

Financial Inclusion of the Elderly: Exploring the Role of Mobile Banking Adoption

Nkosikhona Theoren Msweli ¹ , Tendani Mawela ² 

¹ School of Computing, University of South Africa, 28 Pioneer Avenue, Florida Park, Roodepoort, 1709, South Africa

² School of Information Technology, University of Pretoria, Lynnwood Road, Hatfield Pretoria, 0002, South Africa

Corresponding author: Nkosikhona Theoren Msweli (mswelnt@unisa.ac.za)

Abstract

The extant literature highlights that mobile banking offers various benefits for consumers. However, there is only a limited number of studies that investigate mobile banking adoption by the elderly. This study investigates the factors influencing the adoption of mobile banking by the elderly in a developing country context. The authors explore the enablers, barriers and perceptions of the elderly towards mobile banking adoption. Data were collected through interviews and focus group sessions with respondents from KwaZulu Natal Province in South Africa. The study relies on the Actor-Network Theory as a lens through which to understand the interrelated factors that influence the elderly's perception and adoption of mobile banking. The results reveal a low adoption of mobile banking by the elderly. In addition, it was evident that the barriers that influence the adoption of mobile banking by the elderly include a lack of information and understanding, security and trust issues, demographic factors, language, the complexity of mobile banking applications, and resistance to change. The identified important enablers towards the adoption of mobile banking include convenience, unlimited access, cost-effectiveness. The study proposes a mobile banking adoption model for the elderly and highlights the interrelated technical and non-technical factors influencing mobile banking adoption. Additionally, it offers design guiding principles aligned to the elderly's needs and perceptions of mobile banking.

Keywords

Actor-network theory, Developing countries, Elderly, Financial inclusion, Technology adoption.

Citation: Msweli, N. T., & Mawela, T. (2021). Financial Inclusion of the Elderly: Exploring the Role of Mobile Banking Adoption. *Acta Informatica Pragensia*, 10(1), 1–21. <https://doi.org/10.18267/j.aip.143>

Academic Editor: Zdenek Smutny, Prague University of Economics and Business, Czech Republic

Copyright: © 2021 by the author(s). Licensee Prague University of Economics and Business, Czech Republic.

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution License (CC BY).

1 Introduction

Globally, there is a surge in the number of elderly people as a proportion of the population. The South African Older Persons Act 13 of 2006 defines the elderly as a person who is 60 years of age or older. Studies anticipate that people above the age of 60 will reach 1.5 billion across developing and developed countries by 2050 (UN, 2020). In the context of the increasing elderly population, governments within the Group of Twenty (G20) countries have highlighted the significance of ensuring the sustainable financial inclusion of the elderly (GPFI, 2019). Financial inclusion means that people can access useful and affordable financial products, solutions and services that meet their needs (World Bank, 2018). As individuals age, their financial services needs may change, and they might face various stumbling blocks in accessing and using financial services (GPFI, 2019). In developing countries, financial inclusion and its potential to drive inclusive growth and socio-economic development remains limited (Deloitte, 2019). In light of this, technologies and digital financial solutions are regarded as one way of supporting individuals as they age (World Bank, 2019).

There has been an increasing trend in mobile phone adoption worldwide. These advancements in mobile technologies call for an examination of how the elderly may adopt, use, and benefit from these innovations (Nikou, 2015). Maresova and Kilomova (2016) indicate that m-commerce holds various opportunities for the elderly. Lenka and Barik (2018) highlight that the growth in mobile and electronic financial services such as electronic banking, mobile banking and mobile money transfers hold the potential to improve access to financial services for citizens and thus support their financial inclusion.

Mobile banking entails providing “bank customers access to banking information that facilitates various financial and non-financial transactions using a mobile telecommunication device such as a cell phone, smartphone, or tablet” (Shaikh & Karjaluto, 2016, p. 9). Mobile banking is mainly accessed via mobile browsers available on mobile or smartphones, text messages (SMS), or applications that bank clients download onto their mobile device or tablet (Shaikh & Karjaluto, 2015; Shaikh & Karjaluto, 2016). This study seeks to understand the factors that influence the elderly’s mobile banking adoption. The extant literature highlights the low adoption of mobile banking among the elderly population (Laukkanen et al., 2007; Sindwani & Goel, 2014; Chaouali & Souiden, 2019). According to scholars, literature on mobile banking adoption and the elderly is scarce (Chawla & Joshi, 2017; Choudrie et al., 2018). There is, in particular, a paucity of research on mobile banking adoption by the elderly in the developing country context (Msweli & Mawela, 2020). This study, which was based in a developing country, highlights the perceptions of the elderly towards mobile banking, which is an innovation that may support them as they age and advance their digital financial inclusion in old age. The research question that guides the study is: What factors influence mobile banking adoption among the elderly in South Africa? The study’s primary aim is to understand the factors behind the low adoption of mobile banking by the elderly in South Africa.

2 Literature Overview

2.1 Financial Inclusion of the Elderly

In the past, scholars defined financial inclusion (or exclusion) in light of the broader challenge of social inclusion of people within a society (Mandira, 2008). The elderly’s inclusion in society generally remains a challenge, especially their financial inclusion. A variety of factors influence the financial inclusion of the elderly, such as a lack of digital capabilities, limited financial literacy, cognitive and physical decline, social isolation, reliance on family members and a lack of appropriate financial services and products (GPFI, 2019). Studies note that in developing countries, elderly people are less likely to be aware of and have access to financial solutions that support them (GPFI, 2019). Considering the disruptions and opportunities introduced by Industry 4.0, individuals need to adapt to the changing environment and

adopt new innovative habits. As the world moves to more digital financial services (GPFI, 2019), it is imperative to understand how access and usage of digital innovations may enhance the daily lives of the elderly towards their financial inclusion.

2.2 Mobile Banking

Biljon and Renaud (2016) indicate that the increase in mobile phone adoption has improved internet access for various nations. This is a foundation that supports the adoption of mobile banking. According to Kim et al. (2009), mobile banking is the use of m-commerce by consumers, where smartphones or other mobile devices are used to conduct bank-related transactions such as checking account balance, viewing bank account profile, transferring money and stock trading. Shaikh and Karjaluo (2016) indicate that mobile banking incorporates financial and non-financial transactions conducted on a mobile device. Mobile banking can be perceived as the response of banking institutions to customers' needs as the habits of these customers change due to the adoption and use of mobile technologies (Albashrawi & Motiwalla, 2017). Mobile banking offers both the clients and banks a variety of benefits including portability, accessibility, inexpensive service, readily available service, convenience as well as a broader reach of consumers, high level of security and enhanced revenues (Eckhardt et al., 2009; Laukkanen, 2016; Karjaluo et al., 2021).

Although mobile banking is widely used in developed countries, there is an evident gap in the adoption of mobile banking on the African continent. Be that as it may, the successful implementation of mobile banking in developing countries promises well for efforts directed towards banking exclusion, social exclusion and other financial challenges the African continent faces (Ismail & Masinge, 2012). The developments in mobile banking are significant in the current digitalisation era and ensure financial inclusion in developing countries (Asongu & Odhiambo, 2019). Financial inclusion should encourage access to and the use of various low-priced financial products and services, affording convenience to individuals who are financially excluded, unbanked and under-banked (BASA, 2018). Mobile banking helps to reach the under-banked and unbanked in low income developing countries (Ntseme et al., 2016; Mangani et al., 2019) and improve financial exclusion (Baptista & Oliveira, 2015). There are various examples of successful mobile banking models across Africa, including M-PESA in Kenya and Wizzit in South Africa (Niyogi & Niyogi, 2012; Mbiti & Weil, 2016; Mupfiga & Padare, 2017; Mangani et al., 2019).

2.3 Mobile Banking and the Elderly

The relationship of the elderly with technology has gained some interest (e.g. Luijkx et al., 2015; Hur, 2016; Ivankina et al., 2016; Roque & Boot, 2018). Even though technology ownership is claimed to be growing among the elderly (Chen et al., 2016), it is worth noting that the elderly struggle with various challenges in adopting and using technology (Russell, 2011; Ivankina et al., 2016). According to Nielsen (2013), elderly consumers are 43% slower at using digital technologies and innovation. Research on the overall banking trends has revealed several technology risks (Hanafizadeh et al., 2014) and challenges impacting the adoption of technology by the elderly. Approximately 32% of the elderly reported a lack of ICT knowledge as a reason for not using the internet (Blažun et al., 2014). Additionally, some elderly clients reported that web-based electronic banking is not user-friendly (Gatsou et al., 2018). As a result, technology design should undoubtedly be modified further to accommodate the needs of elderly users (Gatsou et al., 2018). These potential users that may be willing to adopt mobile devices and banking need to understand how to use the new technology (Choudrie et al., 2018).

