) argue that accessibility does not mean usage, the findings continue to affirm the conventional assertion of access to usage causality. Indeed, our findings concur with the connotations of Muoria and Moronge (2018) who recognized agent banking as a branchless banking model that enabled the unbanked population to open accounts with banks. This finding also shows that when people are embedded in a financial inclusion system, they can receive financial knowledge. This reduces irrational risk perceptions and thus translates automatically into usage. Although some researchers have presented startling findings, the results of the present study remain in agreement with conventional postulations while considering the favorable economic environment. The implication is that when participants and beneficiaries of the UMFSNP embrace mainstream financial inclusion, they will be able to reduce the frequency of visiting the bank for even small transactions. Ultimately, the program implementation becomes efficient and effective.

The ninth hypothesis (*H9*) is concerned with the influence of agent banking on financial inclusion. These results support this claim significantly. Thus, financial inclusion is strongly associated with the establishment of bank agents in this study context. The findings indicate that most banks have agents in nearby towns. The results indicate that people have confidence and trust in the use of bank agents. The respondents strongly agreed that agent banking facilitated school fees payments. Even though banks segregate and delegate some services, the most pronounced responsibility of agent banking is observed in school fees payments, with the highest average of 4.3 out of 5 on a 5-point Likert scale. As a means of branchless banking, one may think that school fees payments via bank agents require banks to open accounts with the principal bank. This assertion is supported by the results of the current study.

The tenth hypothesis (*H10*) predicted the mediating role of financial inclusion on the effect of digital finance on the usage of financial services. The results from a full-fledged structural model strongly support the prediction, with a significant beta coefficient. The mediation effect was most pronounced with mobile money compared to agent and mobile banking. These results agree with the postulations of Morgan and Pontines (2014) and Ebong and George (2021), which indicate that when people access mobile money, they are motivated to adopt and use financial services.

The implication is that when beneficiaries of the UMFSNP are financially included, they automatically use financial services. Thus, it is important to ensure that digital financial services are affordable and accessible. Otherwise, it remains in the financial domain of the wealthy. This finding is important because it confirms the findings of Candiya and Ntayi (2020) which clearly highlight the awareness of digital finance and fair treatment by service providers as fundamental drivers of usage. More importantly, as the

government seeks to extend financial inclusion boundaries to the unbanked, efforts should focus on increasing the accessibility and affordability of digital financial services. Again, when the government thinks of launching any program among vulnerable groups, it is important to recognize the role of digital finance. This means that, even though people can transact using their mobile phones, they are still encouraged to open bank accounts. For instance, in this particular context, where participants in the UMFSNP receive money through the district local government, it would be prudent to use the digital financial services highlighted in this study. To this end, an integrated system embedded with digital finance links the beneficiaries of the UMFSNP with sponsoring organs. This would eliminate bottlenecks in the logistical costs and procedures involving local government officials.

Conclusion and recommendation

This study examined the component structure of digital finance and its influence on financial inclusion and usage. A three-dimensional structure of digital finance was developed and validated for convergence and reliability using empirical data. Digital finance was found to be multidimensional, with three constructs. All the validity and reliability indices were within acceptable ranges. The extent to which digital finance impacts the level of financial inclusion and usage of financial services is assessed by examining the standardized path coefficients. In view of the findings and based on the hypothesized relationships, it can be concluded that the dimensions of digital finance impact financial inclusion and usage of financial services. With the exception of mobile banking, agent banking and mobile money significantly and positively impact financial inclusion. Agent banking significantly influences financial services use. The mediating role of financial inclusion in the effect of digital finance on usage was also found to be significant. The implication is that when more unbanked people are financially included, there is likely to be an increase in the usage of financial services. However, the study recommends that financial institutions invest more in establishing and leveraging banking services through bank agents like clearing cheques. In addition, for the unbanked to be included, it is worth noting that mobile money and agent banking are key, despite the existing challenges of unfair treatment of service providers. It is important for the government, in conjunction with financial institutions and telecommunications services, to establish a framework that disallows certain transactions to be effected by cash.

Authors contributions

Nickson Nagaaba: Conceptualization of the study, literature review; research design and methodology; discussion of results and writing the first draft.

Rehema Batamuriza: Instrument development, ethical clearance, data collection, sequential arrangement of tables and figures.

James Basuta: Instrument development, data collection; data cleaning; review and editing

Maryvian Owomugisha: Conceptualization, review of the instrument, critical review of the manuscript for publication.

All authors have read and approved the final version of the manuscript, thus rendering them accountable for all aspects of the work.

Consent form

As authors, we provide outright permission to publish this manuscript, including author details.

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Data availability statement

Supporting data for this study are available upon reasonable request from the corresponding authors.

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Appendix

Table A1. Reliability and exploratory factor analysis.

