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The Economic Impact of FinTech in the South African Banking Industry: A Case of Digital Disruption

By

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ABSTRACT

The Fourth Industrial Revolution has provided new opportunities to tackle problems in health, education, transport and many other sectors. In the financial sector, new financial technology (FinTech) is providing new ways of tackling the problem of financial exclusion. The uptake of cell phones has enabled financial service providers (FSPs) to expand into areas where the most vulnerable have hitherto been outside the reach of the banking agency model. This has ultimately allowed previously financially excluded individuals to have access to bank accounts. Through SMACT (Social Media, Mobile, Analytics, Cloud and the Internet of Things) technologies, FSPs are able to collect new types of data such as call detail record data and mobile app data which have been leveraged globally to enable the emergence of M-Pesa in Kenya, the WeChat payments module in China and KakaoBank, South Korea's first online-only bank. The common thread in these innovations is that these are telecommunications company-led business models that have encroached into the area of finance. Such digital disruption has happened in South Africa but little is understood about how inclusive digital financial services are in the South African context. Moreover, what are the barriers to further financial inclusion, given that South Africa has significantly high bank account uptake rates? What role can the Fourth Industrial Revolution technologies have in breaking those barriers and reaching the lower-income population that has largely been mis-sold financial products that were created for the middle to upper-income population? This study sought to investigate how the diffusion of SMACT technology has contributed to financial inclusion in the South African financial services sector. The study made use of a mixed methods approach to answer this research question. Finscope data from 2012 to 2015 was used as the data source for the quantitative section and key informant interviews as the source of data for the qualitative section. The study found that roughly 80% of adults in South Africa are financially included through formal banks. Despite the near 100% uptake rates of cell phones across all income groups, proximity to an ATM or bank branch still significantly determined whether an individual accessed formal financial services. The study also found that ATM withdrawal, store withdrawal and internet banking were infrequently utilised by lower-income adults. In terms of internet banking and digital financial services in general, financial products, especially digital credit, do not appear to be well aligned with the needs of the lower-

income consumer. The mismatch of financial products and the needs of lower-income consumers is further worsened by poor financial literacy levels in South Africa, especially among lower-income consumers. The study concludes that more needs to be done to increase economic inclusion, digital inclusion and financial inclusion for the lower-income population in South Africa. While consumer protection and transparency are well covered in the regulatory and legislative framework to which FSPs by and large adhere, a more inclusive and sustainable financial sector will only exist if product fit, affordability, financial literacy and convenience issues are addressed. This should happen in an enabling environment where ICT infrastructure benefits all, interoperability of digital financial services is reached and a regulatory framework more focused on financial inclusion is in place.

Keywords: Financial Inclusion, FinTech, Digital Financial Services, Fourth Industrial Revolution, Digital Disruption

DECLARATION

I declare that "The Economic Impact of FinTech in the South African Banking Industry: A Case of Digital Disruption" is my own work, that it has not been submitted for any degree or examination in any university, and that all the sources that I have used or quoted have been indicated and acknowledged by complete references.

Kinyanjui Mungai

Signature: K.Mungai

Date:

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"*Only the disciplined ones are free in life. If you are undisciplined, you are a slave to your moods. You are a slave to your passions*." – Eliud Kipchoge

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LIST OF ABBREVIATIONS

AML	Anti-Money Laundering
CDR	Call Detail Record
CFI	Center for Financial Inclusion
DFS	Digital Financial Services
FICA	Financial Intelligence Centre Act, Act 38 of 2001
FinTech	Financial Technology
FSCA	Financial Sector Conduct Authority
FSP	Financial Service Provider
IoT	Internet of Things
IR	Industrial Revolution
KYC	Know-Your-Customer
MMS	Mobile Money Service
POPI	Protection of Personal Information Act
POS	Point-Of-Sale
QR	Quick Response
SARB	South African Reserve Bank
SMACT	Social Media, Mobile technologies, Analytics, Cloud and the Internet of Things
TAM	Technology Acceptance Model
USSD	Unstructured Supplementary Service Data
WEF	World Economic Forum

CHAPTER ONE: INTRODUCTION

1.1 Introduction and background

This thesis examines the economic impact of FinTech in South Africa with a particular focus on how digital technologies have impacted on financial inclusion. While the goal of governments and financial sector regulators is to promote financial sector stability and consumer protection, financial inclusion tends to be a responsibility borne by all stakeholders. Financial inclusion can potentially lead to improved welfare outcomes for lower-income populations.

Technology can facilitate this process and increase the reach of financial service providers (FSPs) in a manner that disrupts the financial services sector for the benefit of the most vulnerable in society. It is therefore important to investigate the economic impact of financial technology from the viewpoint of financial inclusion.

While financial technology has disrupted savings, credit and insurance provision, it is the payments space that has experienced the most disruption. According to Genesis Analytics (2017:2), payments innovation has increasingly been characterised by different forms of electronic payments such as mobile money and cryptocurrencies. These innovations tend to use smartphone payments through Quick Response (QR) codes or USSD (Unstructured Supplementary Service Data) (Genesis Analytics, 2017:20). In developing countries, financial inclusion has been facilitated through the uptake of electronic payment, primarily through mobile money. However, acceptance and the success of these services are context-specific. M-Pesa in Kenya, WeChat's payments module in China and Paytm in India each has a context that cannot easily be replicated in other countries. M-Pesa heavily relies on a distribution network that has agents who are willing to hold cash for client withdrawals, India's Paytm was heavily backed by the government's demonetisation and digital drive, while China's WeChat payments module leveraged the big data generated by consumers already using WeChat to predict the next need that should be met.

Payments in South Africa have taken place primarily through cash and debit/ credit cards. There are, however, new FinTech-based start-ups that are disrupting the payments sector. Examples of these include Snapscan and Yoco. These have created many jobs and led to improved financial

inclusion. However, the impact of these FinTech companies is yet to be fully understood. What is clear is that FinTech companies, as well as other non-bank businesses such as retailers, have encroached into the payments services of banking, which has led to more competition and growth in the financial services sector. The financial services sector has thereby become a more significant contributor to the South African real economy.

1.2 Defining FinTech

Financial Technology (FinTech) refers to the application of technological innovations in the financial services space. These technologies are considered part of the Fourth Industrial Revolution. In short, the Fourth Industrial Revolution (IR) is the era of cyber-physical systems, in which new technologies have become pervasive in societies. The Third IR was the era of computing and communications (ICT) advances and automated production, the Second IR involved a revolution in electrical power generation and mass production processes, and the First IR was marked by the shift from human and animal power to fossil fuels (steam) and mechanical production.[1]

According to Baller, Dutta and Lanvin (2016:v), the Fourth IR is characterised by faster processing, larger storage spaces as well as increasing information/ knowledge access. What is most striking is the velocity at which these transitions are taking place. As a result, industries have to adapt the way in which they produce to include digital technologies in order to not get left behind. New SMACT (also sometimes referred to as SMACIT) technologies (Social Media, Mobile technology, Analytics, Cloud, and the Internet of Things) – for instance, sensor data from the Internet of Things (IoT) – are being used as data sources. The caveat to all these technologies, as noted, is that the interaction between cyber-physical systems in this revolution has meant that businesses not only require physical but cybersecurity as well to protect their physical and intellectual assets. Losing sensitive customer/ value-chain information as a result of a cyberattack or failing to protect private information could cause a business the loss of a significant proportion of its customers and associates.

SMACT technology is considered FinTech if it is applied in the financial services space. SMACT technologies manifested as FinTech in the financial services market offer unique risks to all

[1] See section 2.2.2 for a more detailed description.

stakeholders. One of the key risks is that of a data breach which could tarnish the reputation of an FSP and which therefore necessitates strong cybersecurity protocols. There are also considerable benefits to FSPs making use of these technologies. For example, SMACT technologies have affected the recruitment management processes of FSPs. The labour market has adapted to new technology platforms that connect employers to prospective employees. The talent management of banks has adapted to technological innovations that allow electronic applications, with the selection, ranking and sorting of applications partially automated, compared with having to physically print, sort and file documents. Further changes are emerging, including the growing digital solutions departments of banks, as more banks switch services from physical branches to increasingly focusing on interacting with clients on digital platforms.

In addition to operating benefits to companies, FinTech has external and social benefits for society. FinTech provides unique opportunities for reaching markets such as lower-income households or the informal sector that is largely underserved by the financial services market. Interesting financial innovations such as mobile money and cryptocurrencies are changing the way we understand the functions of money. Social media which emerged in the Third IR generated large amounts of data that offer opportunities for FSPs to understand their customers beyond the traditional age, income, gender and physical address data which they previously gathered. The Fourth IR has already taken society far beyond the mere digitisation of firms (going online and having a website).

1.3 FinTech as an enabling tool for financial inclusion

In 2014, 62% of all adults globally had a bank account. In terms of distribution, these figures are highest (69.1%) in East Asia and the Pacific (Demirgüç-Kunt, Klapper, Singer, Ansar & Hess, 2018:8). The figures are lowest in Sub-Saharan Africa (SSA), where only 34.2% of adults are banked (Demirgüç-Kunt et al., 2018:137). While SSA generally performs poorly in terms of financial inclusion (and as poorly on most other economic measures), South Africa is a financial inclusion anomaly in the region. In 2014, 70.3% of adults in South Africa were banked (Demirgüç-Kunt et al., 2018:137). This was up from 53.6% in 2011 (Demirgüç-Kunt et al., 2018:137). However, regarding digital financial inclusion, relatively few South Africans participate in the digital economy. While low figures are seen in the use of the internet to pay utility bills, debit/ credit cards are relatively widely used to make purchases. Roughly 25% of South Africans make

use of a debit or credit card to make a purchase (Demirgüç-Kunt et al., 2018:137). This far exceeds the SSA average which is less than 10% (Demirgüç-Kunt et al., 2018:137). On the other hand, South Africa trails behind its upper middle-income peers where nearly 40% of adults make use of debit/ credit cards to make purchases (Demirgüç-Kunt et al., 2018:137).

Globally, digital finance has the power to remove access barriers for clients as well as to provide convenience in terms of customers avoiding travel and long queues. Data-driven services can specifically lead to financial inclusion through incorporating the consumption trends of lower-end consumers into the product development process. Rich data sources such as call detail record (CDR) data, which has become a powerful data source on lower-income clients, can enable financial institutions to improve existing or create new financial products that are affordable and meet the needs of lower-income consumers. If this is done correctly, mass scale can be reached. For example, Tigo Cash, a mobile money provider in Ghana, partnered with the International Finance Corporation (IFC) in using roughly two terabytes of CDRs and transactional data to grow its active customer base from 200,000 to over 1 million in only 90 days (IFC, 2017:43). Similar results have been seen with Airtel in Uganda and M-Pesa in Kenya.

In South Africa, the problem of financial inclusion is constrained at both the demand and supply side. On the demand side, financial inclusion is constrained by insufficient funds, financial services being too expensive, geographical barriers to access, mistrust and a lack of documentation such as an identification document and proof of address (Mungai & Bayat, 2018:233). Further barriers include financial illiteracy and not having a mobile device, which is becoming more and more important as the digital economy expands. On the supply side, inhibiting factors include poor access to data on lower-income markets and lack of incentives to compete for the lower-income market, i.e. a lack of competition among FSPs. Lack of data creates a perception that serving the lower-income market is not economically viable. Poor data on the lower-income market also means that lower earners may be considered riskier markets than middle-income clients, simply because there is not enough information on their behaviours as consumers. This may lead to lower-income clients having to pay relatively higher interest rates on loans, for instance. Poor data on lower-income clients also means that they are more susceptible to product mis-selling as FSPs may not particularly understand their behaviours and may model them incorrectly or simply not develop products to meet their needs. Lack of competition among FSPs means that there is little or no

incentive for large financial corporates to expand their reach among clients at the bottom of the pyramid. A shared constraint on both consumers and FSPs is dealing with poor ICT infrastructure and a lack of interoperability[2]. The latter is a huge constraint that limits the proliferation of digital financial services.

1.4 Problem statement

Despite the large amount of data that banks have, they have struggled to serve lower-income households and the informal sector. Moreover, for those that are financially included, the transmission mechanism from financial inclusion to economic welfare improvement has not always been strong. This is particularly the case for the lower-income market that has not necessarily always experienced the cost-saving benefit of interacting with digital financial services due to the costs of data/airtime (World Bank, 2018:22).