Pikna et al. (2018) found that a substantial hindering factor faced by the elderly is the modernisation of technology, which puts pressure on their competencies. Komminos et al. (2014) maintain that the design of technology for the elderly's needs should consider the psychological, physiological, cognitive and societal factors. Harris et al., (2016) argue that understanding the adoption behaviour of the current elderly group can guide and influence the future adoption choices of the ageing population. However, the

literature indicates that a limited number of studies focuses on understanding mobile banking adoption by the elderly (Choudrie et al., 2018; Msweli & Mawela, 2020). Given the sparse literature on mobile banking and the elderly, this study was instigated to identify the factors that influence mobile banking adoption among the elderly towards supporting their broader financial inclusion and participation in society as they age. The research question underpinning the study is: What factors influence the adoption of mobile banking among the elderly in South Africa?

3 Theoretical Framework: Actor-Network Theory

The Actor-Network Theory (ANT) perspective was adopted as a theoretical lens to guide the study, address the research question, and understand technology use (Adaba & Ayoung, 2017). The theory primarily focuses on the interactions between technology and individuals. Moreover, it is widely recognised as a lens through which to understand how people use technology (Arif et al., 2017). The theory offers an interdisciplinary approach to investigating society and technology issues (Callon, 1986; Latour, 1987; Law, 1987) and places equal consideration on both human and non-human actors in technology adoption (Walsham, 1997). ANT has been widely used as a lens through which to understand how individuals consume technology (Arif et al., 2017). The theory was borrowed as an interpretive tool (Arif et al., 2017) to gain a deeper understanding (Harry et al., 2014) of mobile banking adoption among the elderly. It was also used to elaborate on individual lived experiences, which upholds the study's authenticity (Cresswell et al., 2010) and promotes the understanding of the dynamics that shape the adoption of mobile banking (Adaba & Ayoung, 2017).

ANT identifies actors as both human and non-human and that these form part of a heterogeneous network of aligned interests, including people, organisational standards and technical artefacts (Cresswell et al., 2010). As actors negotiate their place in the network, there is a need to interpret the change in the actor's behaviour as the translation process takes place. In this view, Latour (1987) highlights that the notion of moments of translation can guide technology innovation. This study applies the ANT translation process to understand how actors connect and interact in different networks. If new artefacts are introduced in a context, it can inform or guide the sampling deliberations (Cresswell et al., 2010). When an innovation such as mobile banking is introduced, those receiving it are said to go through moments of translation. There is no guarantee that the newly formed network will be successful since innovation may generate resistance, which is a common consumer behaviour (Harry et al., 2014). For a network to be stable, the translation needs to occur. Callon (2014) proposes 4 phases involved in the translation process, namely Problematization, Interessment, Enrolment, and Mobilisation.

4 Methods

4.1 Research Approach and Objectives

The interpretivist philosophical paradigm underpins the study. The study is qualitative and exploratory and seeks to understand the perceptions, enablers and barriers towards mobile banking adoption by the elderly in support of their financial inclusion.

4.2 Participants and Data Collection

For data collection, the study relied on interviews and focus groups. Walsham (2006) maintains that interviews are an effective method of accessing informants' interpretations in the field. Interpretivists argue that the relationship between organisations, people, and technology is ever-changing due to environmental changes where organisations operate (Klein & Myers, 1999). In addition, spending time with the respondents is essential. The literature review informed the interview guide. In this study,

understanding the enablers, barriers and perceptions of the elderly towards mobile banking adoption was of interest.

Ethical approval was obtained from the applicable research committee for the study. Data was collected in a developing country context over a period of four months (November 2019 to February 2020), from the elderly aged 60 and above residing in the KwaZulu Natal Province of South Africa. The elderly from old aged homes and community organizations were invited to participate in the study, and they were briefed about the purpose of the study. The final sample included four focus groups, each comprising five elderly respondents and eight individual interview sessions. Each session was approximately two hours long. The data were transcribed and coded using ATLAS.ti 8 to extract themes and then analysed using the thematic analysis approach (Braun & Clarke, 2006).

5 Results

5.1 Mobile Banking Actor-Network

As per the concept of translation, establishing a stable actor-network brings various roles together to form an alliance and ensure a successful adoption of mobile banking among the elderly group. Figure 1 depicts how an actor-network may appear if there is alignment in interests and all actors are successfully enrolled. The graphical symbols used to illustrate the Mobile Banking Actor-Network in this study were adapted from Silvis and Alexander (2014) and the descriptions are included in Appendix A.

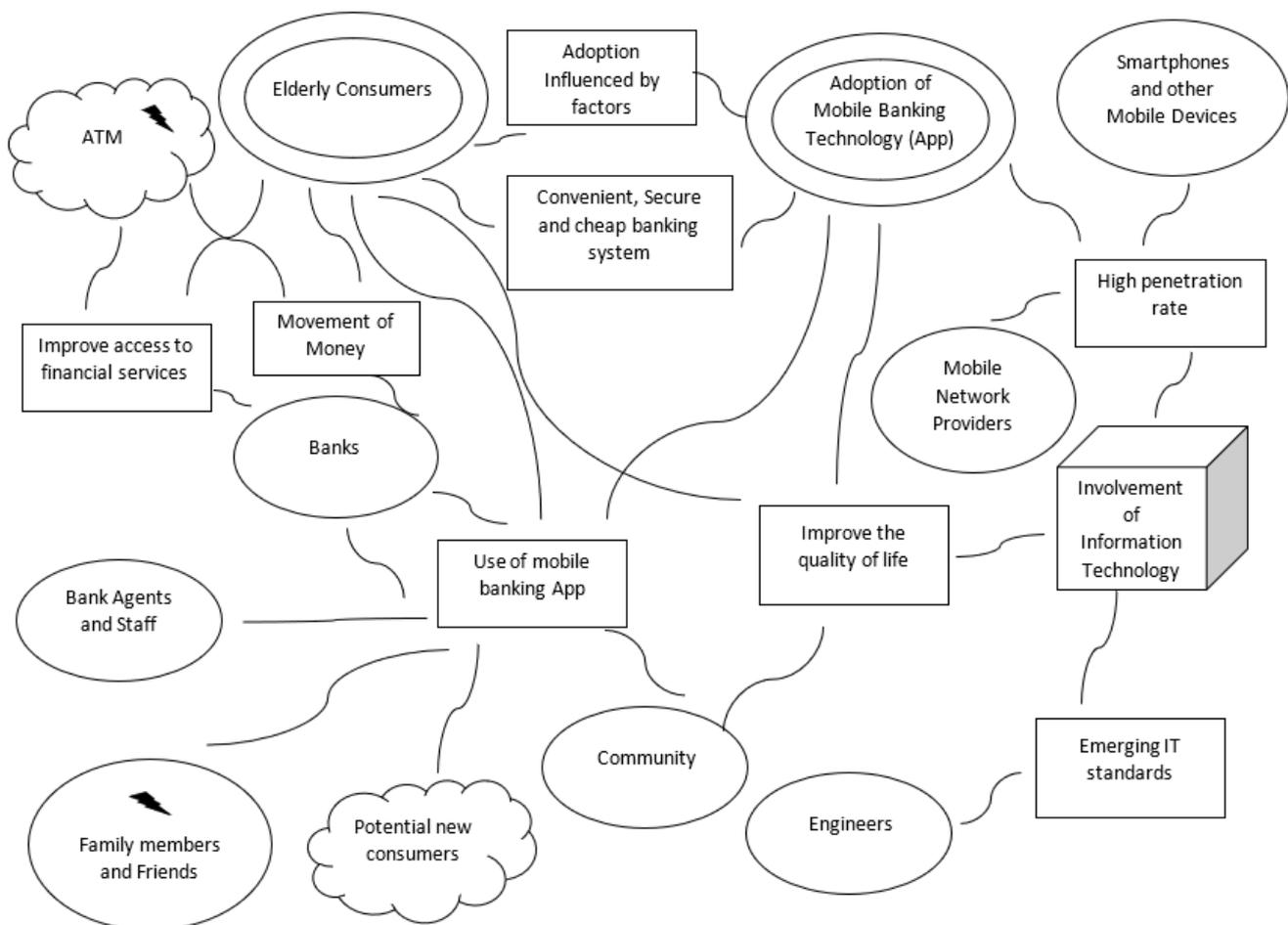


Figure 1: Mobile Banking Actor-network.

5.1.1 Perceptions of the elderly towards mobile banking

The elderly explained their understanding of mobile banking and shared their perceptions of mobile banking. They shared varying thoughts and knowledge with regards to mobile banking. Some of them were able to define mobile banking as follows:

“It’s when you use the phone to bank; whether you are at home, in the taxi, anywhere you are, you get bank services. You can deposit, put notice, anything you need from the bank.”

It also emerged from the interactions that some of the elderly have a somewhat limited understanding of mobile banking; one respondent attempted to describe mobile banking as:

“It means you don’t have to go to the bank, you utilise your cellphone.”

However, some had no understanding or awareness of it, such as the following respondent that highlighted:

“I have no clue what it is, internet banking or mobile banking. I know it is something that has to do with the cellphone.”

From the groups that participated in this study, only a minority indicated that they used mobile banking. Several reasons were stated by the elderly for resisting this technology. One non-user notes:

“I feel people who use mobile banking are vulnerable as people can steal their money or access important information about them.”