Constructs		Factor loadings	Mean	Skewness	Kurtosis	Std. Deviation	Cronbach's	cumulative %ge of variance
DIGITAL Financial Services								
Mobile Money								
mm1	I do not experience mobile money failure in the form of system failure and network failure	0.596	3.05	-0.452	-0.924	1.301	0.911	18.08
mm2	I am aware of basic financial services like mobile money	0.645	3.70	-0.659	-0.818	1.37		
mm3	I have ever saved money on mobile money	0.627	3.85	-0.86	-0.42	1.295		
mm4	I have been borrowing money cash on mobile money	0.776	3.64	-0.581	-0.962	1.389		
mm5	For the last 12 months, I have not submitted any complaint.	0.764	3.73	-0.555	-0.9	1.277		
mm6	I comply to the terms, conditions and requirements of mobile money	0.794	3.67	-0.518	-0.797	1.219		
mm7	Mobile money is an affordable and efficient alternatives for transaction	0.806	4.2	-0.875	-0.372	1.211		
mm8	Mobile money allows dispute resolution and handling based between customers and service providers	0.768	3.65	-0.611	-0.729	1.273		
mm9	On a monthly basis I receive and send money to organizations using Mobile money	0.783	3.81	-0.737	-0.532	1.255		
Mobile banking								
mb1	I know how to transfer or convert money on my account into airtime on my phone	0.805	3.71	-0.664	-0.888	1.384	0.858	34.284
mb2	I comply to the terms, conditions and requirements of Mobile banking	0.778	3.63	-0.718	-0.775	1.362		
mb3	Mobile banking allows a customer to transfer money from account to mobile money	0.769	3.84	-0.973	-0.008	1.201		
mb4	Mobile banking allows depositing and withdrawing money from the bank	0.779	4.02	-1.137	0.544	1.09		
mb5	On a monthly basis I receive and send money to organizations using mobile banking	0.672	3.62	-0.661	-0.727	1.299		
mb6	I am aware of basic financial services like Mobile banking	0.659	3.78	-0.818	-0.369	1.208		
Agent banking								
ab1	There are many bank agents in our nearest town	0.76	3.66	-0.604	-0.937	1.385	0.901	45.665
ab2	Every financial institution has the agent outlet	0.718	3.75	-0.582	-0.865	1.274		
ab3	Bank agent outlets have enough cash to facilitate transactions like school fees payment	0.797	4.3	-0.808	-0.507	1.219		
ab4	I find Agent banking outlets secure to transact with any time beyond set banking working hours	0.773	3.68	-0.576	-0.776	1.267		
ab4	Agent banking allows a customer to pay bills	0.691	3.66	-0.612	-0.733	1.275		
ab6	I make at least one transaction through agent banking every month	0.743	3.82	-0.748	-0.527	1.257		
Usage of financial services								
fs1	I make payments or receive money through inter-account transfer	0.726	3.64	-0.729	-0.751	1.36	0.903	55.045
fs2	There are innovations provided by service providers to enhance the usage of financial services e.g. system integration	0.71	3.84	-0.974	-0.012	1.203		
fs3	I transfer money via financial institutions	0.696	4.03	-1.165	0.604	1.098		
fs4	Mobile money is safer and more convenient	0.734	3.63	-0.657	-0.734	1.296		
fs5	I get loan from financial institutions	0.681	3.79	-0.839	-0.325	1.205		
fs6	I use a mobile phone to make payment	0.691	3.87	-0.966	0.108	1.17		
fs7	I am saving money with banks at least monthly.	0.714	3.79	-0.787	-0.293	1.172		
fs8	I am saving money for the future demand and investments using financial institutions	0.648	3.83	-0.845	-0.326	1.223		

(Continued)

Table A1. Continued.

	Constructs	Factor loadings	Mean	Skewness	Kurtosis	Std. Deviation	Cronbach's	cumulative %ge of variance
fs9	Financial institutions have facilitated investments	0.674	3.9	-1.234	0.823	1.145		
fs10	I respect the rules and regulations of using mobile money	0.739	3.88	-0.92	0.347	0.995		
fs11	I have at least one bank account	0.806	3.97	-1.161	1.171	0.969		
fs12	I have ever been explained on how to use bank accounts and other financial services	0.701	3.8	-0.906	0.075	1.113		
Financial inclusion								
fa1	I have the necessary documents for registering a SIM card on mobile money	0.785	3.84	-0.992	0.437	1.093	0.887	62.394
fa2	I have the necessary documents for opening a bank account	0.775	3.84	-0.94	0.447	1.04		
fa3	I find it easier to open a bank account	0.746	3.99	-1.243	1.3	1.004		
fa4	I have more than one bank account	0.675	3.92	-1.075	0.526	1.089		
fa5	I make more than one transaction with nearby banks	0.806	3.97	-1.161	1.171	0.969		
fa6	Nowadays mobile phones are more affordable and accessible	0.701	3.8	-0.906	0.075	1.113		
fa7	I have ever invested in financial products like shares	0.785	3.84	-0.992	0.437	1.093		
fa8	I understand the language and applications used in mobile phone	0.775	3.84	-0.94	0.447	1.04		
fa9	Access points with financial agents and banks are near	0.108	3.71	-0.664	-0.888	1.384		