South Africa contains a mixture of both formal and informal economies (Finmark Trust, 2017:3). A large number of South Africans primarily transact through cash. The term 'cash is king' still applies and has been reinforced by a slow-changing payments ecosystem in which cash is still the common or only accepted means of payment. For example, in minibus taxis, cash is the only accepted medium of exchange. Almost all street vendors only accept cash payments. Lower-income individuals largely interact with these entities to buy necessities such as airtime and food as well as to commute. This may be among the reasons why the majority of deposits of individuals in South Africa are withdrawn immediately after remuneration (Finmark Trust, 2017:3). This practice is more common among lower-income individuals. The benefits of being financially included are thus not experienced by these individuals (Finmark Trust, 2017:3). Three things are clear from the above. Firstly, the informal economy directly plays a role in determining financial inclusion. Secondly, the financially excluded can be characterised as being poor to lower-income and interact with the informal economy. Thirdly, since digitalisation usually precedes financial inclusion, there is a strong need to digitalise both the poor/ lower-income individuals as well as

[22] Here we refer to the cross-usability of digital devices in different contexts. For example, if a debit card could be used in both rural and urban areas and even street vendors hade card machines, that debit card would not face issues with interoperability since it could be used virtually anywhere.

the informal economy. Financial inclusion is a means and not an end. If digitalisation leads to financial inclusion, it should ultimately have an economic impact.

Many of the digital platforms that have diffused in the financial services sector attempt to address the problem of the 'cash-based' economy and reduce the risk that consumers bear whenever they carry cash, such as the risk of misplacing money or being robbed (International Finance Corporation, 2018:85). Digital platforms have, however, not adequately served the lower-income market. Despite the success of mobile money in other developing countries, South Africans have not adopted nor used the services as well as FSPs have hoped. Finmark Trust (2017:3) attributes the inadequate adoption of mobile money in South Africa to inappropriate technologies being chosen as the means of implementing the services. Agent network challenges have also been a barrier to adoption, in terms of cash float, trust, etc. In fact, Flaming, Mckay & Pickens (2011:xiii) cite that, in Brazil approximately 1 in 4 agents had been robbed of USD500 on average, in the past three years. A similar perception of risk exists for customers when it comes to mobile money services. Consequently, many lower-income individuals still use cash as their main mode of payments. Some even hold their savings in cash rather than keeping them in the bank or using a mobile money service. Digitalisation has happened at the end-user level, where many more South Africans have mobile phone and internet access relative to other African countries (Gillwald, Mothobi, and Rademan, 2018:6). The mass market consumers are therefore potentially ready for digital disruption at the payments level. What is holding them back from adoption? What market dynamics have yet to be understood by the supply side?

Currently, part of the challenge of understanding the impact of FinTech on financial inclusion is the difficulty of indicating the links between data and impact in the South African context. It is also not clear what type of data is being collected by FSPs and how the data is being used. This is important, as consumers and policymakers need to ascertain what gaps currently exist and whether FinTech is reducing the gaps or not. It would also be important to understand whether a successful use case exists in South Africa and to examine the link between the data being used and the impact to which it led. This study seeks to address these shortcomings.

The market gaps alluded to above exist because both the demand side and the supply side appears to experience related information problems. The supply side does not have data of all consumers or potential consumers, particularly individuals who have no income and therefore might not have

some form of bank account. The demand-side data is unable to fully capture the efforts of the supply side and point out all of the shortcomings of FSPs and regulators. For instance, FSPs could argue that the information asymmetry that leads to consumers making poor financial decisions is an issue of financial illiteracy. If the researcher only engaged with those involved in the provision of financial services, this sentiment might be shared. However, the consumer-side data might indicate even financially literate consumers making poor financial decisions due to information asymmetries, which may emanate from a lack of transparency or poorly designed financial products. Understanding these market dynamics requires engagement with all stakeholders, consumers, regulators, FSPs and researchers who also understand how the two sides interact. This study aims to address the gaps in knowledge that exist from a symbiotic perspective.

1.5 Research question and objectives

1.5.1 Research question

The key research question that this thesis investigated is: What is the economic impact of financial technology in South Africa in relation to financial inclusion?

1.5.2 Objectives

The thesis set the following research objectives in order to answer the research question:

- Describe the financial inclusivity of digital financial services from a supply-side perspective.
- Describe the financial inclusivity of digital financial services from a demand-side perspective.
- Assess the uptake, access and usage trends of financial services in relation to savings, payments, and credit behaviours in South Africa.
- Through the experience of a large FSP, review what economic impact data generated from financial technologies has had, specifically on the quality of financial inclusion.
- Combine supply-side and demand-side data on financial inclusion in order to paint a holistic picture of the impact of financial technology on economic, financial and digital inclusion.

1.6 Relevance of the research

From a demand-side perspective, financial inclusion has been thoroughly researched. Many studies have conducted surveys on the access to and use of various financial services, for example, whether and how often mobile banking is used. Studies such as those by Chigada and Hirschfelder (2017), Ramavhona and Mokwena (2010) and Assensoh-Kodua, Migiro and Mutambara (2016) have provided insight into certain financial services and the barriers that are faced from the demand side in accessing these services. However, there are aspects that have been missed by such studies. Firstly, they have largely considered financial services/ products in isolation, not recognising the dynamic nature in which these services can act as substitutes and complements to each other. For example, cardless withdrawals act as substitutes to card withdrawals. For instance, if an individual can make use of cardless withdrawals, it means that he does not need to own a debit card. Can we then refer to the uptake of debit cards as 'disappointing' or 'poor' when in fact, more and more individuals are moving towards using their cell phone to withdraw cash? Secondly, in the South African context, households may be cross-financing entrepreneurial consumption with household consumption, which brings up a new complexity. That is, when the household and business consumption are conflated, it affects the assessment of a household's overall welfare and access to financial services. For instance, a household may note that it has a vehicle and that it qualified for a loan for the vehicle. However, the vehicle may in fact belong to the informal business that the household head runs, and not to the household. Moreover, the vehicle may be receiving financing from the income of the business rather than the household's income. This may mean that while the business has adequate access to credit, members of the household may perhaps not have access to credit. Fischer (2011:5) recommends the use of survey data that asks about the financing of certain products. For example, 'how did you finance the purchase of a car?' This would be helpful in measuring the actual usefulness of financial services for individual/ household purposes, rather than generally asking households about their use of certain financial services, e.g. 'how often do you use mobile banking?' This eliminates the complexity that cross-financing creates, which is a phenomenon common in informal markets.

From a supply-side perspective, financial inclusion is usually measured through bank penetration, that is, determining the extent of formal account ownership. Other measures include access, which is measured through distance from an ATM and distance from a bank branch, as well as use, which

is measured through transaction volumes. Although these measures are universal, in developing countries like South Africa, other factors such as informal finance need to be considered (Fischer, 2011:4). According to Fischer (2011:4), the supply-side perspective on financial inclusion is significantly under-researched. Moreover, a broader overview of the wide range of financial services in a general equilibrium has not been adequately covered in the literature.

According to Katoroogo (2016:36), studies that have assessed financial inclusion have focused on bank account ownership rather than the use of credit, payments and insurance products. There have been significant innovations from the supply side that have promoted financial inclusion. Very little research, however, exists on how appropriate the vast array of financial products is for South African consumers. It is expected that with changes in socioeconomic status certain financial products become more appropriate while others become less appropriate. For example, a Mzansi account may be suitable for a bottom of the pyramid consumer, but if the consumer were to accumulate significant wealth, she may no longer find the account appropriate to meet her needs. Know-your-customer (KYC) requirements and emerging forms of data allow FSPs to better understand the appropriateness and weaknesses of financial products for specific consumers. For instance, KYC information which includes the ID and physical address of a client, once aggregated with other client's information, may indicate that clients from certain geographic locations make poor use of digital financial services. This may later be identified as being a problem with internet connectivity in that geographical area. Banks could use this information to review areas where the client base is increasing or decreasing, which may impact on the rollout or reduction of ATMs in specific areas.

This study, therefore, seeks to provide a better understanding of the demand-side and supply-side factors affecting financial inclusion that can have an economic impact in terms of welfare improvements. More specifically, understanding how digital solutions such as mobile banking is being adopted by consumers in savings, credit and payments behaviours. This is important to understand as financial inclusion has changed over the years with the introduction of mobile banking, which has changed the behaviour of clients in relation to financial service usage (demand side). The study also investigates changes that have taken place on the supply side. Cell phones, sensors and social media all generate huge amounts of data that could help determine factors never before considered in financial inclusion measurements. The study aims to investigate how banks

have used this data and what contributions have been made to financial inclusion as a result of these technologies. Lastly, the combination of supply-side and demand-side data is not common in the literature. In fact, this study makes its contribution to the body of literature by combining semi-structured data from key informant interviews conducted with structured data from Finscope, in order to provide insights on financial inclusion in the Fourth Industrial Revolution in South Africa.

1.7 Conclusion

This chapter began by providing important background information on the recent global developments in technology and finance. This was followed by defining the intersection between technology and finance – known as FinTech. It was important to establish a common understanding of what was meant by the term "FinTech" in this study, as the term would be used extensively throughout the thesis. Next, the chapter explained the relevance of FinTech in the greater discussion on financial inclusion and what role it can and has played. From this, it was recognised that South Africa has a high level of financial inclusion, especially compared to Sub-Saharan African peers. However, there was still room for improvement. The use of FinTech was identified as a possible tool for extending access to the lower-income market. The market gaps on the demand and supply-side were then explored in the problem statement, which provided input into developing the research question and objectives of the study. The chapter lastly defended the relevance of the study, which stemmed from the lack of understanding of what demand-side and supply-side factors play a role in digital financial services stimulating financial inclusion in South Africa.

1.8 Thesis outline

Chapter One introduces the study, provides some background information on the topic and presents the research questions that the study aims to answer. Chapter Two delves into the theoretical literature on the topic. Chapter Three reviews the empirical literature on the topic. Chapter Four discusses the methodology of the study in terms of data, methods and how the study was operationalised. Chapter Five presents the findings of the study of the Finscope data (the quantitative research). Chapter Six presents the findings of the study from the key informant

interviews (the qualitative research). Chapter Seven concludes the study with some policy recommendations and highlights possible areas of future research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

If finance fuels the engine of production, technology is the lubricant that further enhances the entire mechanism by increasing the speed of accessing and transferring finances, which ultimately leads to more efficiency in the supply chain and the production process. Moreover, this interplay of technology and finance leads to innovation. This relationship between technology and finance is built on the use of disruptive technologies in both back and front-end financial service operations. The intersection between digital disruption and FinTech occurs where cyber-physical systems (SMACT) increase the availability of infrastructure for not only businesses but consumers as well. This not only allows FSPs to become more efficient by becoming more paperless and having shorter queues (essentially cutting costs), but this also allows greater convenience for customers (time-saving and overcoming geographical barriers).

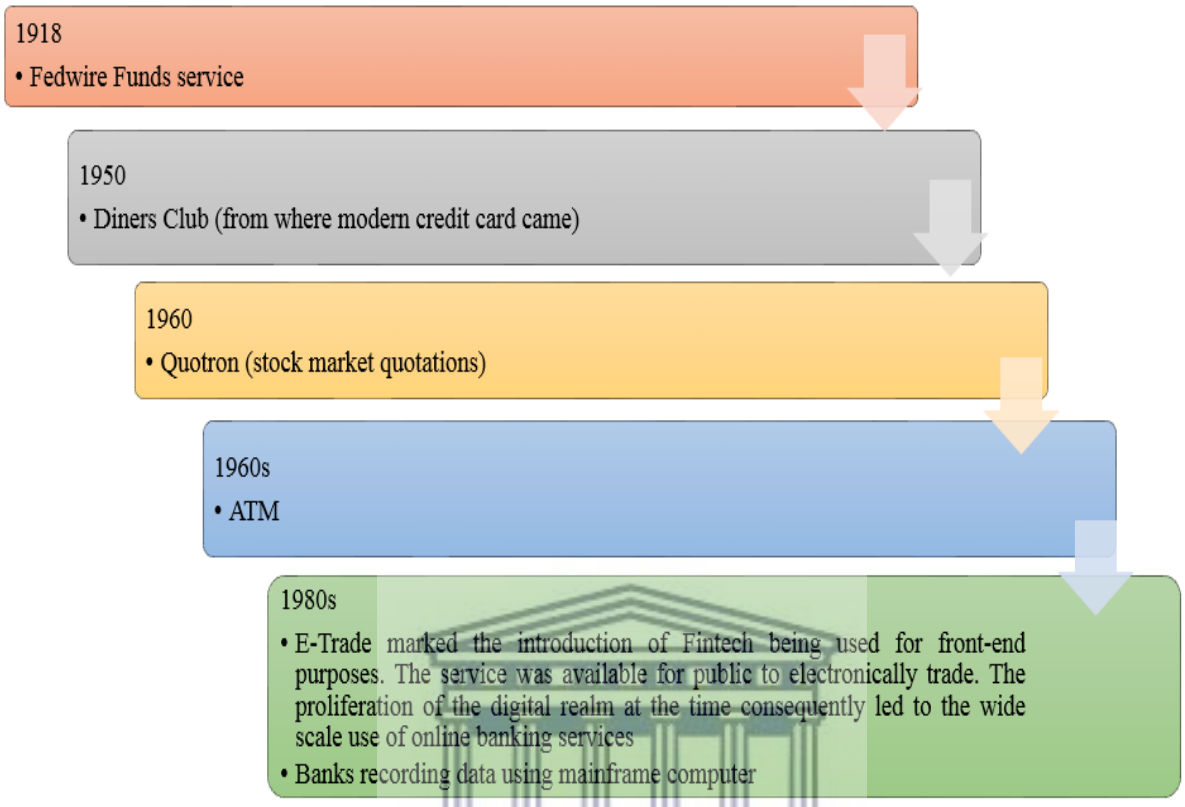
This chapter will review the existing theoretical literature on the impact of digital disruption on financial services provision. The chapter opens with a discussion on the history of FinTech followed by a discussion on the four industrial revolutions in order to provide a historical backdrop highlighting how the various digital technologies that have emerged have led to economic transformation. This is followed by a theoretical review which begins by defining the digital economy and all its components. Following this, it is important to take a step back and understand the role of technology in innovation and how disruptive innovations can be characterised. The literature is discussed with regard to some neoclassical perspectives as well as seminal work by Christensen (1997) on the phenomenon of disruptive innovations. The chapter then discusses the adoption process of these disruptive innovations with a particular focus on the financial services sector, before beginning to define financial inclusion, discuss why it is important and how technology has disrupted the financial services sector and banking. The last two sections discuss the supply and demand sides of financial inclusion in South Africa, particularly important given this study's focus on digital disruption on both sides of the spectrum, i.e. within the bank and in the experience of the end-user.