The above comment suggests some of the elderly have their reservations based on their observations or social influences. There is a need to promote mobile banking as an emerging innovation and highlight its benefits to potential users, especially the elderly consumers.

The perceptions of the elderly further showed they are not aware of the banks’ intentions:

“I feel what they are trying to do is just drop all this personal communication. I am used to being personally looked at and served.”

The view mentioned above suggests that the elderly prefer traditional (branch-based) banking since it is a method they are accustomed to. Nevertheless, some of the elderly did recognise that mobile banking can be much safer, as one respondent argued:

“Why would you expose yourself like that and move around with money and expose yourself to crime? There is no need to carry cash; these days it’s unnecessary.”

Being in a developing country proved to be a disadvantage to the elderly using mobile banking. Socio-economic challenges affect how individuals access technological products and services. Also, the affordability of mobile data, as well as the availability of stable electricity supply, are some of the issues hindering the adoption of mobile banking, as one respondent noted:

“You also have to worry about load shedding.”

Another respondent highlighted a concern associated with costs and added:

“When I use the ATM to get money, the bank will charge me around R20. So, if I want cash, I do not go to the ATM. I go to a grocery store like Checkers, and when I do my grocery, I will ask for cashback. The banks charge interest, and grocery stores don’t charge interest.”

5.1.2 Perceptions regarding the benefits and enablers of mobile banking

Implementation of mobile banking has proved to benefit some consumers, where branch and internet banking are no longer the only options for individuals. The participants in this study noted several enablers that motivate them to adopt mobile banking.

Convenience was noted and appreciated by the elderly in this study. One respondent added:

“It is convenient, no queues, even at night and weekends and holidays you can still do it just like that.”

While this suggests the practicality of this technology, it further elaborates on unlimited access instead of the time and location restrictions associated with branch banking.

Cost-effectiveness was also highlighted as an enabler. The cost of banking has been relatively high, considering every transaction processed at the branch is for a fee. Affordability is one reason why many citizens remain unbanked and have limited access to financial services in developing countries, such as South Africa. Some respondents noted that mobile banking is a cost-saving solution. As one respondent asserted, there are *“free deposits, and it saves me my gas money”*. The mobility of this technology means the elderly consumers no longer need to visit the banks; hence it saves them travel costs, and they can process banking transactions anywhere at a time that suits them.

5.1.3 Perceptions regarding the barriers towards adopting and using mobile banking

As argued in the extant literature, the adoption of mobile banking among the elderly is very low. Therefore, the respondents were probed about the barriers that prevent them from adopting mobile banking. The respondents highlighted the following:

Lack of information and understanding: Due to the lack of knowledge of technology, elderly consumers are not adopting mobile banking. The respondents indicated that they do not have a full understanding of mobile banking and its functionality. Banks do not introduce or promote their innovative products and services to this unique group of consumers to improve awareness and potential use. The statement below came from one of the respondents:

“It is more convenient to go to the bank, and they do it for you. Because, when you sit here with this thing, you don’t even know how to work with it and you are working with money and lots of money, and then you are scared to do it. You are scared who’s going to hack you or are you going to send it to the right person and whether you are doing the right thing.”

The above statement indicates that banks may need to provide their consumers with additional information to access and use mobile banking associated with their financial products.

Security: Elderly people are portrayed as a vulnerable group of individuals and are very cautious about activities involving money. Lack of security is a serious concern among the elderly. The following quotes came from respondents who suggest that they do not think mobile banking is secure.

“Mobile banking is not secure; I might lose my money, and I might forget to close it, and someone will steal my money.”

“I’m afraid of someone looking into my account and stealing money without my knowledge.”

Trust: This is another barrier that hinders the respondents from adopting mobile banking. Respondents stated that when a person is old, they become more vulnerable, and there are too many risks. Trusting technology becomes a problem and trusting people to help is another issue as they might take advantage of the situation.

Complexity: The respondents perceived mobile banking as complicated. They mentioned the struggles they endure when using mobile banking, such as lengthy procedures, as one reason why they do not fully adopt mobile banking.

Resistance to change: This issue also emerged as a factor influencing the adoption of mobile banking. The current elderly population were not raised in the digital era, and the respondents preferred the old way of doing things. One respondent added:

"I do not like things that are out of my league. I have children, and they do everything, but I told them no."

Demographic factors

Under demographics, the following elements emerged as factors hindering the elderly from adopting mobile banking:

Age: It emerged from the conversations with the elderly that some perceive mobile banking as an innovation suited for young people. One respondent said:

"I think it's an intolerance towards old people. We don't quite know what they mean. We are not the same as our grandkids. We are not good with technology and the technology is too advanced, and we are from the old school."

Health Decline: This is another factor that emerged as an inhibitor towards the adoption of mobile technology. The elderly indicated that as they age, they face several challenges such as vision impairment. Therefore, they are unable to use the phone for mobile banking.

Language: South Africa is a diverse developing nation, and thus, banking institutions have consumers from various ethnic groups speaking different languages. The elderly indicated that they could not understand some of the information in the mobile banking application. One respondent said:

"Asiyi-understandi nje (we do not understand it at all). You see me, all I know is to go to the bank and bank my money. But I do swipe my card. I don't even buy airtime on my phone."

In agreement, another respondent added:

"They're using a language which does not apply to us, and it is not what we are used to."

Mobile banking proved to be uncompromising towards accommodating different languages or use of general terminology that may be understood by the elderly.

Social influences: The social environment has a significant impact on what the respondents think of mobile banking. The information that respondents have regarding mobile banking comes from social networks such as people in their communities, friends, family and media. The adoption depends on the credibility of the shared information and the source.

Role of Gender: From the interactions with the respondents, it was noted that males are more likely to adopt and use mobile banking. The following quotes were observed:

"No, I can't use mobile banking, but I used to do it when my husband was alive."

"I know my son does not even put his pin. He just looks at his smartphone."

"My husband uses mobile banking, and it is very difficult for me to understand how to use it."

5.1.4 Suggestions for mobile banking

The respondents suggested strategies for consideration by mobile banking providers when designing and developing mobile banking applications.

Easier methods of verification: Password authentication is not a method that most elderly appreciate. The login credentials must comply with security standards, and the elderly struggle to create and remember these credentials. Therefore, they suggested biometric authentication.

"It's safe and secure because they have to use your face. I think it will be an ideal solution because it is quick because they use your face or fingerprints."

Training and educational information: Lack of understanding leads to low confidence in the use of technology. Some individuals resist mobile banking because they lack the knowledge and skills to use it. The elderly indicated that banks should provide them with training to enable them to use mobile banking.

Stricter security measures: The respondents argued for more security measures to ensure their details and money is safe. Credit cards also require protection from credit card fraudsters operating online. This suggestion came from one of the respondents:

“They should put the security parameters like biometric authentication I think it’s an ideal solution.”

The data presented in this section highlights that even though there are advantages of embracing mobile banking, several barriers that hinder the adoption also exist.

5.2 An ANT Perspective of Mobile Banking Adoption

5.2.1 Actors

The study identified the following actors as having a role in forming a stable mobile banking actor-network, and all are given equal treatment, as suggested by Callon (1999). The actor’s interests and roles were analysed and are listed in Table 1.

Table 1: Actors involved in forming mobile banking actor-network.

Actants	Their Interests and roles
Human Actors	
Elderly consumers	For them to trust mobile banking technology, they need to transfer money anytime and anywhere, to check their bank balance and manage their accounts timeously (Malaquias & Hwang, 2016).
IT Engineers (Application/System developers)	Inscribe into the artefact the way it is used and the intention for using it.
Family members and friends (of the elderly)	Motivate for the use of mobile banking. Act as an interface between the elderly user and mobile banking. They help in setting up the banking platform and use.
Bank agent and staff (e.g. Bank Tellers and customer service)	To have income as well as an opportunity for bonuses or incentives. A certain percentage of the revenue generated from technology innovations contributes to salaries.
Non-Human Actors	
Banks (Banking institution)	To increase revenue and profit. Establish a competitive advantage (introduce new financial products). To attract new consumers. To improve access to financial services. To see returns from investment in infrastructure.
Customer location	Mobile network connectivity, technology attitude and beliefs.

Actants	Their Interests and roles
Bank Application (App)	Facilitate the interaction between the bank and the consumer. To provide convenient banking. To create a user profile, the user must be affiliated with a particular bank and bank account.
ATM	Facilitate the interaction between the bank and the consumer.
Money	It moves from one account to the next in the form of digital money.
Mobile device (e.g. smartphone, tablets/iPad)	Host the bank application (mobile app). May act as an enabler or barrier for mobile banking.
Mobile network providers	To increase revenue (cost of network data to download and access the app), bank apps run using a mobile network. To facilitate the cash withdrawals (process USSDs).
Bank account	Profiles assigned to the elderly. Access to specific products and services.

5.2.2 Translation

The importance of translation cannot be taken for granted when dealing with new technology. As cited by the respondents, banks may initiate banking technologies without considering their customers' diversity, particularly the elderly. Similarly, IT engineers design these technologies without considering the needs of different user groups. The multifaceted nature of actants calls for further interrogation due to misunderstandings that may result from overlapping interests among the actors trying to form an alliance. When new technology is made available, potential users assess the value and intentions to check the conformity of common interests (Gilly & Zeithaml, 1985). However, human actors tend to value technology more if it does not conform to any structural arrangement. Table 2 summarises findings using the ANT four moments of translation to highlight the various phases towards mobile banking adoption.

Table 2: Summary of study findings – ANT perspective.

Moments of translation	Findings
Inscription / Problematisation	<ul style="list-style-type: none"> • The elderly consumers as focal actors are not using mobile banking, or there is low adoption of mobile banking among the elderly. • Mobile banking has been embodied by financial products and services such as money transfer, viewing bank statement and paying bills. • Mobile banking has been framed with a number of benefits for users to explore, such as convenience. • It was introduced to move around digital money between different users and merchants. • There is a preference for traditional banking over mobile banking among the elderly.
Interestment	<ul style="list-style-type: none"> • Only a few elderly users view mobile banking as a convenient way of banking.

Moments of translation	Findings
	<ul style="list-style-type: none"> ● Banks offer mobile banking to users without targeting a specific group. There is no customisation or personalisation of the platform. ● Banks offer the mobile bank app (artefact) with various product and services. ● The banks view mobile banking as a solution to unlimited access to banking services. ● The elderly people are willing to adopt and use mobile banking provided their interests are inscribed into IT artefacts.
Enrolment	<ul style="list-style-type: none"> ● Some barriers affect the enrolment of actors into the network. ● The banks do not provide the consumers with enough information to increase awareness, understanding and usage. ● The costs associated with mobile banking are debatable. However, lengthy procedures may result in extra charges for users. ● The elderly consumers perceive mobile banking as insecure and risky to use this technology as a banking mode. ● The complexity of the application prevents many elderly consumers from using technology. They are afraid of making a mistake. ● The studied users and potential users suggested the strategies for enrolling other key actors based on their needs, such as the need for secured mobile banking, training and easier authentication or verification.
Mobilisation	<ul style="list-style-type: none"> ● Family members, friends and other elderly users have become advocates of mobile banking, influencing others to use it. ● Family members act as an interaction interface in cases where they assist the elderly consumers with the banking app's use and navigation. ● The issues affecting those who have been enrolled, such as running out of data, need to be resolved. ● The network is not yet stable. The relationships within this actor-network are being negotiated and debated. ● Solutions are suggested to keep the current actors enrolled. ● Some elderly customers are not willing to use mobile banking.

6 Discussion

The study investigated the factors influencing mobile banking adoption (Al-jabri & Sohail, 2012) among the elderly. It also provided insights into the roles that other actors can play to assist the elderly in adopting mobile banking. Mobile banking is a positive offering from banking institutions, and it can enhance access to financial services for the elderly, thus promoting financial inclusion.

6.1 Enablers for Mobile Banking Adoption

In translating the actors' interests, mobile banking was recognised as affording consumers an ability to conduct banking anywhere and anytime. Convenience may appear as an essential enabler in developed regions. However, for citizens in developing regions, it is mostly appreciated for its ability to reduce travel time and brokerage costs (Muzurura & Chigora, 2019). This study shared the same sentiment; convenience was found to be one of the enablers that motivate elderly consumers to adopt and use mobile banking. Similarly, the Federal Reserve Board (2016) reported convenience as the most common reason provided by 45% of consumers using mobile payment services. These findings confirmed those of Mlitwa and Tshetsha (2012). The elderly also elaborated on the cost-effectiveness and usefulness of mobile banking

since it saves them travel costs and long queues, confirming Dass and Pal's findings (2011). Elimination of queues is a benefit that is easily observed and visible to many consumers (Al-jabri & Sohail, 2012). On the contrary, Owusu et al. (2020) found that consumers continue to queue at banks for small services such as checking account balance, which is accessible at ATMs or in mobile banking applications. The ease of use of mobile banking (Ntseme et al., 2016; Owusu et al., 2020) and the availability of information about the functionality and operability of mobile banking technology can increasingly direct motivation towards the adoption of mobile banking technology (Mcgaughey et al. 2012; Pankomera & van Greunen, 2018).

This study also emphasises the importance of access to information when introducing new technology and to support adoption. According to Shankar and Jebarajakirthy (2020), mobile banking is an emerging technology, and many consumers lack awareness of mobile banking technology. This concern has been cited by several researchers (Laukkanen & Cruz, 2010; Halaweh, 2011; Mlitwa & Tshetsha, 2012; Pankomera & van Greunen, 2018; Choudrie et al., 2018). Even though the elderly would be happy with feature phones (Biljon & Renaud, 2016), they are willing to learn how to work with advanced technology (Švecová & Odlerová, 2018). Roque and Boot (2018) argue that it can be beneficial to train an individual without basic knowledge of how to interact with an interface or to navigate and perform financial transactions on the bank application. Drawing from this study's findings, awareness and educational campaigns are essential in any new product or technology (Mulwa & Waema, 2016).

6.2 Barriers for Mobile Banking Adoption

Lin (2018) found that mobile applications have issues that inhibit the elderly from adopting them, namely: complexity, the interaction logic, which is not consistent with their behaviour logic, and the interface design. One of the insights offered by age-friendly banking is that if a bank can provide good service for its older customers, it can provide excellent service for all (Gatsou et al., 2017). The elderly in this study noted that the mobile banking applications they are presented with are advanced and difficult for them to use.

Security has become a significant and persistent issue in the adoption of mobile banking. Baabdullah and Alalwan (2019) found security to significantly impact on continued intention to use mobile banking. Similarly, this study found that elderly consumers worry about security. Consequently, the elderly must know and recognise security measures (Peral-Peral et al., 2013) inscribed in mobile banking. Authentication procedures should be structured so that they do not intimidate the elderly but rather make them feel safe. Mupfiga and Padare (2017) recommend using progressive technologies to authenticate users, such as biometric technology. Addressing the security and privacy issues, Wazid et al. (2019) mention that a strong and secure authentication system is crucial to secure mobile banking applications. To improve security, some of the elderly in this study suggested the use of biometric technology as a method of authentication. Baabdullah and Alalwan (2019) highlight that biometric technology ensures safe and faster delivery of information while preventing unnecessary fraud, particularly with banking transactions. Similarly, previous research suggested the use of biometrics, such as fingerprint authentication (Panjwani & Cutrell, 2010; Sharma & Mathuria, 2018).

This study further identified trust as a barrier hindering the adoption of mobile banking. This finding aligns with those of other scholars (Sindwani & Goel, 2014; Manuel & Veríssimo, 2016). The elderly, especially in developing countries, are vulnerable. Effah (2012) states that in developing countries, the preferred payment method is physical cash rather than digital cash due to trust issues.

Peral-Peral et al. (2013) indicate that the elderly face difficulties in learning new technology; thus, they prefer traditional banking that involves human interaction. This statement was supported by Lin (2018), who highlights that as one ages, the ability to learn new skills declines rapidly. Similarly, in this study, the elderly indicated that they prefer to go to the bank and be assisted by bank tellers as they find it challenging to learn new things. Even though the elderly consumers mentioned that they prefer

traditional banking, they also indicated that they are willing to adopt mobile banking (Harris et al., 2016). Traditional or branch banking is continuously reported as the most preferred form of banking among elderly consumers (Jayachandran, 2019). The reason being that there is a personal interaction with the bank teller (customer service). Besides, the consumers can enjoy conversations with other actors such as bank agents or tellers (Ramón-Jeronimo et al., 2014).

Demographics also influence mobile banking adoption. Similarly, Azumah et al. (2020) found gender, age and income as additional factors that significantly affect individuals' banking behaviour. The results of this study confirmed these findings indicating that men are more likely to adopt mobile banking. The study further established that language hinders several elderly consumers from adopting mobile banking. Older people are often not familiar with technical language, particularly specialist terminologies used in different applications (Komninos et al., 2014). There are 18 official languages used and spoken in India, with two thirds of the population being illiterate, which creates challenges in the adoption of mobile banking (Goyal et al., 2012). Similarly, South Africa has 11 official languages spoken across the country (Brenzinger, 2017), while mobile banking uses one dominating language, which is English (Firdhous & Karunaratne, 2011; Halaweh, 2011). Low literacy levels were reported as a barrier (Panjwani & Cutrell, 2010). However, even individuals who are fluent in English often struggle to understand specialised and technical terms (Komninos et al., 2014).

7 Proposed Design Guiding Principles

The elderly consumers are exposed to mobile banking that they cannot use (Švecová & Odlerová, 2018) due to the factors identified in this study. The physiological and cognitive changes in the elderly suggest that the interaction process, and the interaction of mobile technology for elderly users should be different from those designed for younger users (Lin, 2018). The following five design guiding principles are proposed for consideration when developing mobile banking to ensure that it is aligned with the needs of the elderly.