2.2 Historical background

2.2.1 History of FinTech

The invention of the telegraph in 1866, as well as the development of the first transatlantic cable line, were strong drivers of initial growth in FinTech. In 1918, Fedwire Funds Service revolutionised banking by using the telegraph to transfer money between 12 central banks (Harris, 2016). The invention of the credit card and the automated teller machine (ATM) in the 1950s and 1960s respectively allowed people to have credit access without having to carry money around. ATMs, in particular, meant that people could make deposits and withdraw money outside of bank premises. In terms of electronic trading systems, the Quotron trading system invented in 1960, as well as the E-Trade model of 1982, revolutionised the banks and individual investors respectively. The E-Trade model, which in the 1990s leveraged the internet, is referred to by Harris (2016) as one of the first real FinTech companies. The diagram below illustrates the development of FinTech from a historical perspective.

Figure 1: History of Fintech



Source: http://www.banklesstimes.com/2016/06/27/the-history-of-FinTech/ (summarised by author)

2.2.2 The Four Industrial Revolutions

Production processes have transformed over time. There have been four industrial revolutions, each distinguished by the forces that drove and transformed production processes in each revolution and fundamentally changed society. Each revolution created technologies and infrastructure that became the foundation of the next revolution.

The First Industrial Revolution began at the end of the 18th century and was largely driven by the use of water and steam power to mechanise production (Bloem, Doorn, Duivestein, Excoffier, Maas & Van Ommeren, 2014:11). A good example was the cotton spinning machine which was introduced and improved upon during this phase (Stearn, n.d; Lambert, n.d). Britain was the centre of this phase of the industrial revolution, which also resulted in the expansion of coal and iron production as well as greater development of the railroad (Lambert, n.d). These advancements

allowed for more output per worker as well as a transformation of agriculture and manufacturing in the European economy (Stearn, n.d; Lambert, n.d).

The Second Industrial Revolution started around the beginning of the 20th century. Innovation in mass production, through the ideas of specialisation and division of labour and the invention of the assembly line, was led by the United States and powered by an ample supply of cheap electricity and oil. A series of innovations resulted from progress in the understanding of electromagnetism and chemistry (Philbeck, 2016:1). The telephone, television, microwave and computer invented in this phase laid the foundation for progress in communication technology that characterised the Third Industrial Revolution.

The Third Industrial Revolution, also referred to as the digital revolution, began in the 1970s and leveraged the use of information technology and electronics to automate production (Bloem, Doorn, Duivestein, Excoffier, Maas & Van Ommeren, 2014:11). In this revolution, the internet and cell phones played major roles in cutting costs and increasing efficiency for businesses. Electronic products became smaller and more mobile while hosting more power, functionality and capabilities than their predecessors (Philbeck, 2016:1). A shift also occurred in economies and jobs from manufacturing to the services sector. The third industrial revolution was characterised by the development of SMAC technology in the form of social networks, mobile applications and platforms, advanced analytics and big data, and latterly, cloud-based platforms and artificial intelligence.

The Fourth Industrial Revolution has been associated with the emergence of cyber-physical systems (Bloem, Doorn, Duivestein, Excoffier, Maas & Van Ommeren, 2014:12). Schwab (2016:1) describes the revolution to uniquely consist of a combination and connection between technological, physical and biological aspects in the digital realm. The Fourth Industrial Revolution saw the addition to the above-stated technologies of an increasing integration between information and operational technology and the interconnection between cyber and physical assets – the so-called Internet of Things and hence the acronym SMACT.

The Fourth Industrial Revolution is also characterised by increasingly pervasive and rapid ‘disruption’. Disruptive technologies are innovations characterised by earlier adoption, wider application and more impactful change. For example, the rapid evolution of robotics not only

resulted in disruptive manufacturing technologies that initiated smart factories but have begun to cause concerns globally regarding the impact of these robots on human jobs, security and privacy (consider, for example, how drones are already deployed). Discussion has already begun in the banking sector on the use of artificial intelligence in front-end financial services.

Digital technology applications include the use of artificial intelligence in everyday life (e.g. Siri); the streamlining of operations through the use of high technology software that connects value-chains and various levels of operations, and the use of sensors in farming and in machine to machine communication in factories and 'smart' homes).

Transitions in cyber systems from Web 0 to Web 3.0 (Internet of Things and services) have brought businesses and people closer globally. Aspects that characterise Web 3.0 include a greater connection between the physical and virtual realm, the connection of business models and the development of new business services linking the physical to the virtual in innovative ways that appeal to customer needs that may not even have yet formed. Knickrehm, Berthon and Daugherty (2016:2) define the digital economy as the proportion of economic production that comes from digital inputs such as digital equipment, digital skills and the intermediate goods and services utilised in the production process. The digital economy consists of digital technologies that foster trade through e-commerce (Baye, Brosseau, Heiner, Millet & Wu, 2013:5). Digital platforms allow information to be exchanged across networks at unprecedented speeds between multiple parties, connecting people and resources in powerful new ways.

2.3 Theoretical review

2.3.1 The role of data in the digital economy

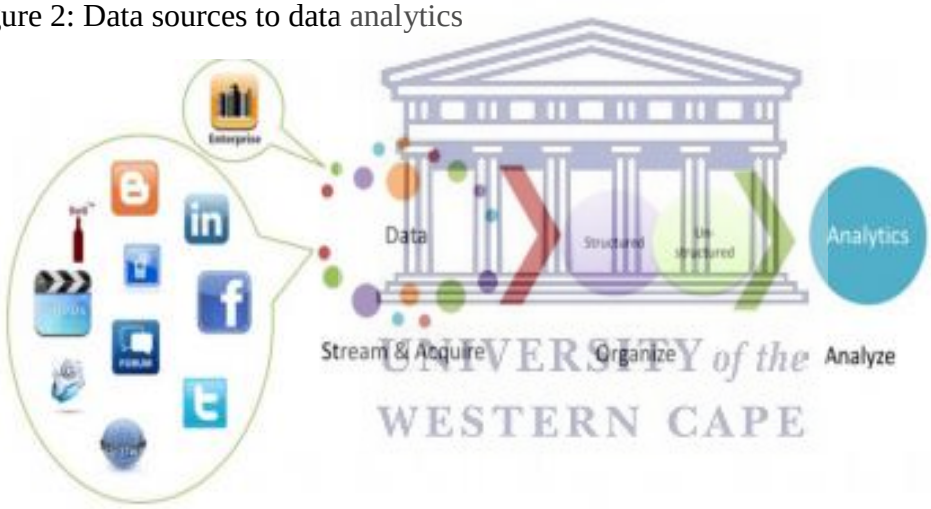
The digital economy has given rise to a host of digital technologies, including SMACT and blockchain technology. These technologies have penetrated various industries in South Africa, including the financial services industry. Data is a central component of the digital economy (Genesis Analytics, 2017:75). The financial services sector deals with a significant daily volume, variety and velocity[3] of data.

[3] Velocity refers to the rapid pace at which data is generated.

2.3.2 The pathway from acquisition (raw data) to impact (analytics)

Siddiqui and Qureshi (2017) highlight the trail to analytics from raw data. Their model refers to twitter data, transactional data, blog views and emails as part of the plethora of unique data sources available for the banking sector to use. Each data sources varies in storage requirements because of heterogeneity in data structure, volume and velocity. For example, it may seem efficient to have a certain database management system that deals with high-volume data. However, if the data is complex, how efficiently does that data management system help in organising the data? There is still some contention on the use of cloud technology for data storage among banks. Cloud technology offers quick and cost-effective storage of data, however, there are security concerns regarding access that deter the adoption of these services (Rieger, Gewald & Schumar, 2013:10). Banks are also wary of sharing client information with cloud computing providers like Amazon.

Figure 2: Data sources to data analytics

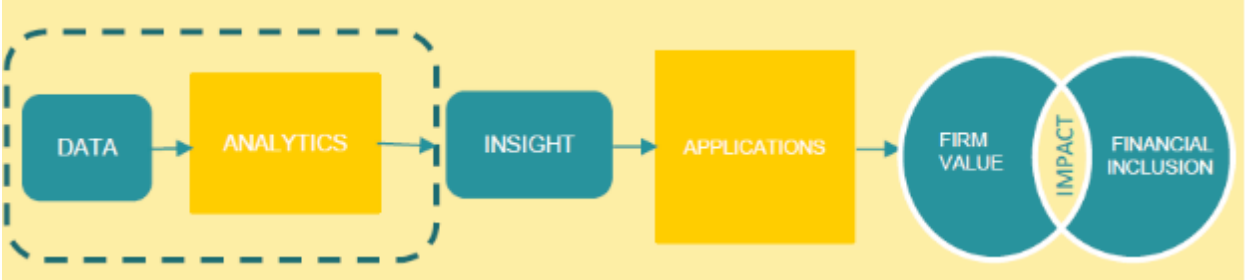


Sources: Siddiqui and Qureshi (2017)

This model ends with analytics which does not paint a full picture of how data is acquired nor provides insights that allow banks to meet their goals. Nordin (2016:2) includes an insights and impact section in her model that depicts the pathway from data to financial inclusion through three phases – data, insights and impact. Some types of data form the basis for the foundation of financial inclusion, be it concrete statistics used on the supply side to add a broad range of financial service offerings for customers to use, or, on the demand side, informal information that is communicated to potential savers about a thriving stokvel in their community. All these types of data are useful and lead to decisions that may or may not affect financial inclusion. On the supply side, data is

particularly important in achieving financial inclusion. Financial service providers are, however, faced with a variety of data sources and will have to choose which data to import based on the storage and analytical capabilities, among other factors.

Figure 3: Topology of the process from data to impact



Source: Nordin (2016)

2.3.3 Types of data

Data is a statistic, a reference, a fact, an observation or an interview that could either be quantitative or qualitative (Nordin, 2016:2). Data could be structured, unstructured or semi-structured and come from a variety of internal or external sources. The next section defines the different types of data dealt with by FSPs. Due to the large number of data sources used, this study will only focus on a few that directly relate to the SMACT technologies, particularly in relation to how useful that data is to the financial services sector.

There are two types of data, traditional and non-traditional/ alternate data/ emerging data. Traditional data consists of structured data only. Non-traditional data, on the other hand, consists of all three data classes (structured, semi-structured and unstructured data).

2.3.3.1 Structured data

Structured data, such as in a spreadsheet, can be sorted into records, each row with a unique identifier (Nordin, 2016:2). Each record has the same number of attributes. This type of data is referred to usually as traditional data. This form of data informs FSPs on trends and client consumption of financial products (Nordin, 2016:4). The data volume is large but not complex to classify and analyse.

2.3.3.2 Unstructured data

This type of data does not have any structure. It does not follow the record/ column layout (Nordin, 2016:3).

2.3.3.3 Semi-structured data

These are records (rows) that have a greater degree of variety than structured data, so much so, that each row does not necessarily have the same number of columns (Nordin, 2016:3).

2.3.3.4 Big Data

Big data has been characterised through; volume, velocity, and variety (3V's) (Laney, 2001). More recently, researchers have begun including value and veracity as additional features of big data (Chen, Kazman, & Mathes, 2015: Normandeau, 2013: Ward & Barker, 2013). This type of data cannot effectively be stored, managed and analysed in conventional database systems. These database systems cannot support the speed that is required to extract, load and transform large amounts of data (Trujillo, Garcia, Jones, Kim, & Murray, 2015). The conventional relational database not only is time-inefficient but is not cost-effective either (Schad, 2017; Trujillo, Garcia, Jones, Kim, & Murray, 2015). These systems are only able to handle low volume and low complexity queries (Schad, 2017). Scaling up such a database is usually costly (Trujillo, Garcia, Jones, Kim, & Murray, 2015). Heterogeneity in data file types and structures create complexities that are difficult for banks to deal with by themselves. The technical difference in scaling up big data as opposed to a relational database is associated with how one physically adds capacity to the system. While big data databases are scaled up through increasing the number of nodes in the system, relational databases are scaled up by expanding the current nodes by increasing the memory capacity of each node (Schad, 2017).