Use of understandable terminology: English is commonly used in web and technology applications. There is a need to acknowledge that not all technology users have English as their home language or first language. Besides, the diverse meaning of terms used in applications across different sectors needs to be recognised. The elderly suggested the use of less complicated and easy to understand terminology.

Shortened Mobile Banking procedures: Long procedures are an issue for the ageing population, in the sense that they may become confused while performing a transaction and may make mistakes while others fail to complete it. The elderly emphasised that they are old, and at times face limitations and cannot keep up with technology.

Easier and secure authentication methods or verification: The elderly expressed their concerns with using passwords or pin numbers that they tend to forget. The elderly suggested using biometric technology as a method of authentication because it is easier and more secure.

Larger icons with descriptions and font: Icons are a common way of communicating options in mobile applications; however, the ageing population struggle to find the meaning behind them or comprehend the option represented by each icon (Lin, 2018). It is recommended that each icon includes a short description written in simple language and is designed with a larger font as some elderly users may have visual impairments.

Use of Assistive technology: Most ageing people rely on family members, carers and friends to perform some of their daily activities, including small tasks such as reading a text message. Adopting assistive technologies in mobile banking applications will allow the elderly to perform their banking transactions independently.

8 Towards a Mobile Banking Model

Studying the adoption of technology by the elderly has been a complex exercise to undertake, considering various factors. Existing technology adoption models such as the Technology Adoption Model (TAM) and its extended versions, Senior Technology Adoption Model (STAM) as well as the Unified Theory of Acceptance and Use of Technology (UTAUT), and Innovation Diffusion Theory (IDT) have been used to investigate the adoption of mobile banking (Lule et al., 2012; Shaikh & Karjaluto, 2015; Albashrawi & Motiwalla, 2017; Pankomera & van Greunen, 2018). However, these models are not adequate for making conclusions about adoption behaviour among the elderly. Gelderblom et al. (2010) highlight that existing technology and mobile phone adoption models do not satisfactorily capture the mobile phone adoption patterns of the elderly. They further suggest the refinement of STAM, including the possibility of the elderly partially adopting the technology. Investigating adoption by the elderly cannot be conducted in the same manner as investigating young consumers, considering the varying psychological and physiological features when studying their behaviour. The existing models ignore some of these factors. Figure 2 outlines a proposed mobile banking adoption model for the elderly. The model incorporates elements to be considered, and these are derived from the results of this study and extant literature as discussed below.

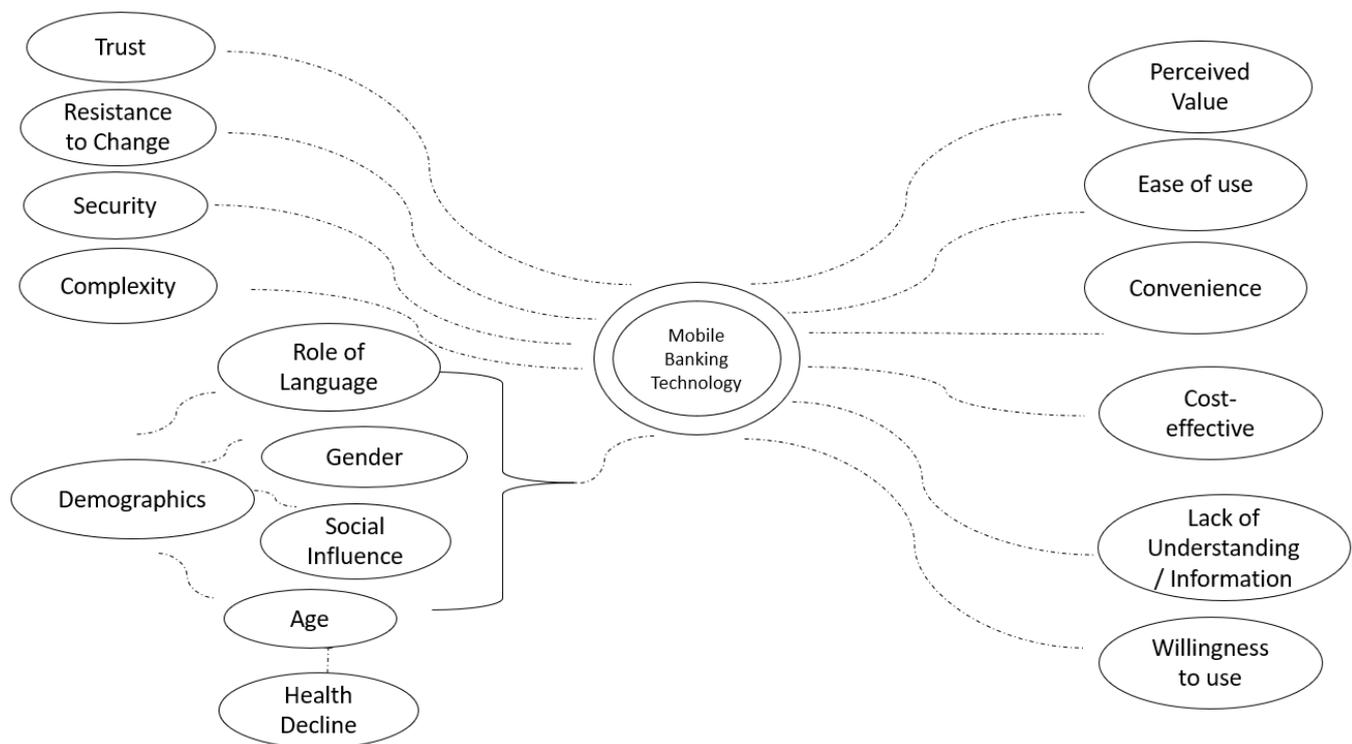


Figure 2: The Proposed Mobile Banking Adoption Model for The Elderly.

Trust: Goyal et al. (2012) indicate that consumers should be able to trust mobile banking applications and providers and be guaranteed that their details will not be saved and misused.

Resistance to change has been documented by sociologists, psychologists, and marketers (Gilly & Zeithaml, 1985). This factor has been widely cited as a barrier in previous studies, where elderly users resist technology including mobile banking because they prefer to use systems or methods they are comfortable with (Laukkanen et al., 2007; Halaweh, 2011; Touchaie & Hashim, 2018). Chaouali and Souiden (2018) refer to it as resistance to innovation.

Security: The following studies report security as a major issue hindering the adoption of mobile banking (Motwani, 2016; Chen et al., 2018; Pankomera & van Greunen, 2018; Wazid et al., 2019).

Complexity: This factor will be defined by knowledge of technology and operation (Chauhan et al., 2018). The elderly indicated that they do not want to work with technology as they do not understand and fail to operate the phone.

Demographics: Social differences may influence the adoption decision (Owusu et al., 2020). It is significant to prioritise the issue of inclusiveness and reach, considering the diversity of mobile banking users and potential users. Under demographics, the following factors are considered:

- **Role of language** – Mobile technologies use English as a language of interaction. However, not all users are proficient in this language, which results in resistance and low adoption.
- **Gender** – Gender is an essential moderating variable in adopting mobile business applications (Vasudeva & Chawla, 2019).
- **Social influences** – Hong (2019) found that social influences have a significant positive relationship with the intent to use mobile banking. Information and reassurances provided by individuals surrounding the consumers could improve awareness and consumer intentions towards mobile technology (Baabdullah & Alalwan, 2019).
- **Age** – Age was used as a moderating role in various mobile banking studies (Chawla & Joshi, 2018; Chaouali & Souiden, 2019; Vasudeva & Chawla, 2019). Consumers are inspired to use mobile banking based on their needs which is likely to change as they age (Trabelsi-Zoghalmi et al., 2018).
- **Health Decline** – Elderly people are challenged by several issues associated with age. Most individuals over 50 years of age show signs of ageing, such as decline in cognitive and physical skills, which impedes the adoption of mobile technologies (Laukkanen et al., 2007; Touchaie & Hashim, 2018).

Perceived Value: This factor is adapted from the UTAUT2 model. Perceived value has been proposed as a direct determinant of customers' intention to adopt mobile banking (Abdallah et al., 2017).

Ease of Use: Adapted from TAM, this variable is widely accepted as a predictor of the intention to use technology. Baptista and Oliveira (2015) confirm that this is the variable's role in enabling the adoption of mobile banking.

Convenience: This enabling factor has been cited by various scholars investigating mobile banking adoption (Kim et al., 2009; Mlitwa & Tshetsha, 2012; Chawla & Joshi, 2018).

Cost-effectiveness: The elderly need to experience the reduced cost (lower bank charges) in the use of mobile banking. Currently, they are not entirely convinced of this benefit due to other surrounding issues overriding the low cost of banking, such as lengthy procedures that consume too much data.

Lack of Understanding: Awareness and understanding are crucial features for an individual to adopt and use new technology. The elderly in this study suggested that banks should offer awareness campaigns to educate them on mobile banking applications provided together with products and services.

Willingness to Use: The elderly indicated they are willing to try and use mobile banking depending on how their needs are incorporated and how it is used. If there is a will to use, it will be easy to influence the elderly towards adoption because they will be open to technology and suggestions.

9 Conclusion

Literature has indicated that the growth in mobile and electronic financial services such as electronic banking, mobile banking or mobile money transfers hold the potential to improve access to financial services for citizens and thus support financial inclusion. This study investigated the factors influencing the adoption of mobile banking by the elderly. The following factors were identified as barriers that hinder the elderly from adopting mobile banking: security, lack of information or understanding, trust and demographics (age, social influence, gender, health decline and language). The study further identified

the following factors as enablers that promote the use of mobile banking by the elderly: convenience, cost-effectiveness and unlimited access.

9.1 Research Contributions

The study contributes to the limited literature on mobile banking adoption. It is one of the few studies to have adopted an interpretive, qualitative approach through the lens of ANT to study the adoption of mobile banking by the elderly in developing nations. The results of this study highlight the need for banking institutions to investigate the needs of the elderly and how they may be supported in adopting mobile banking applications. The study proposed a model for understanding mobile banking adoption by the elderly. Additionally, implications for mobile banking providers were highlighted through the design guiding principles that were proposed.

9.2 Limitations and Future Research

The study collected data from South African elderly citizens in KwaZulu Natal province. Therefore, the findings may not be fully generalisable to elderly people in other settings. Future studies may extend the research by collecting additional data from other provinces or developing countries. Additionally, considering the recent experiences from the COVID-19 pandemic and associated social distancing requirements, many people relied more on mobile banking services. Therefore, it is suggested that future studies may investigate the implications of COVID-19 for mobile payments, including mobile banking, in such a context that poses unique challenges for businesses, governments and society at large.

Additional Information and Declarations

Acknowledgements: We are grateful to Professor Hossana Twinomurinzi for his support and encouragement.

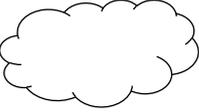
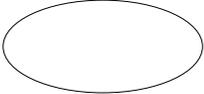
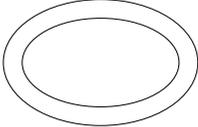
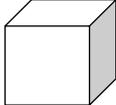
Conflict of Interests: The authors declare no conflict of interest.

Author Contributions: N.T.: Conceptualization, Methodology, Writing – Original draft preparation. T.M.: Supervision, Writing – Reviewing and Editing.

Data Availability: The data that support the findings of this study are available from the corresponding author.

Appendix A

The graphical symbols used to illustrate the Mobile Banking Actor-Network in this study were adapted from Silvis and Alexander (2014).

Symbol	Concept	Description
	Action at a distance	Where an actor is acting upon another that is far away from itself (physically or conceptually)
	Exemplary Instances	Actors that do not explicitly form part of the empirical dataset, but nonetheless are part of the actor-network
	Source Actor	An entity that forms part of ANT analysis
	Main research focus	Actors that directly influence the primary purpose of the research
	Blackbox	A black box represents a well-formed network of allied actors that is so strong that the assemblage is counted as only one actor
	Translating Actor	Any entity that is included in an ANT analysis that translates between a Source and a Target

References

- Abdallah, A., Dwivedi, Y. K., & Rana, N. P. (2017). Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust. *International Journal of Information Management*, 37(3), 99–110. <https://doi.org/10.1016/j.ijinfomgt.2017.01.002>
- Adaba, G. B., & Ayoung, D. A. (2017). The development of a mobile money service: an exploratory actor-network study. *Information Technology for Development*, 23(4), 668–686. <https://doi.org/10.1080/02681102.2017.1357525>
- Al-jabri, I. M., & Sohail, M. S. (2012). Mobile Banking Adoption: Application of Diffusion of Innovation Theory. *Journal of Electronic Commerce Research*, 13(4), 379–391.
- Albashrawi, M., & Motiwalla, L. (2017). Understanding Mobile Banking Usage: An Integrative Perspective. In *Proceedings of the 2017 ACM SIGMIS Conference on Computers and People Research* (pp. 63–70). ACM. <https://doi.org/10.1145/3084381.3084405>
- Arif, S., Sidek, S., & Abu Bakar, N. (2017). Actor-network theory (ANT) as an interpretative tool to understand the use of online technologies: A review. *Asian Journal of Information Technology*, 16(1), 61–68. <https://doi.org/10.3923/ajit.2017.61.68>
- Asongu, S. A., & Odhiambo, N. M. (2019). Mobile banking usage, quality of growth, inequality and poverty in developing countries. *Information Development*, 35(2), 303–318. <https://doi.org/10.1177/0266666917744006>
- Azumah, S. B., Balinto, C., Adzawla, W., & Osei-Baafi, L. A. (2020). Effect of Mobile Banking on the Banking Behaviour of Informal Sector Workers in Accra, Ghana. *Journal of Asian Business Strategy*, 10(1), 133–141. <https://doi.org/10.18488/journal.1006.2020.101.133.141>
- Baabdullah, A. M., & Alalwan, A. A. (2019). An integrated model for m-banking adoption in Saudi Arabia. *International Journal of Bank Marketing*, 37(2), 452–478. <https://doi.org/10.1108/JBM-07-2018-0183>

- Baptista, G., & Oliveira, T.** (2015). Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators. *Computers in Human Behavior*, 50, 418–430. <https://doi.org/10.1016/j.chb.2015.04.024>
- BASA.** (2018). *BASA Annual Report*. <https://www.banking.org.za/>
- Biljon, J. Van, & Renaud, K.** (2016). *Validating Mobile Phone Design Guidelines: Focusing on the Elderly in a Developing Country*. SAICSIT.
- Blažun, H., Vošner, J., Kokol, P., Saranto, K., & Rissanen, S.** (2014). Elderly People's Interaction with Advanced Technology. *Studies in Health Technology and Informatics*, 201, 1–10. <https://doi.org/10.3233/978-1-61499-415-2-1>
- Braun, V., & Clarke, V.** (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Brenzinger, M.** (2017). Eleven Official Languages and More: Legislation and Language Policies in South Africa. *Journal of Language and Law*, 67, 38–54. <https://doi.org/10.2436/rlid.i67.2017.2945>
- Callon, M.** (1986). The Sociology of an Actor-Network: The Case of the Electric Vehicle. In Callon M., Law J., Rip A. (eds.) *Mapping the Dynamics of Science and Technology* (pp. 19–34). Palgrave Macmillan. https://doi.org/10.1007/978-1-349-07408-2_2
- Callon, M.** (1999). Actor-Network Theory—The Market Test. *The Sociological Review*, 47(1_suppl), 181–195. <https://doi.org/10.1111/j.1467-954x.1999.tb03488.x>
- Chauali, W., & Souiden, N.** (2019). The role of cognitive age in explaining mobile banking resistance among elderly people. *Journal of Retailing and Consumer Services*, 50, 342–350. <https://doi.org/10.1016/j.jretconser.2018.07.009>
- Chauhan, S., Gupta, P., & Jaiswal, M.** (2018). Factors inhibiting the internet adoption by base of the pyramid in India. *Digital Policy, Regulations and Government*, 20(4), 323–336. <https://doi.org/10.1108/DPRG-01-2018-0001>
- Chawla, D., & Joshi, H.** (2018). The Moderating Effect of Demographic Variables on Mobile Banking Adoption: An Empirical Investigation. *Global Business Review*, 19(3), 90–113. <https://doi.org/10.1177/0972150918757883>
- Chen, A. N., Downey, J. P., McGaughey, R. E., & Jin, K.** (2016). Seniors and Information Technology in China. *International Journal of Human-Computer Interaction*, 32(2), 132–142. <https://doi.org/10.1080/10447318.2015.1067499>
- Chen, S., Su, T., Meng, G., Xue, M., Liu, Y., Xu, L., & Fan, L.** (2018). Are Mobile Banking Apps Secure? What Can Be Improved? In *Proceedings of the 2018 26th ACM Joint Meeting on European Software Engineering Conference and Symposium on the Foundations of Software Engineering* (pp. 796–802). ACM. <https://doi.org/10.1145/3236024.3275523>
- Choudrie, J., Junior, C. O., McKenna, B., & Richter, S.** (2018). Understanding and conceptualising the adoption, use and diffusion of mobile banking in older adults: A research agenda and conceptual framework. *Journal of Business Research*, 88, 449–465. <https://doi.org/10.1016/j.jbusres.2017.11.029>
- Cresswell, K. M., Worth, A., & Sheikh, A.** (2010). Actor-Network Theory and its role in understanding the implementation of information technology developments in healthcare. *BMC Medical Informatics and Decision Making*, 10(1), 67. <https://doi.org/10.1186/1472-6947-10-67>
- Dass, R., & Pal, S.** (2011). Exploring the Factors Affecting the Adoption of Mobile Financial Services Among the Rural Under-Banked. In *European Conference on Information Systems (ECIS 2011)*, 246. <https://aisel.aisnet.org/ecis2011/246>
- Eckhardt, A., Laumer, S., & Weitzel, T.** (2009). Who Influences Whom? Analyzing Workplace Referents' Social Influence on it Adoption and Non-Adoption. *Journal of Information Technology*, 24(1), 11–24. <https://doi.org/10.1057/jit.2008.31>
- Effah, J.** (2012). Mobilizing Culture for E-Business in Developing Countries: An Actor Network Theory Account. *The Electronic Journal of Information Systems in Developing Countries*, 52(5), 1–18. <https://doi.org/10.1002/j.1681-4835.2012.tb00370.x>
- Federal Reserve Board.** (2016). *Consumers and Mobile Financial Services 2016*. <https://www.federalreserve.gov/econresdata/consumers-and-mobile-financial-services-report-201603.pdf>
- Firdhous, M. F. M., & Karunaratne, P. M.** (2011). An ICT Enhanced Life Quality for the Elderly in Developing Countries: Analysis Study Applied to Sri Lanka. *Journal of Health Informatics in Developing Countries*, 5(1), 47–59.
- Gatsou, C., Politis, A., & Zevgolis, D.** (2017). Seniors' Experiences with Online Banking. In *2017 Federated Conference on Computer Science and Information Systems*, (pp. 623–627). FedCSIS. <https://doi.org/10.15439/2017F57>
- Gatsou, C., Politis, A., & Zevgolis, D.** (2018). Online Banking: A Seniors' Experience Study. *International Journal of Computer Science and Applications*, 15(1), 83–97.
- Gelderblom, H., Dyk, T. Van, & Biljon, J. Van.** (2010). Mobile phone adoption : Do existing models adequately capture the actual usage of older adults? In *Proceedings of the 2010 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists* (pp. 67–74). ACM. <https://doi.org/10.1145/1899503.1899511>
- Gilly, M. C., & Zeithaml, V. A.** (1985). The Elderly Consumer and Adoption of Technologies. *Journal of Consumer Research*, 12(3), 353–357.
- Goyal, V., Pandey, U. S., & Batra, S.** (2012). Mobile Banking System in India: Practices, Challenges and Security Issues. *International Journal of Computer Trends and Technology*, 1(2), 2278–3091. <https://doi.org/10.14445/22312803/ijctt-v43p106>
- GPII.** (2019). *Aging and Financial Inclusion on 8 Key Steps to Design a Better Future G20 Fukuoka Policy Priorities*. <https://www.oecd.org/g20/summits/osaka/G20-Fukuoka-Policy-Priorities-on-Aging.pdf>
- Halaweh, M.** (2011). Adoption of E-commerce in Jordan: Understanding the Security Challenge. *The Electronic Journal on Information Systems in Developing Countries*, 47(3), 1–13. <https://doi.org/10.1002/j.1681-4835.2011.tb00331.x>