2.3.3.5 Data sources

Various types of data can be collected by financial service providers: social media data, mobile technology–CDR data, mobile app data, sensor data (IoT) and RFID scans/ point-of-sale data.

i. Social media data

Getting a 360-degree view of customers can be achieved by using customer social media data. This is particularly helpful as structured transaction data only provides a glimpse of the customer (Joshi & Saxena, 2013:2). It provides socioeconomic data and spending patterns but it does not explain the broader customer identity, such as their hobbies. This is important data if there is to be

a true understanding (and potentially lucrative anticipation) of customer behaviour. Moreover, the data is important if the bank is to predict how customers will respond to financial products they plan to develop. There are many challenges related to social media data. Firstly, the volume of the data is large. Secondly, the data has substantial variety (text, audio, video, jpeg). Thirdly, the banks have to deal with the velocity at which this type of data is generated every second. Even if banks could collect this type of data efficiently, they would still have to deal with the fact that the data contains a lot of 'noise', that is, data that may not be useful to the bank (Joshi & Saxena, 2013:2). Social media data does, however, contain 'signal' data, which is data that may be useful to the bank (Joshi & Saxena, 2013:2). The challenge to banks is to distinguish between the two types of data through establishing some type of protocol and then extracting the data in a cost-effective manner that also complies with applicable legislation or regulation (see section 2.7.1.1).

There are concerns related to the use of social media data in banking. For example, the veracity of the data is questionable as it is easy to buy Twitter followers, which may artificially improve the credit score of an individual (Baesen, cited in Zicari, 2016). That is, if Twitter followers are positively linked to a credit score, buying Twitter followers can lead to an individual who previously would not qualify for a home loan gaining access to money that she may not be able to repay. Moreover, if social media is used in credit score calculations, it may dilute the impact of more valid measures of assessing the creditworthiness of an individual. Social media data also creates opportunities for discrimination. Banks are not allowed to base their credit scoring on discriminatory identifiers such as gender, race or beliefs (Baesen, cited in Zicari, 2016). Social media data may thus create an ethical loophole which may undermine the regulatory compliance of banks (Baesen, cited in Zicari, 2016).

ii. Mobile technology / Call detail record (CDR) data

Call detail records (CDRs) have been around for a while but have yet to be fully leveraged by FSPs in their decision-making processes. CDRs are records that document text or calls. The data collected includes the receiving and calling number, date, duration and geographical area of a call (Nordin, 2016:6). This provides valuable insight into the life of a customer, such as who he interacts with the most, whether he is a client of the bank or one of its competitors, which neighbourhoods the caller spends most of his time in or whether the CDR confirms the residential and occupational information provided by the client to the bank. Such data is KYC

information that could as easily assist the bank to identify suspicious activity as assist the bank to obtain a 360-degree view of its clients in order to better serve them. This type of data is becoming increasingly attractive in light of the ubiquity of cell phones in South Africa (Nordin, 2016:6). The sharing of information is also relevant. Telecommunication companies that are contemplating getting into financial services themselves are unlikely to be willing to sell their competitive edge to FSPs. Such information could be useful in assessing the credit score of an individual (Baesen, cited in Zicari, 2016). In Kenya, there have been various applications of CDR data in banking by Safaricom, a telecommunications company, as well as Tala, an FSP (Nordin, 2016:6).

CDRs are among the most promising data sources since more people have cell phones than financial accounts. Cell phones are also widely owned across such broad age, income and geographical constituents that they constitute a diverse and large (volume) source of big data. The financial inclusion potential through CDRs for lower-income communities in developing countries is therefore huge (Nordin, 2016:7). A substantial problem is the reliability of the data. Cell phones/ sim cards, despite being RICA'd, are not always bought first-hand and they can easily change hands without the mobile operator's knowledge. Identifying who really sent a certain message may not be as straightforward as it seems on the face of it.

iii. Mobile application data

Mobile application data has become more prevalent with the reduction in the cost of smartphones and consequent increase in smartphone uptake. Mobile application data is particularly strategic as it provides clearance/ gives permission to app providers to use very valuable information such as personal ID details, IMEI number, geographical location (located through GPS), battery life and lists of contacts (Nordin, 2016:10). The biggest barriers to adoption include smartphone costs and data costs which primarily inhibit lower-income consumers. Mobile application platforms enable banks to collect data on their clients as well as reduce their costs of administration. The data collected could provide valuable insights that improve mobile banking and assist banks to customise their marketing to specific clients.

iv. Sensor data and the Internet of Things

The Internet of Things (IoT) refers to the use of the internet to connect devices. These devices may include mobile devices (tablets, smartphones), electronics (television, smart fridge), production

equipment, surveillance equipment and even vehicles. The increasing prominence of the IoT will speed up digital disruption in the financial services sector (Harvey & Pagett, 2015:1). The proliferation of these technologies will also give rise to more cyber-physical systems that will allow businesses to streamline activities, and consumers to have better interactions with one another and between themselves and machines. Apple and other technology companies have leveraged the IoT to create smart homes in which voice commands trigger specific reactions from various smart devices (Gottheil, A, 2017). For example, the lighting, security cameras and heating can be turned on or off with a voice command the moment the user enters or leaves a room in the house in order to save electricity. From the businesses' perspective, smart technologies have featured in the creation of smart factories that use sensor technology and the IoT to facilitate interaction between machines. This has led to cost-cutting technological breakthroughs such as predictive maintenance which already plays a role in reducing downtime related to machine damage and workers' injuries due to malfunctioning machines.

According to Nordin (2016:1), the IoT area began in 2008 when the number of things that were connected to the internet first exceeded the number of people connected to the internet. Privacy and security issues are still significant barriers to IoT adoption in financial service provision (Nordin, 2016:2). In terms of lending, sensor data could significantly disrupt the way in which lending decisions are made. Through the collection of sensor data in agriculture or manufacturing, lenders of capital could use this available data and more appropriately assess the investment risks and returns (Harvey & Pagett, 2015:3). Based on sensor data that has never before been used, small-scale farmers, SMMEs and other inadequately financed businesses could potentially see high levels of financial inclusion based on this alternate data. Applications of sensor data have already taken place in retail banking. Examples of these include video tellers and kiosks (Harvey & Pagett, 2015:3). More nuanced applications of sensor data are required in the retail banking space, as branchless banking becomes a phenomenon across the globe. The traditional payment experience is therefore disappearing and banks have to seriously consider how they will offer payments services in an IoT intensive ecosystem. In addition, questions have to be asked about how banks will manage the large volume of sensor data in a cost-effective manner.

Currently, the IoT is still in its early phases in terms of the number of uses that exist. There are still problems regarding cybersecurity which has been proven to be vulnerable in many instances.

In fact, establishing a standard communication language between devices persists as a grey area. There are still too few cases of use with strong value propositions (Nordin, 2016:12). Moreover, current IoT projects have tended to be developed and operated in silos and questions of interoperability thus arise (Harvey & Pagett, 2015:3). Consequently, we are yet to see the financial inclusion implication of sensor data in developing countries like South Africa (Nordin, 2016:12).

v. RFID scans/ Point-of-sale data

Perhaps a more established and traditional type of data is point-of-sale data. This type of data comes from debit and credit card transactions. Whenever a debit card purchase is made, for example, at a retail store, the bank picks up where the product was bought and how much was paid. This type of data is easy to collect and store relative to the types of data that were discussed above. The next step for banks is to understand customer spending habits and, based on this behaviour, be able to predict which purchases are 'out of character' or may perhaps be considered suspicious. This would help to curb credit/ debit card fraud and protect clients who may have been targeted by criminals.

2.3.3.6 Cloud computing

Cloud technology has been an important facilitator of innovation through the establishment of cloud platforms for applications developers. Digital disruptors such as WhatsApp, Uber and Airbnb would not be possible without the use of cloud platforms. The management and protection of data are particular forefront issues and opportunities in cloud computing. Cloud infrastructure has to have servers and networks that can handle large amounts of data without crashing. Therefore, part of the discussion on cloud computing includes 'Big data' and 'analytics'. Van der Boor, Oliveira and Veloso (2014:1601) indicate that the openness of a platform is a determining factor in the development of new no-technical applications on the platform to serve the needs of users. Flexible technology platforms and favourable regulatory conditions were identified in the study as enablers of user innovations while latent market demands were identified as a driver of user innovations (Van der Boor et al., 2014:1605). Better cloud computing infrastructure has allowed companies to store, analyse and extract meaningful information from large amounts of data. This will subsequently lead to better information availability which may assist businesses in making better decisions. Harvey and Pagett (2015:3) note that, through data captured using sensors

and analysed on people, platforms that deliver financial services will enhance the ability of people to make better financial decisions.

2.3.3.7 Non-traditional data

Non-traditional data includes all three data classes, which creates complexity in terms of storing, managing and analysing this data as time and cost-effectively as possible. This type of data also has more data privacy barriers which adds to the uncertainty/ risk of banks. Ultimately, this informs the access, storage and analytical capabilities of FSPs.

FSPs have historically focused on traditional data, but are slowly starting to incorporate non-traditional and alternate data into their decision-making process (Nordin, 2016:3). Alternative data is similar to non-traditional data (Nordin, 2016:3). The data is used for assessing the risk of lending based on non-financial data, i.e. not using the income and expenses of a business or individual (Nordin, 2016:3). Alternate data could be used in the informal market, where business owners may not have the accounting knowledge to accurately record income/ expenses/ assets. While informal traders may not have financial data, they may have utility bills or rental payment receipts which could be used to assess the creditworthiness of the traders. The table below classifies the different uses of data by financial service providers in their decision-making processes.

Table 1: The different uses of data by financial service providers in their decision-making processes

Traditional financial data		Emerging data sources	
Internally created	Spending/consumption data (patterns, absolutes, accounts – checking, savings, etc.)	**Newly used**	Census data
	Payments data (debit, credit, missed payments, repayments history, purchased history, debt history, etc.)		Education data
	Product/usage data (loyalty card data, claims data, inventory)		Rent
	Channel data (communication, distribution, payments, point of sale, supply chain)		Medical payments (insurance premiums, etc.)
	Customer services data (CRM, support history, patient records)		School fees
	Compliance data (KYC, AML, etc.)		Utility bills (electricity, gas, water, internet, etc.)
	Marketing data (campaign performance, market research, etc.)		Call centre voice records
	Mortality tables		Subscriptions (cable TV, etc.)
Externally created	Credit bureaus	**Newly Available**	Social media data (YouTube, LinkedIn, Yelp, etc.)
	Affiliations		
	Industry data		Call detail records
	Trading data		
	Regulatory data		Psychometric data
	Analyst reports		
	Government data (OGD)		Satellite imagery
Created via direct engage-ment	Personal demographic data (age, gender, marital status, size of family, etc.)		
	Employment data (income, sector, position, years in business, etc.)		Geospatial data
	Asset data (net worth, debt to enquiry ratio, property – how many, size, location, value, etc.)		
	Contact details (email, phone number, etc.)		Biometric identification data
	Identity verifiers (government issued IDs, proof of address, etc.)		
	Customer touch point data (via ATMs, call centres, websites, branches, etc.)		Mobile data (usage, make and model, mobile money transactional data, SMS content, etc.)
	Customer interviews		
	Survey questionnaire data (in person, online, mail, SMS, etc.)		Clickstream/mouse data
	Focus group discussions		

Source: Nordin (2016)

A key opportunity in the current data-based economy is leveraging big data to improve financial inclusion. Opportunities exist in using utility payment bills, call detail records, psychometric data and social media data to better understand the credit needs of underserved/ unserved subgroups of the economy (Loufield, Ferenzy & Johnson, 2018:7). Advanced applications of big data are found in customer segmentation, customer engagement/ interaction, product design, fraud mitigation and identity verification (Loufield, Ferenzy & Johnson, 2018:7).

The area of risk management can vastly be improved through the appropriate use of big data to improve fraud detection, credit scoring and cyber analytics on a client level (Nordin, 2016:8). On a firm level, big data could be used to improve stress testing and financial crime compliance in keeping the bank in line with anti-money laundering (AML) protocols. Although banks have applied analytics to a wide range of financial products, they are yet to take a 360-degree perspective on customer relationship management (Siddiqui & Qureshi, 2017:34). Banks inadequately use external data like social media data. There are many benefits to big data adoption in banking, including identifying reasons for problems, discovering the most effective and efficient interfaces between the bank and its clients, identifying the most valuable customers to the bank, risk mitigation, tailored marketing, more efficient HR processes and mitigating fraud risk (Siddiqui & Qureshi, 2017:35). Banks, however, struggle with the legal and regulatory challenges. Data integrity and privacy are priorities that banks have to maintain in order to not lose the trust of third-party partners and customers. Other difficulties include inefficient data management systems/ processes, as well as developing the best relationship pricing models (Siddiqui & Qureshi, 2017:35).

2.3.3.8 Analytical capabilities

The analytical capabilities of an FSP are crucial in determining what impact the data can have on firm value and financial inclusion. A huge investment has to be made not only into analytical software but more broadly in data management software and hardware. Decisions have to be made about whether to store information on-site in backup servers or in the cloud. The type of data management software directly impacts on the analytical capabilities of the FSP. It affects how quickly data can be accessed and the likelihood of failure during analysis. The figure below depicts the various analytical capabilities in which banks may engage.

Figure 4: Analytical Capabilities

Source: Adapted from IBM (2013)

2.4 The role of technology in innovation

2.4.1 Importance of technology to innovation

In neoclassical economics, both technological change and innovation are seen as exogenous elements (Evangelista, 2015:5). Neoclassical economics includes seminal work by Ramsey (1928), Cass (1965) and Koopman (1965) which model long-run economic growth. Their models note that at a given level of technology, per capita output is dependent on increases in the capital to labour ratio. Hence, they do not consider technological change and innovation as integral to understanding the functioning of markets or understanding the overall output of an economy (Evangelista, 2015:5). Endogenous growth models such as those of Lucas (1988) and Romer (1986) include innovation and technological change in explaining output growth. Joseph Schumpeter's noteworthy contribution came in the form of methodology and perspectives on the role of innovation from monopolies and how that results in competition that overall leads to economic change (Evangelista, 2015:7). That is, profitable innovations from monopolies act as incentives for new firms to enter the market. This leads to more competition in the market and fundamentally changes how that market operates. Neo-Schumpeterian, supply-side, micro-based perspectives on the role of technology in deterministically relating to economic growth as well as the assumptions they present, are quite simplistic in the manner in which they view the relationship between technological advancement and economic growth (Evangelista, 2015:11). This

perspective also only perceives a linear and deterministic impact of technology on the economy and society as a whole (Evangelista, 2015:14). Technological change in a capitalist economy exacerbates already existing income inequalities, divergences between labour productivity and the capacity of the market to absorb all output (Evangelista, 2015:15).

Evangelista, Guerrieri and Meliciani (2014:3) note that a less deterministic approach to the relationship between ICT and the economy has more recently become prevalent in the literature, with a movement towards looking at inclusion and exclusion from the digital society, taking into account socioeconomic and cultural context (Evangelista et al., 2014:3). Evangelista et al. (2014) find that ICT access was not a significant contributor to the macroeconomic performance outcomes among EU countries. These were attributed to the already high level of access to ICT infrastructure and devices in EU countries which allowed other factors (e.g. ICT usage and digital empowerment) to have a more significant role in affecting the performance variables (Evangelista et al., 2014:23).

Although investing in digital technologies is important, for developing countries like Brazil the focus should be on creating an environment in which digital technologies can be leveraged for growth. This includes an emphasis on human capital, infrastructure, regulation and openness (Abarche, 2016). This is because there is no guarantee that greater digital technology penetration will lead to improved employment and long-term economic growth (Abarche, 2016).

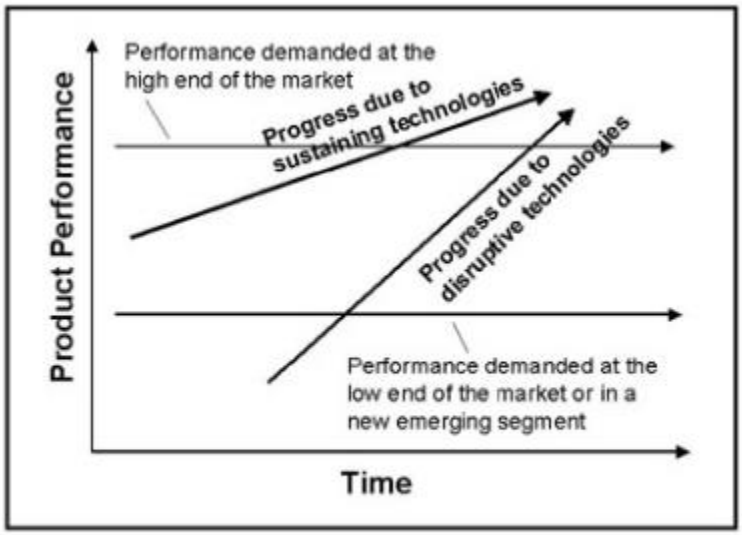
As a result of short life-cycles, digital technologies may increase productivity but not necessarily increase the competitiveness of a country (Abarche, 2016). From a low base, a developing country may increase economic growth and productivity of sectors in the economy. However, once a certain technology becomes ubiquitous, which occurs relatively fast due to network effects associated with digital technologies, the technology will no longer offer a competitive advantage.

Christensen (1997) developed a framework explaining the repeated failure of companies with a focus on the disk drive industry. He tries to explain this over a prolonged period of time to negate the counter-argument that the failures were situational. Three aspects are discussed. Christensen (1997:xv) firstly distinguishes between sustaining and disruptive technologies, the former being technologies that better the performance of a product each year in a way valued by mainstream customers and the latter being technologies leading to a product that usually has lower performance levels than the sustaining technologies but is able to capture peripheral customers. What is noted

is that incumbents focus on sustaining technologies, for example improving the number of gigabytes a memory card can store. Secondly, Christensen (1997) highlights that products of sustaining technology often surpass the market demand requirement of customers. Christensen (1997:xvii), thirdly highlights how investing in disruptive technologies is not a rational investment for firms as the margins are low, the product is generally unappealing to mainstream customers, and the initial focus of disruptive technologies is on small, emerging markets. This disincentivises incumbents from investing in disruptive technologies, particularly under pressure arising from shareholders and customers. The three reasons mentioned above lead to an underinvestment in disruptive technologies by companies that, as a result, may lose significant market share if the disruptive technology becomes ubiquitous.

The figure below illustrates the trajectories of sustaining and disruptive technologies over time as well as the performance demanded in the markets. Christensen (1997:206) notes that the best way to identify disruptive technologies is to graph the trajectories of performance improvement demanded in the market versus the performance improvement supplied by the technology. In order to do this, the current mainstream market needs have to be clearly defined. Moreover, these needs should be compared to the present capacity of the technology. In addition, an observation of the actual customer interaction with the product (e.g. with broadband) is needed for verifiability reasons as opposed to customers self-reporting their usage of the product. Lastly, these observations should indicate how much of the product (e.g. broadband data) is required by the customer.

Figure 5: Product performance of disruptive and sustaining technologies



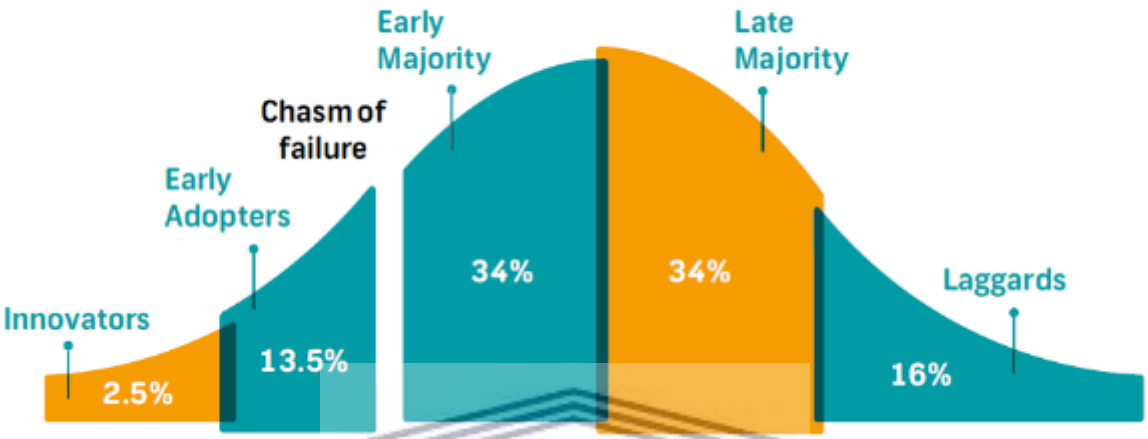
Source: Christensen (1997)

2.5 The adoption of disruptive innovations: Digital disruption

Much of the discussion on disruptive innovation and early adoption assumes that first-mover advantages always exist. There are clearly some advantages to being a first-mover. Firms that act first and are able to use their speed and financial strength to leverage the new possibilities offered by new technology can become dominant in that field. This may make it difficult for newcomers to enter the market. This may be linked to the slowdown in the emergence of start-up companies valued at $1 billion or more (Abarche, 2016). Alkema and Chen (2017:34) argue that first-mover advantages from disruptive innovation technologies are largely dependent on distinguishing between long-term value and the 'hype' associated with the technology. The figure below illustrates the technology adoption life-cycle by George Moore (as depicted in Alkema & Chen, 2017) which has been applied in economics, information technology and marketing and fields. The life-cycle of innovations can be represented by an S-curve. The s-curve consists of four stages, namely the start-up stage, the scale stage, the competing stage and the transition stage. According to Christensen (1997:11), if a firm moves along the S-curve, this is considered to be as a result of incremental improvements of technological methods that already exist. On the other hand, if a

jump occurs from one s-curve to the next, this could be attributed to the adoption of a dramatically new technological approach (Christensen, 1997:11).

Figure 6: Stages of technology adoption



Source: Alkema and Chen (2017)

Holistically considering the various theories around technology with regards to firm success and failure, we have to begin at Schumpeter's seminal work which argues that the innovation of monopolies leads to abnormal profits which signal new companies to enter the market in the hope of capturing the profits. But how do these companies defend themselves against competition from other market forces? How do they maintain their competitive advantage and succeed? Porter (1979) notes five different forces that need to be taken into account in order to succeed in the market. But even after taking these forces into account, large companies may still fail. Christensen (1997) found that large companies in the disk drive industry failed despite following traditional business strategies and listening to their investors.

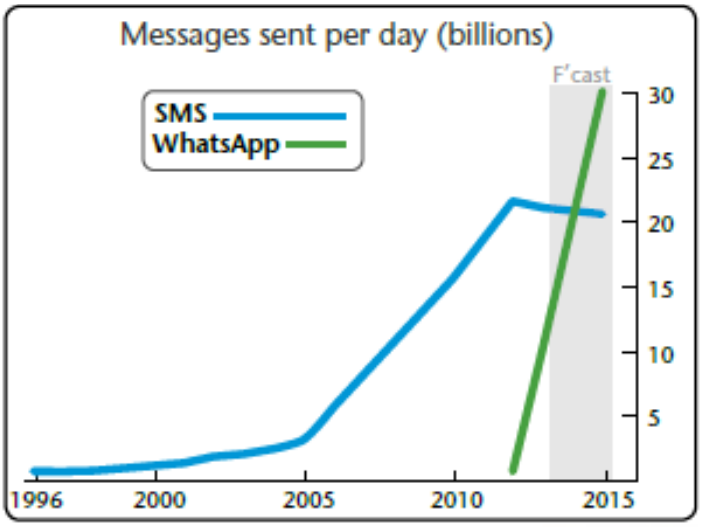
Christensen (1997) presents evidence that when it comes to sustaining technologies (radical or incremental), the established firms outperformed the entrant firms. The established firms led in innovation in this regard and entrant firms were primarily followers. The opposite was true from disruptive technologies where entrants led innovation and established firms that did not fail were followers. Christensen (1997) attributes this lag in adoption to incumbent firms succumbing to customer pressure to remain invested in sustaining technology products.

Digital disruption is broadly defined as cyber-physical systems (e.g. SMACT) and their capacity to significantly transform society. The origin of digital disruptions is however not clear-cut. The third industrial revolution provided the architecture and networks required for digital disruptors such as Amazon, Google and Apple. It is however interesting to note that the digital disruption that took place in the 90s and early 2000s occurred at a much slower speed relative to digital disruption taking place in the present day (Chan, 2016; Moeller, Hodson, & Sangin, 2017).

Digital disruption can also be defined through its characteristics. Some of the most referred-to examples in the literature include Uber, Airbnb and Netflix (Kennedy, 2015; Dawson, 2018). All three businesses changed the process of conducting business with consumers in their respective industries. Uber and Airbnb both utilised the sharing economy economic model in which one party could borrow and rent assets owned by another party. These peer-to-peer business models have been particularly disruptive, in that the barriers to entry have significantly reduced. Each of these markets has become more competitive because they encourage self-employment and entrepreneurship. Moreover, they have shifted the way in which insurers relate to the property and taxi industry. For instance, what type of insurance would cover a homeowner who uses Airbnb to rent out his home for a couple of weeks?

A factor affecting the speed of digital disruption and the penetration of these disruptive technologies into the market is the network effect. LinkedIn is a good example of how the network effect works, wherein the value of the platform/ service is partly derived from the number of users on the service. The more people use LinkedIn to network, the more people the service attracts through word of mouth and the general pressure that exists on people to use the service as it increasingly becomes a standard for connecting professionally. The graph below illustrates how far WhatsApp has surpassed the use of SMS, partly owing to the network effect.