- Hanafizadeh, P., Keating, B. W., & Reza, H. (2014). Telematics and Informatics A systematic review of Internet banking adoption. *Telematics and Informatics*, 31(3), 492–510. <https://doi.org/10.1016/j.tele.2013.04.003>
- Harris, M., Cox, K. C., Musgrove, C. F., & Ernstberger, K. W. (2016). Consumer preferences for banking technologies by age groups. *International Journal of Bank Marketing*, 34(4), 587–602. <https://doi.org/10.1108/IJBM-04-2015-0056>
- Harry, R., Sewchurran, K., & Brown, I. (2014). Introducing a mobile payment system to an emerging economy's mobile phone subscriber market. An actor network perspective. *Electronic Journal of Information Systems in Developing Countries*, 62(1), 1–26. <https://doi.org/10.1002/j.1681-4835.2014.tb00442.x>
- Hong, I. B. (2019). Understanding and Predicting Behavioral Intention to Adopt Mobile Banking: The Korean Experience. *Journal of Global Information Management*, 27(3), 182–202. <https://doi.org/10.4018/JGIM.2019070110>
- Hur, M. H. (2016). Empowering the elderly population through ICT-based activities: An empirical study of older adults in Korea. *Information Technology & People*, 29(2), 318–333. <https://doi.org/10.1108/ITP-03-2015-0052>
- Ismail, T., & Masinge, K. (2012). Mobile Banking: Innovation for the Poor. *African Journal of Science, Technology, Innovation and Development*, 4(3), 98–127.
- Ivankina, L. I., Trubchenko, T. G., Krukovic, E. M., Shaidullina, A. R., Shaftelskaya, N. V., & Chernyak, V. K. (2016). The Use of Information and Communication Technologies by Elderly People. In *The European Proceedings of Social & Behavioural Sciences, III. International Scientific Symposium on Lifelong Wellbeing in the World* (pp. 235–242). Future Academy.
- Jayachandran, A. (2019). E-Banking or Branch Banking? Preference of Senior Citizens in Kerala. *The IUP Journal of Bank Management*, 18(2), 19–29.
- Karjaluoto, H., Glavee-Geo, R., Ramdhony, D., Shaikh, A. A., & Hurlpaul, A. (2021). Consumption values and mobile banking services: understanding the urban–rural dichotomy in a developing economy. *International Journal of Bank Marketing*, 39(2), 272–293. <https://doi.org/10.1108/IJBM-03-2020-0129>
- Kim, G., Shin, B., & Lee, H. G. (2009). Understanding dynamics between initial trust and usage intentions of mobile banking. *Information Systems Journal*, 19(3), 283–311. <https://doi.org/10.1111/j.1365-2575.2007.00269.x>
- Klein, H. K., & Myers, M. D. (1999). A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems. *MIS Quarterly*, 23(1), 67–94.
- Komninou, A., Nicol, E., & Dunlop, M. D. (2014). Reflections on design workshops with older adults for touchscreen mobile text entry. *Interaction Design and Architecture*, (21), 70–85.
- Latour, B. (1987). *La scienza in azione: introduzione alla sociologia della scienza*. Edizioni di Comunità.
- Laukkanen, T. (2016). Consumer adoption versus rejection decisions in seemingly similar service innovations: The case of the Internet and mobile banking. *Journal of Business Research*, 69(7), 2432–2439. <https://doi.org/10.1016/j.jbusres.2016.01.013>
- Laukkanen, T., & Cruz, P. (2010). Mobile banking rollout in emerging markets: evidence from. *International Journal of Bank Marketing*, 28(5), 342–371. <https://doi.org/10.1108/02652321011064881>
- Laukkanen, T., Sinkkonen, S., Kivijärvi, M., & Laukkanen, P. (2007). Innovation resistance among mature consumers. *Journal of Consumer Marketing*, 24(7), 419–427. <https://doi.org/10.1108/07363760710834834>
- Law, J. (1987). Technology Transfer and Social Engineering. *Social Studies of Science*, 17(3), 564–569. <https://doi.org/10.1177/030631287017003008>
- Lenka, S. K., & Barik, R. (2018). A discourse analysis of financial inclusion: post-liberalization mapping in rural and urban India. *Journal of Financial Economic Policy*, 10(3), 406–425. <https://doi.org/10.1108/JFEP-11-2015-0065>
- Lin, L. (2018). Research on Mobile Applications Interaction Design Based on Cognitive Ability of the Elderly. *Advances in Social Science, Education and Humanities Research*, 176, 195–199.
- Luijckx, K., Peek, S., & Wouters, E. (2015). “Grandma, You Should Do It—It’s Cool” Older Adults and the Role of Family Members in Their Acceptance of Technology. *International Journal of Environmental Research and Public Health*, 12(12), 15470–15485. <https://doi.org/10.3390/ijerph121214999>
- Lule, I., Omwansa, T., & Mwololo, T. (2012). Application of Technology Acceptance Model (TAM) in M-Banking Adoption in Kenya. *International Journal of Computing and ICT Research*, 6(1), 31–43.
- Malaquias, R. F., & Hwang, Y. (2016). An empirical study on trust in mobile banking: A developing country perspective. *Computers in Human Behavior*, 54, 453–461. <https://doi.org/10.1016/j.chb.2015.08.039>
- Mandira, S. (2008). *Index of Financial Inclusion, Working Paper, No. 215*. Indian Council for Research on International Economic Relations (ICRIER), New Delhi. http://icrier.org/pdf/Working_Paper_215.pdf
- Mangani, K. S., Syaikat, Y., Arifin, B., & Tambunan, M. (2019). The Role of Branchless Banking in Performances of Households’ Micro and Small Enterprises: The Evidence from Indonesia. *Economics and Sociology*, 12(3), 114–131. <https://doi.org/10.14254/2071-789X.2019/12-3/8>
- Manuel, J., & Verissimo, C. (2016). Enablers and restrictors of mobile banking app use: A fuzzy set qualitative comparative analysis. *Journal of Business Research*, 69(11), 5456–5460. <https://doi.org/10.1016/j.jbusres.2016.04.155>
- Maresova, P., & Klimova, B. (2016). The Potential of mCommerce for Seniors in Developed Countries. In *Advanced Multimedia and Ubiquitous Engineering* (pp. 63–68). Springer, Singapore. https://doi.org/10.1007/978-981-10-1536-6_9
- Mbiti, I., & Weil, D. N. (2016). Mobile Banking the Impact of M-Pesa in Kenya. In *African Successes, Volume III: Modernization and Development* (pp. 247–293). University of Chicago Press.