Figure 7: Messages sent per day



Source: Portio Research, a16z, *The Economist*, 2015, as cited in Bradley et al. (2015)

A digital disruption is particularly distinguishable from the usual dynamics of competition in that the speed of innovation of digital disruptors and the risks associated are particularly quick and high respectively (Bradley, Locks, Macaulay, Noronha & Wade, 2015:1). Uncertainties related to disruptive technologies are among the reasons that large companies underinvest in disruptive innovations. However, some companies disrupt their business models as a result of new technologies. Digital disruptors pose a clear threat to competitors because of the pace of growth of their users and the flexibility of their business models that allows them to compete in more than one market (Bradley et al., 2015:1). Furthermore, product innovations resulting from disruptive technologies are appealing to customers because of their convenience, simplicity and relatively lower price (Christensen, 1997:xv). The example of Kodak's failure to adopt new technologies and their resistance to digital disruption in the midst of changing customer needs has been discussed repeatedly in the literature as a lesson to incumbents that do not disrupt their business models when faced with digital disruptions.

Governments will also be affected by the digital revolution. Technology offers an increasingly important platform for government and public engagement. This is of particular importance for the vulnerable, in order to keep government accountable for its current projects as well as to voice their concerns over difficulties that they face. The exchange of information between devices has

led to what has been referred to as a smart factory in which cyber-physical systems improve the efficiency of the traditional factory (Bloem et al., 2014:7).

We are not only seeing changes in efficiency but in the overall business models of enterprises. Businesses offer consumers value in different ways depending on their business model. It is important to note that the businesses that have been the most successful disruptors recently, such as Amazon and Netflix, have not only focused on one business model but a combination of business models, e.g. more cost value, more experience value and more platform value for the consumer (Bradley et al., 2015:8). Therefore, remaining static or using one business model may set back a potentially competitive enterprise in the digital age.

2.5.1 Importance of Fourth Industrial Revolution technology adoption to innovation in financial services

No universal definition of FinTech currently exists (Schueffel, 2016:1). Some researchers and practitioners consider fintech as an action, others as industry and some as a type of technology (Schueffel, 2016:1). FinTech can however loosely be defined as the overlap between technology and finance (Zavolokina, Dolata, Schwabe, 2016:1). FinTech can also be viewed as the convergence of technology and finance resulting in a generation of new ideas/ ways in financial services. Initially, FinTech came from technological/ computing processes that were applied to the back-end of banks or trading firms. Now there is an increased prevalence of the application of these technologies at the front-end office. This relationship between technology and finance is built on the use of disruptive technologies in both back and front-end financial service operations.

The financial services sector in South Africa has been transformed both by disruptive technologies and digital disruptions. Some of the disruptive technologies that have revolutionised banking in South Africa include the cell phone, the personal computer, the internet and the ATM. These technologies can be referred to as disruptive because of the convenience and lower transaction costs they offer customers. All have allowed for a paperless, cheaper and faster-transacting banking system. Digital disruptions that have transformed the financial sector include such innovations as mobile banking, PayPal and Bitcoin (Alkema & Chen, 2017:9). These financial digital disruptions are a key opportunity for banks that want to maintain a competitive advantage. The banking sector has to disrupt its business models in the new digital age or be displaced (Alkema & Chen, 2017:7). To disrupt their business model, they have to change their value

proposition (that is, the way the business plans to deliver its goods/ services to meet customer needs/ wants).

Changes have already occurred in the banking sector with the increasing use of cell phones and mobile banking services. Blockchain, PayPal and Snapscan have each caused disruptions in the financial services sector as they have changed how consumers and businesses transact internationally. Blockchain will allow for secure online transactions between two counterparts in a decentralised manner. Blockchain has yet to be adopted in South Africa, but in the near future may cause changes in the way the government, consumers and businesses transact. An intriguing aspect of blockchain is its ability to decentralise banking which may fundamentally threaten the banking system in South Africa (Alkema & Chen, 2017:8).

The availability of advanced ICT is speculated to be a positive determinant of FinTech development (Haddad & Hornuf, 2018:7). The availability of such technologies creates new possibilities for innovation and new methods of conducting business, thereby leading to new business models (Haddad & Hornuf, 2018:6). Some of the benefits of advanced ICT to FinTech include the lowering of transaction costs, increasing the speed of transactions, information sharing and improvements in customer convenience (Haddad & Hornuf, 2018:7).

Information technology and technology, in general, have drastically transformed financial institutions (Okiro & Ndungu, 2013:146). This transformation has been progressive, with a multitude of services successfully being introduced (Okiro & Ndungu, 2013:146). The rise in global online shopping is indicative of the fact that, despite some security concerns, more customers are increasingly trusting digital means of transacting (McWaters & Galaski, 2017:89). Rather than traditional banks, FinTech and big technology firms are setting the pace on how banking should 'feel' and what kind of experience customers should have while banking (McWaters & Galaski, 2017:89). Skan, Dickerson and Gagliardi (2016:5) split FinTech companies into two broad categories. The first group includes FinTech companies that are direct threats to incumbent FSPs. These companies are disruptive innovators since they target smaller markets by providing better customer experiences. The second category, which comprises collaborative FinTech companies that provide solutions that benefit incumbent FSPs and other market participants, actually has experienced significantly more growth in investment compared to the first category of FinTech companies (Skan, Dickerson & Gagliardi, 2016:5).

Investment management has been affected by the increase in automation among financial institutions. Investment banks have experienced efficiency gains on their front-end functions since the advent of the internet and digitisation (Treat, Mcgraw, Helbing & Brodersen, 2016:1). In contrast, back-end processes have remained unchanged for the most part (Treat et al., 2016:1). Treat et al. (2016:1) point out that blockchain technology could benefit the investment banking industry by reducing the risk of counterparties as well as decreasing the opaqueness of contracts and reporting.

Investment banking has also been particularly disrupted with the use of robo-advisers to engage with clients on investment decisions. Robo-advisory, which is increasingly permeating the investment management industry, is standardising the practice of offering investment advice (McWaters & Galaski, 2017:128). With the target of robo-advisory being the mass-market customer, which is a low per-customer value consumer, the cost of acquiring these customers for new entrants has become relatively high (McWaters & Galaski, 2017:135). Investment advice is, however, a particularly personal service and requires a high degree of sensitivity and engagement, especially with high-net-worth clientele. Consequently, emotional intelligence and other intangible human qualities are becoming differentiating aspects for investment management firms (McWaters & Galaski, 2017:145). Hence, a greater investment in these aspects may yield profitable gains for investment firms amid Fourth Industrial Revolution robo-advisory transitions.

Another Fourth Industrial Revolution innovation is crowdfunding, the use of an online platform that allows individuals, businesses and organisations to raise funds from donors to finance their projects, e.g. new business ventures, school buildings and paying off school tuition. Some of the crowdfunding applications that have gained popularity include Kickstarter, GoFundMe and Indiegogo. All of these crowdfunding applications deducts a proportional fee on the funds raised.

McWaters and Galaski (2017:149) note that crowdfunding platforms experienced investor and entrepreneur demand-driven growth that occurred quite rapidly. The potential for long-term, wide-scale, growth in equity crowdfunding was not perceived with optimism due to its lack of integration with the broader financial sector (McWaters & Galaski, 2017:149). Despite this, success stories of equity crowdfunding platforms such as Seedrs and AngelList indicate that the potential for equity crowdfunding may be brighter than suggested.

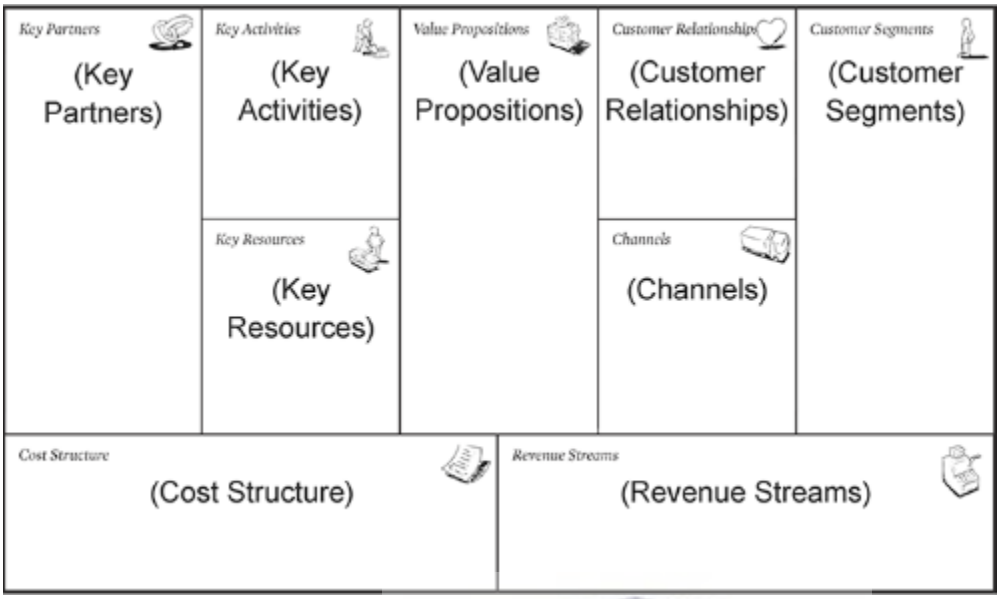
2.5.2 The FinTech business model

All business enterprises make use of some sort of business model, be it explicitly or implicitly in place (Teece, 2010:173). Business models are used to establish the value-creation process for the business to customers (Teece, 2010:173). They can be essentially defined as the manner in which value is created and transferred to customers for a price (Teece, 2010:173). New technologies mean more customer choice and require businesses to be consumer-focused in order to capture the attention of the customer. Furthermore, value-propositions need to be adjusted. That is, the offering that the business promised to deliver to the customer has to be adjusted to meet changing customer needs.

A number of business model frameworks exist that explicitly take value propositions into account. Among the most commonly known frameworks are Johnson (2010) and Osterwalder and Pigneur (2010). Johnson (2010) establishes a four-box business model framework that considers customer value-proposition, the profit formula (revenue model, cost structure, target unit margin, resource velocity), key resources and key processes. The business model is aimed at businesses which enter into activities that are outside of the core functions which Johnson (2010) refers to as the "white space". Johnson (2010) argues that the best way of going about this is to develop an entirely new business model rather than attempting to incorporate the new activity into the old business model. Osterwalder and Pigneur (2010) developed a business model canvas that includes nine elements, namely value proposition, customer segments, customer relationships, sales/ distribution channels, key resources, key activities, key partnerships, revenue streams and cost structure. Unlike the four-box business model, Osterwalder and Pigneur (2010) go into more detail in their description of value proposition and consider, with additions, all the aspects offered by Johnson (2010).

The Business Model Canvas of Osterwalder and Pigneur (2010) is illustrated in the diagram below. The framework will be used in this study as a measurement framework for a microeconomic assessment of the impact of digital disruption on the banking industry and the economy at large.

Figure 8: Business model Canvas



Source: http://141nh047iozd1l75s22eer06.wpengine.netdna-cdn.com/wp-content/uploads/2013/02/Business-Model-Canvas-

Along with the value proposition aspect, the business model canvas takes into account eight other elements. Revenue streams refer to the various ways that income flows to the bank or financial intermediary (as in the case of this study). This may be through lending, leasing or brokerage fees. Cost structure refers to the proportion of the costs that are fixed or variable. This aspect could also be used to consider the economies of scale in the industry. The customer segment dimension refers to how the market has been segmented, e.g. diversified markets and multi-sided markets. Customer relationships in the model refer to how engaged the customer is with the business, from a human interaction point of view. Examples of this include self-service, automated services and online community services. Key activities refer to the activities (e.g. marketing) that the bank engages in so that it can deliver the value of their product/ service to the customer. Key resources include the human, physical and intellectual resources of a business. Lastly, key partners are important and this aspect takes the back and front end of the value chain into account. In some cases, banks partner with smaller financial intermediaries in the delivery of certain financial products/ services. This aspect considers the strategic alliances that businesses may have formed with each other in the delivery of their value propositions. The innovation of new products and services changes the production chain, the number and type of workers required and subsequently the value proposition

of the business. The above business model frameworks all take value proposition into account in some way, despite differing in other aspects considered in their models. These types of innovations that specifically aim at meeting consumer needs for convenience and experience are referred to as disruptive innovations.