- Mcgaughey, R. E., Zeltmann, S. M., McMurtrey, M. E., & Downey, J. P.** (2012). *M-Commerce and The Elderly: The Current state of affairs*. http://www.swdsi.org/swdsi2012/proceedings_2012/papers/Papers/PA141.pdf
- Mlitwa, N., & Tshetsha, N.** (2012). Adoption of Cell-Phone Banking among Low-Income Communities in Rural Areas of South Africa. *IBusiness*, 4, 362–370.
- Motwani, B.** (2016). Prediction of Intention of Senior Professionals to Prefer Mobile Banking. *FIB Business Review*, 5(4), 51–64. <https://doi.org/10.1177/2455265820160409>
- Msweli, N. T., & Mawela, T.** (2020). Enablers and Barriers for Mobile Commerce and Banking Services Among the Elderly in Developing Countries: A Systematic Review. In *Conference on e-Business, e-Services and e-Society* (pp. 319–330). Springer, Cham. https://doi.org/10.1007/978-3-030-45002-1_27
- Mulwa, M. M., & Waema, T. M.** (2016). Understanding Mobile Banking from a Theoretical Lens : Case Studies of Selected Kenyan m-Banking Products. *International Journal of Innovation in the Digital Economy*, 7(1), 54–68. <https://doi.org/10.4018/IJIDE.2016010105>
- Mupfiga, P., & Padare, T.** (2017). The Rise of Mobile Technology on the Financial Sector in Zimbabwe. *Journal of Systems Intergration*, 3, 19–26.
- Muzurura, J., & Chigora, F.** (2019). Consumers' Behavioural Intention to Adopt Mobile Banking in Rural Sub-Saharan Africa Using an Extension of Technology Acceptance Model: Lessons from Zimbabwe. *International Journal of Business, Economics and Management*, 6(6), 316–334. <https://doi.org/10.18488/journal.62.2019.66.316.334>
- Nielsen.** (2013). *Under the Influence: Consumer Trust in Advertising – Nielsen*. <https://www.nielsen.com/sa/en/insights/article/2013/under-the-influence-consumer-trust-in-advertising/>
- Nikou, S.** (2015). Mobile technology and forgotten consumers: The young-elderly. *International Journal of Consumer Studies*, 39(4), 294–304. <https://doi.org/10.1111/ijcs.12187>
- Niyogi, A., & Niyogi, S.** (2012). Mobile Money for Unbanked in India. *International Journal of Finance and Policy Analysis*, 4(2), 26–36.
- Ntseme, O. J., Nametsagang, A., & Chukwuere, J. E.** (2016). Risks and Benefits from Using Mobile Banking in an Emerging Country. *Risk Governance & Control: Financial Markets & Institutions*, 6(4), 355–363. <https://doi.org/10.22495/rgcv6i4c2art13>
- Owusu, G. M. Y., Bekoe, R. A., Addo-yobo, A. A., & Otioku, J.** (2020). Mobile Banking Adoption among the Ghanaian Youth. *Journal of African Business*, in press, 1–22. <https://doi.org/10.1080/15228916.2020.1753003>
- Panjwani, S., & Cutrell, E.** (2010). Usably Secure, Low-Cost Authentication for Mobile Banking. In *SOUPS '10: Proceedings of the Sixth Symposium on Usable Privacy and Security* (Article No. 4). ACM. <https://doi.org/10.1145/1837110.1837116>
- Pankomera, R., & van Greunen, D.** (2018). Challenges, Benefits, and Adoption Dynamics of Mobile Banking at the Base of the Pyramid (BOP) in Africa: A Systematic Review. *The African Journal of Information and Communication*, 21, 21–49. <https://doi.org/10.23962/10539/26113>
- Peral-Peral, B., Arenas-Gaitán, J., & Ramón-Jeronimo, M. A.** (2013). Internet Banking: Segmenting Elderly by Latent Class Cluster. In *Recent Advances in Automatic Control, Information and Communications*, (pp. 309–314). WSEAS.
- Pikna, J., Fellnerova, N., & Kozubik, M.** (2018). Information Technology and Seniors. In *CBU International Conference on Innovations in Science and Education*, (pp. 702–708). CBU.
- Ramón-Jerónimo, A. M., Peral-Peral, B., Jorge, A.-G., & Villarejo-Ramos, A. F.** (2014). Gender Gap in the Use of Internet Banking Services: The Case of Elderly People. <https://idus.us.es/bitstream/handle/11441/36949/Ram%F3n,%20Peral,%20Arenas%20y%20Villarejo,%202014.pdf?isAllowed=y&sequence=1>
- Roque, N. A., & Boot, W. R.** (2018). A New Tool for Assessing Mobile Device Proficiency in Older Adults : The Mobile Device Proficiency Questionnaire. *Journal of Applied Gerontology*, 37(2), 131–156. <https://doi.org/10.1177/0733464816642582>
- Russell, H.** (2011). Later life ICT learners ageing well. *International Journal of Ageing and Later Life*, 6(2), 103–127. <https://doi.org/10.3384/ijal.1652-8670.1162103>
- Shaikh, A. A., & Karjaluto, H.** (2015). Mobile banking adoption: A literature review. *Telematics and informatics*, 32(1), 129–142. <https://doi.org/10.1016/j.tele.2014.05.003>
- Shaikh, A. A., & Karjaluto, H.** (2016). On some misconceptions concerning digital banking and alternative delivery channels. *International Journal of E-Business Research*, 12(3), 1–16. <https://doi.org/10.4018/IJEER.2016070101>
- Shankar, A., & Jebarajakirthy, C.** (2020). How do electronic word of mouth practices contribute to mobile banking adoption? *Journal of Retailing and Consumer Services*, 52, 101920. <https://doi.org/10.1016/j.jretconser.2019.101920>
- Sharma, L., & Mathuria, M.** (2018). Mobile Banking Transaction Using Fingerprint Authentication. In *2018 2nd International Conference on Inventive Systems and Control (ICISC)*, (pp. 1300–1305). IEEE. <https://doi.org/10.1109/ICISC.2018.8399016>
- Silvis, E., & Alexander, P. M.** (2014). A study using a graphical syntax for actor-network theory. *Information Technology & People*, 27(2), 110–128. <https://doi.org/10.1108/ITP-06-2013-0101>
- Sindwani, R., & Goel, M.** (2014). Acceptance of Technology Based Self Service banking Among Mature Customers. *PRiMa: Practices and Research in Marketing*, 5(1).
- Švecová, M., & Odlerová, E.** (2018). Smartphone and Mobile Application Usage among Seniors in Slovakia. *European Journal of Science and Theology*, 14(6), 125–133.

- Touchaie, S. A., & Hashim, N. H.** (2018). The Influence of Dispositional Resistance to Change on Seniors' Mobile Banking Adoption in Malaysia. *Journal of Soft Computing and Decision Support Systems*, 5(6), 1–12.
- Trabelsi-zoghalmi, A., Berraies, S., & Yahia, K. Ben.** (2018). Total Quality Management & Business Excellence Service quality in a mobile-banking-applications context: do users' age and gender matter? *Total Quality Management*, 31(15–16), 1639–1668. <https://doi.org/10.1080/14783363.2018.1492874>
- UN.** (2020). *United Nations: World Population Ageing Report 2019*. United Nations. <https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Report.pdf>
- Vasudeva, S., & Chawla, S.** (2019). Does Gender, Age and Income Moderate the Relationship Between Mobile Banking Usage and Loyalty? *International Journal of Online Marketing*, 9(4), 1–18. <https://doi.org/10.4018/IJOM.2019100101>
- Walsham, G.** (1997). Actor-Network Theory and IS Research: Current Status and Future Prospects. In Lee A.S., Liebenau J., DeGross J.I. (eds) *Information Systems and Qualitative Research*, (pp. 466–480). Springer. https://doi.org/10.1007/978-0-387-35309-8_23
- Walsham, G.** (2006). Doing interpretive research. *European Journal of Information Systems*, 15(3), 320–330. <https://doi.org/10.1057/palgrave.ejis.3000589>
- Wazid, M., Zeadally, S., & Das, A. K.** (2019). Mobile Banking: Evolution and Threats Malware threats and security solutions. *IEEE Consumer Electronics Magazine*, 8(2), 56–60. <https://doi.org/10.1109/MCE.2018.2881291>
- World Bank.** (2019). *The Role of Digital Financial Inclusion in Preparing for Older Age and Retirement*. <https://www.financialcapability.gov.au/files/the-role-of-digital-financial-inclusion-in-preparing-for-older-age-and-retirement.pdf>
- World Bank.** (2018). *World Bank Financial Inclusion Overview*. <https://www.worldbank.org/en/topic/financialinclusion/overview>

Editorial record: The article has been peer-reviewed. First submission received on 4 February 2021. Revisions received on 18 March 2021 and 23 March 2021. Accepted for publication on 23 March 2021. The editor in charge coordinating the peer-review of this manuscript and approving it for publication was Zdenek Smutny .

Acta Informatica Pragensia is published by Prague University of Economics and Business, Czech Republic.

ISSN: 1805-4951