Some of the elements in the business model framework are incorporated into the model of this study to assess how different data sources have led to disruption that affects firm value. The determinants of sustainable financial inclusion (SFI) in the model of the Boston Consulting Group (Kessler et al., 2017) are also incorporated. Customer segments, channels and customer relationships and key activities from the BMF are collapsed into customer centricity that has four aspects, namely a 360-degree view, personalised marketing and customer retention and distribution channels (added from the SFI model). Key activities are removed and are partly covered through financial inclusion as well as the inclusion of innovation of new products/ services aspects. The financial inclusion aspect comprises of access (to bank branches, ATMs, online banking, cell phone banking and to mobile wallets), usage (of lending, payments and savings accounts as well as their frequency of use), and broad-based inclusion (the inclusion of lower-income households and the informal sector). This differs yet is an improvement on the 'key activities' aspect as it links digital disruption in key areas such as savings, lending and payment facilitation to financial inclusion. The innovation of financial services/ products replaces the products and services aspect in the SFI model with a more dynamic approach looking at whether new financial products are more affordable, more convenient and simpler, in which case they may be considered disruptive innovations, as defined by Christensen (1997). The key resource that this study focuses on is human resources. This takes the place of the organisational, people and cultural aspects in the SFI model. Key resources are therefore renamed as human resources. Lastly, 'partners' is removed and is replaced with risk management and fraud detection. The two components included for these aspects are know-your-customer (KYC) and anti-money laundering (AML) approaches of banks. These approaches include regulators and partners as banks have to ensure that client information is accurate and that any form of suspicious activity is identified. They may even include competitors as banks need to ensure that clients do not have multiple loans at different banks without the banks' knowledge.

2.6 Financial inclusion

2.6.1 Definition of financial inclusion

Financial inclusion is defined by the Center for Financial Inclusion (CFI) as the "state in which everyone who can use them has access to a full suite of quality services at affordable prices, delivered by a range of providers in a competitive market, with convenience, dignity and consumer protection to financially capable clients" (CFI, n.d.:2). Matsebula and Yu (2017:3) define financial inclusion as the non-existence of price barriers in broadly accessing financial services and products. Financial inclusion measures tend to include *accessibility/ availability*, *usage* and *quality* aspects. According to the World Bank People's Group of China (2018:5) *accessibility* to financial services refers to the geographical proximity of consumers to access points such as bank branches, agents and ATMs. Cell phones and computer access points are also considered in this dimension (World Bank People's Group of China, 2018:5). Poor accessibility to financial services leads to high transaction costs which further deter engagement with the financial sector, particularly for lower-income consumers (World Bank People's Group of China, 2018:5). Financial inclusion involves more than just access. Account ownership does not entirely capture the notion of financial inclusion, which also encompasses *usage*, including considering how frequently individuals use their accounts (Thom, Cooper, Weideman, Coetzee, Gray, Hougaard & Plessers, 2016:64). It is not uncommon for transaction accounts to remain inactive for prolonged periods of time. For this reason, usage is an important factor to consider in assessing financial inclusion. In addition, financial services include services such as insurance, savings, payments and credit facilities. From a financial inclusion perspective, the provision of financial services therefore concern both the variety of product classes as well as the frequency and magnitude of transactions.

According to Donian and Eltringham (2011:13), there are two categories of financial inclusion definitions. Firstly, financial inclusion is being defined in terms of access and availability without considering the suitability or appropriateness of the financial services offered (Donian & Eltringham, 2011:13). The second category is more holistic, in that it refers to functional financial inclusion and sustainable financial inclusion, whereby usage is ongoing and occurs on a sustainable basis in a way that meets the needs of both suppliers and customers (Donian & Eltringham, 2011:13). This is usually the *quality* aspect of financial inclusion. The World Bank (2012) views the quality of financial inclusion as referring to the match between financial products

and consumer needs, as well as the consumers' product awareness and understanding. That is, the quality of financial inclusion measures, assess the appropriateness of financial products in meeting the everyday needs of consumers (Katoroogo, 2016:36). The indicators of the quality of financial inclusion include convenience, product fit, transparency, safety, terms of contract, consumer protection and financial literacy (World Bank, 2012:17). By contrast, the CFI glossary links the 'quality' of financial inclusion to affordability, convenience, product fit, safety, dignity of treatment and client protection (CFI, 2011:9). The overlapping quality measures were developed from both supply and demand-side surveys (World Bank, 2012:17).

Appropriateness, suitability and quality features related to financial inclusion are particularly under-investigated. Banks need to invest in data, analytics and insights that allow them to identify the needs of each customer segment and how the current set of financial products meets those needs. This should lead to innovation that fills the gaps or shortfalls where certain customer segments' needs are not being met by the available set of financial products. The World Bank People's Group of China (2018:7) states that the more appropriate financial products can be useful in improving uptake and use, as well as lead to participation in the formal financial sector by underserved and unserved customers.

2.6.2 Importance of financial inclusion

Financial inclusion is a socioeconomic issue at a global level (Matsebula & Yu, 2017:1). Consequently, financial access has become one of the World Bank's 2020 goals (Matsebula & Yu, 2017:1). Access to finance smooths the consumption of households while it can insure against productivity shocks such as drought. Access to finance provides buffers against unforeseen circumstances and equips households and firms to weather difficult times. At a household level, a lack of access to finance could significantly affect access to educational and entrepreneurial opportunities and increase the risk of households falling into poverty.

Financial inclusion benefits the economy by reducing poverty and inequality and contributing to economic growth (Matsebula & Yu, 2017:2). GDP is therefore positively affected by financial inclusion as financial inclusion increases credit access and facilitates more productivity (Dabla-Norris, Townsend, Ji & Unsal, 2015:4). The seminal work by Joseph Schumpeter has relevance here. Schumpeter's contributed his methodology and perspectives on the role of innovation from monopolies and how that results in competition that overall leads to economic change

(Evangelista, 2015:7). The three critical elements that arise from Schumpeter's Theory of Economic Development are innovations, ground-breaking entrepreneurs that are pivotal in creative destruction, and bank credit that facilitates the financing of innovative businesses and investments (Dal Pont Legrand & Hagemann, 2015:4). The financial sector therefore plays a crucial role in the development of the economy by providing credit to both the formal and informal markets.

According to Dabla-Norris, Townsend, Ji and Unsal (2015:2), financial deepening has increased in emerging markets over the past 20 years. While the volume of credit has increased drastically, this has not led to an equivalent broadening of access to credit (Dabla-Norris et al., 2015:2). It can be inferred from this that financial inclusion has therefore been concentrated among top earners and large corporations. Historically, the poor and lower-income households have been financially excluded by commercial banks due to the high associated risk of lending to low socioeconomic classes (Matsebula & Yu, 2017:2-3). Ngonyama and Simatele (2017:3) argue that ensuring that financial services and products are broadly accessible to SMEs and poor households is essential for these entities to not be financially excluded from the formal credit market. Institutions that offer microfinancing options created this type of service to cater to underserved markets, namely the small businesses and lower-income individuals that would have otherwise have been unable to access financial services such as insurance and loans (Matsebula & Yu, 2017:3).

2.6.3 Measuring financial inclusion

It is well established that financial inclusion requires more than just account ownership but includes easy access to a variety of financial services. A number of indicators have been used to assess the degree of financial inclusion within countries. Among the indicators are accessibility and usage components such as the number of bank branches per 1,000 adults or per 1,000 km^2, the number of commercial bank branches per 100,000 adults or per 1,000 km^2, domestic credit as a percentage of GDP, domestic deposits as a percentage of GDP, and aggregate percentage of the adult population with a formal bank account. In fact, the accessibility component of financial inclusion tends to go hand in hand with the 'mobile subscriptions' component in estimating the accessibility of financial services. With increasing POS terminals, retail agents will increasingly play a substantial role in financial inclusion access measurements. These measures are useful but they cannot capture the notion of financial inclusion at an individual level. Aggregation of some of these variables is necessary to develop a more comprehensive measure of financial inclusion.

Sarma (2008) developed the Index for Financial Inclusion (IFI). The IFI includes three measures, namely bank penetration, the availability of bank services and usage. The methodology employed by Sarma (2008) is similar to that of the UNDP in its HDI computation. Below is the formula for Sarma's (2008) IFI measure where for country *i*, bank penetration is captured by *p*, bank availability is captured by *a* and usage is captured by *u*.

$$IFI = 1 - \sqrt{\frac{(1-p_i)^2 + (1-a_i)^2 + (1-u_i)^2}{3}}$$

There are, however, weaknesses with using such an index to measure financial inclusion. Most importantly, country-level aggregates are more likely to succumb to multiple counting which may overestimate financial inclusion in the country. Consumers may have an active bank account open at multiple financial institutions without banks identifying the common individual owning the accounts. This would affect the reliability of the bank penetration estimate. Informal financial services products are critical in developing countries like South Africa and may serve lower-income individuals who are currently under/ unserved by formal financial institutions. This is not measured in the bank availability indicators which perhaps underestimates the level of financial inclusion in developing countries. Country-level estimates also fail to indicate exactly who is being financially included. This is especially important in historically unequal societies such as South Africa.

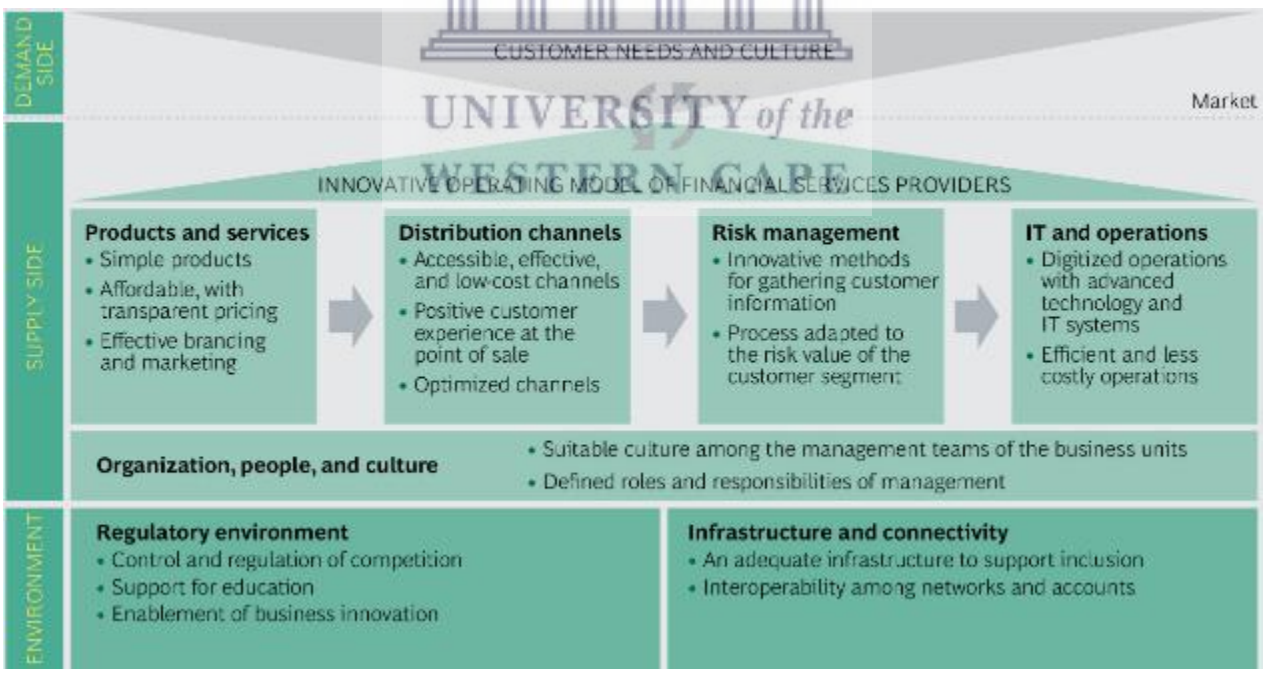
2.6.4 Conceptualising the quality of digital financial inclusion using the Boston Consulting Group model .

Modelling the financial inclusion implication of digital disruption in banking is a complex task that requires an understanding of the roles that both the supply and demand sides play. Most importantly, it is vital to clearly define the focus of the model to avoid adding too many variables (overfitting). Firstly, the study will only consider the savings, payments and lending aspects of banking. The study is mainly interested in areas in financial service provision that have been significantly disrupted and transformed by Fourth Industrial Revolution digital technology. Secondly, it is important to note that technologies such as social media, mobile technologies and the IoT have a variety of uses. Social media, for instance, could be used for advertising or could

be used as a channel for digital payments (WeChat). For this reason, it is important to define exactly what aspects of the Fourth Industrial Revolution technologies are being studied. In the case of this study, the study investigates the use of data components of the technologies; for example, how social media data is being used to improve digital payments or the benefit of using cloud technology to store customer data. Thirdly, this chapter discusses the areas of impact that were assessed in the study. Lastly, the importance of connecting financial service provision (the supply-side) with customer uptake and usage (the demand side) will be discussed.

Kessler et al. (2017) note that overall well-being is linked to financial inclusion. They further note that financial inclusion measurements have either been too simplistic or too academic. The model Kessler et al. (2017) present includes a host of financial services products and considers usage and sustainability components in addition to uptake. Kessler et al. (2017) note that sustainability is an important measure as in assessing the feasibility of how financial services can be used by the consumer. For example, such use is not sustainable if the consumer risks going bankrupt due to high withdrawal fees. The model is illustrated below.

Figure 9: Sustainable Financial Inclusion



Source: Kessler et al. (2017)

In the above model, the sustainability of financial inclusion is measured through a myriad of factors separated into demand-side, supply-side and environmental factors. The demand-side factors include customer needs and culture. Financial services products that are not aligned with customer needs and culture are not likely to be successful. Demand-side data is particularly useful in understanding the needs of consumers. The supply-side factors relevant to providing sustainable financial products that lead to long-term financial inclusion include well-marketed, affordable financial products/ services, an accessible distributional channel, effective risk management, well developed IT systems and operations, and lastly organisational factors such as employees and work culture (Kessler et al., 2017). Environmental factors include infrastructure and connectivity (Kessler et al., 2017). These factors can either impede or advance up the diffusion of FinTech that impacts on financial inclusion. For example, a lack of point-of-sale terminals in informal shops limits the digitisation of payments in the informal market. This further encourages customers to use cash as their main means of payments.

2.6.5 Defining impact

The impact of FinTech technologies can be evaluated from the perspective of how much their implementation has led to economic inclusion, financial inclusion and digital inclusion. As illustrated in the figure below, these three spheres often overlap. For the lower-income population, many are economically excluded and are not participating significantly in the economy. Many are also reliant on domestic remittances from other family members or social grants. Economic exclusion is a key reason why many lower-income adults are financially excluded. The World Bank Findex database indicates that the most cited reason for adults not having a bank account is due to insufficient funds (Mungai & Bayat, 2018:233). Sustainable financial inclusion cannot occur if an individual is economically excluded. For example, an individual may open an account, but for lack of money or a need to transact may soon allow the account to become inactive. Being digitally excluded also has consequences in terms of a reduction in access to real-time information, employment opportunities and online banking. A lower-income individual without digital access will also have to face geographical barriers to accessing economic opportunities and the formal financial sector. As a result, digital exclusion is becoming a significant trigger of both economic and financial inclusion in the Fourth Industrial Revolution.

Figure 10: Overlap between financial, economic and digital inclusion

Source: Author

From an impact perspective, FinTech can improve the ability of FSPs to collect data on lower-income markets. This could potentially lead to financial inclusion. Although economic inclusion could potentially take place through FinTech start-ups that employ people, FinTech tends to require higher levels of education and therefore is not a big employer of lower-income, less-skilled workers. The economic benefit could, however, come in the form of credit. New credit models that make use of alternate data present the promise of reaching rural farmers and businesses in disadvantaged communities. Jumo is currently actively involved in this lending sphere in Africa. It is unclear how many such cases exist in South Africa and how significant their impact is on inclusion. Nevertheless, in order for there to be an impact, FSPs need to well-versed in FinTech and the different types of data that are available. Moreover, they need to understand how to responsibly use that data in order to improve the firm value as well as to contribute to financial inclusion.

From the FSP perspective, once insights are extracted from the data through analytics, the firm has to have a plan or objective that it sets to achieve by using the new insights, such as product innovation or increasing market share. It is therefore important that insights collected directly add

to firm value, which should be clearly defined. New insights could also provide helpful perspectives on why the firm has not yet achieved these targets.

2.6.6 Financial inclusion and consumer welfare

Financial inclusion is not an end but a means to an end. The end is consumer welfare. The same could be said for both digital and economic inclusion. To improve consumer welfare both at the individual and at the household level, uptake rates have to be driven up through improving the quality aspects of financial inclusion, e.g. product fit. This can be achieved through a functional and inclusive digital financial system. In fact, a digital financial system can improve welfare through enabling individuals to build lump sum investments, be insured against negative shocks, be able to receive instant payments during emergencies and experience customised savings, credit and insurance services (Radcliffe & Voorhies, 2012:5). In addition, poor individuals who may not have been previously banked are able, through making use of a savings account, to build up a financial record that would improve the chances of them qualifying for loans later (Radcliffe & Voorhies, 2012:4). For FSPs to improve consumer welfare, there needs to be a balance between developing products that generate the most value for the firm in terms of revenue and developing products that meet the needs of unserved or underserved consumers. This has to be balanced against risk mitigation approaches that are employed through customer due diligence. If KYC checks are applied to strictly, following the rules-based approach rather than the risk-based approach, where the proportionality principal is a key component, financial exclusion will occur in the case where lower-income consumers who may lack documentation such as proof of address which will prevent them from transacting

The dilemma or tension described above can be referred to as the agency problem. The principal-agent problem in this case occurs because consumers are welfare-maximising individuals and FSPs are profit-maximising (Ozili, 2018:337). The misalignment in their goals can lead to financial products that only meet the demands of high-income or middle-income individuals at the cost of the poor. Ozili (2018:338) recommends that, from a digital financial product perspective, the principal-agent problem can be mitigated if consumers are actively involved in the decision-making process, i.e. more consumer power can be achieved through having multiple providers rather than a few providers. This would dilute the power of FSPs and allow consumers to sign up with providers that maximise their welfare.

2.6.7. Does technology contribute to financial inclusion?

The financial innovation before the global financial crisis of 2008 was seen in a positive light at the time. A plethora of creative yet risky financial instruments was tied to other financial instruments to underpin a boom in the United States housing market which was fed by debt and poor regulation (particularly with regards to subprime mortgages). When the market bubble burst and instigated the 2008 financial crisis, one of the consequences was a large distrust of large financial corporations. This may have expedited the increase in curiosity regarding other means of exchange, units of account and ways of storing value. For instance, the creation of Bitcoin, a blockchain innovation which meets the three functions of money, was created as a reaction to the 2008 financial crisis (Ito, Narula & Ali, 2017). Haddad and Hornuf (2018:7) speculate that the increase in customers distrust of incumbent banks after the 2008 financial crisis has positively impacted on FinTech firms. It has been suggested that the less reliable or stable a financial sector is, the greater the chance of FinTech start-ups forming (Haddad & Hornuf, 2018:8).

According to the International Finance Corporation (IFC, 2017:4), currency fluctuations and a relatively low supply of products for savings and credit narrowed growth in the banking sector in most African countries. It notes further that cell phone adoption rates amid high poverty rates suggest significant potential for FinTech start-up formation (IFC, 2017:4). The narrow country-specific success of some FinTech innovations in Africa may be related to the need-focused prerequisite for the innovations to succeed in developing countries. Therefore, countries or geographical areas that possess dissimilar customer needs each requires unique FinTech innovations that seek to meet the needs in those specific areas. Context therefore matters as a determinant of FinTech diffusion. The lesson that can be learnt from the failure of M-Pesa to diffuse ubiquitously in South Africa is that distribution networks, cell phone subscriptions and the regulatory framework are critical determinants in the diffusion of FinTech innovation (IFC, 2017:5). Chigada and Hirschfelder (2017:5) also use the case study of M-Pesa failing to successfully diffuse in South Africa despite high cell phone adoption rates, to advise that the environmental context should not be neglected. Overall, their study finds that mobile banking services permeated Zimbabwe and Kenya through the success of EcoCash and M-Pesa respectively (Chigada & Hirschfelder, 2017:8). The study suggests that perhaps part of the reason that mobile banking services have not gained as much prominence in South Africa is a lack of marketing these services, as well as the fact that bank account diffusion rates are already

particularly high, therefore reducing the supposed need for mobile banking as a primary means of banking (Chigada & Hirschfelder, 2017:7).

2.7 The supply and demand side of financial inclusion

2.7.1 Supply side

The supply side of financial inclusion consists of banks, FinTech start-ups, telecommunication companies and internet companies. Financial inclusion is defined by the Center for Financial Inclusion as the "state in which everyone who can use them has access to a full suite of quality services at affordable prices, delivered by a range of providers in a competitive market, with convenience, dignity and consumer protection to financially capable clients" (CFI, n.d.:2). According to the CFI (CFI, n.d.:2), the Findex database paints the most comprehensive portrait of the demand side of financial inclusion, from an internationally comparative perspective.

As countries develop, the services sector, particularly the financial services sector, becomes a fast-emerging field while there is a gradual decline in the contributions of the primary and secondary sectors. Growth in infrastructure and general economic development of non-financial sectors cannot take place without adequate financing. The financial services sector (finance, insurance, real estate and business services[4]) has increased in relative size over the years as the economy of South Africa has developed to become globally competitive. Archer (2008:1) reports that the relative size of the financial services sector increased from 10% of GDP in 1960 to 19.59% in 2006. In 2015, Finance, Insurance, Real estate and Business Services sector contributed 19.8% to total real GDP (Botes, & Kuhn, 2017:83). Forty-eight percent of the contribution to this sector came from the Finance and Insurance sub-sector whilst 52% from Real estate and Business Services (Botes, & Kuhn, 2017:83).

The 2016-2017 Global Competitiveness Report of the World Economic Forum (WEF) ranks South Africa 47th globally for competitiveness (Schwab, 2017:25). South Africa's strong ranking was attributed to it being a frontrunner in the region in financial markets and infrastructure, among other factors (Schwab, 2017:25). The WEF notes that in order to increase competitiveness, there has to be a rise in productivity as well as an economic environment created in which emerging

[4] As per the SIC codes at statsa.co.za.

business models and technologies can foster growth (Schwab, 2017:9). South Africa was ranked 11th out of 138 countries in terms of financial market development (Schwab, 2017:325). Moreover, South Africa ranked in the top five out of 138 countries in financial services meeting business needs, financing through local equity markets, soundness of banks and regulation of securities exchanges (Schwab, 2017:325).

For financial innovation to increase social welfare, the social return from the innovation should exceed the private returns from the innovation. Society benefits if costs of transacting are lowered, there is an increase in liquidity and the speed of transacting is faster. Regulatory mechanisms have to be in place in order to ensure that more liquidity and its associated risks do not lead to a repeat of the 2008 financial crisis.

2.7.1.1 Regulation

Banks in South Africa have long been monitored by the South African Reserve Bank through the Banks Act (Act 94 of 1990) and the Mutual Banks Act (Act 124 of 1993). In addition to the SARB, the Financial Services Board also plays a supervisory role but is responsible for ensuring efficient banks. Hence, this system is referred to as a twin-peaks regulatory system. However, as of 31 March, the Financial Services Board no longer formed part of the twin-peaks model (National Treasury, 2018:1). On 1 April 2018, the Prudential Authority and Financial Sector Conduct Authority became operational (National Treasury, 2018:1). These newly established monitoring authorities reinforce the twin-peaks model long adopted by South Africa's financial services authority (National Treasury, 2018:1). The Prudential Authority, which has been established as part of the South African Reserve Bank, will have a supervisory role in monitoring the soundness of financial institutions in South Africa (National Treasury, 2018:1). On the other hand, the Financial Sector Conduct Authority will focus on consumer protection in the financial sector (National Treasury, 2018:1).

According to data on the Reserve Bank's website (accessed on 30 June 2017), South Africa's banking industry comprises of 10 locally controlled banks, six foreign-controlled banks, three mutual banks and 15 branches of foreign banks. The sector is highly concentrated, with the 'big five' controlling the majority of the sector's assets (BANKSETA, 2017:21). Competition in the banking sectors is crucial for strengthening the effectiveness of monetary policy, as well as ensuring efficiency in the credit market (Greenberg & Simbanegavi, 2009:26). Most recently, the

SARB issued a licence to Bank Zero which is poised to be the first digital-only bank in South Africa. This is particularly interesting as questions may arise regarding how such a bank can be regulated.

According to Lawack (2013:323), there are a number of banking regulations that all mobile banking services have to adhere to in South Africa. These include the South African Reserve Bank Act (Act 89 of 1990), the National Payment System Act (Act 78 of 1998), the Banks Act (Act 90 of 1994), the Exchange Control Regulations, Financial Intelligence Centre Act (Act 38 of 2001), and the South African Reserve Bank's Position Paper on Electronic Money. The importance of the South African Reserve Bank's Position Paper on Electronic Money is that it states that only registered South African banks may issue mobile money (SARB, 2009:7). Non-banks will be allowed to issue mobile money only if this occurs in a joint venture with a registered bank (SARB, 2009:7). Banks, however, have to apply to the Registrar of Banks in this regard (SARB, 2009:7).

Table 2: Summary of legislation applicable to FinTech

Regulation	Year	Detail
National Credit Act	2005	All lenders are to be registered as credit providers. All fees and charges that can be charged are prescribed by this Act.
Banks Act	1990	Used by the Reserve Bank for the issuance of licences and monitoring of bank activities. Section 52 of the Banks Act allows for non-banks to enter into arrangements with banks. This may allow the non-banks to offer payment-related services in conjunction with the bank.
Financial Markets Act	2012	The act aims to license and regulate exchanges, central securities depositories, clearing houses and trade repositories. In addition, the Act is used to regulate and control securities trading, clearing and settlement and the custody and administration of securities. The Act also prohibits insider trading and other market abuses.
Financial Advisory and Intermediary Services Act	2002	The Act regulates the activities of all financial services providers who provide advisory or intermediary services to consumers. FSPs are required by this Act to be licensed and adhere to a professional code of conduct.
National Payment System Act	1998	According to the Reserve Bank, the Act aims "To provide for the management, administration, operation, regulation and supervision of payment, clearing and settlement systems in the Republic of South Africa; and to provide for connected matters". The Act also stipulates that only registered banks can issue electronic money.
Financial Intelligence Centre Act	2001	Aims to fight financial crime such as money laundering, tax evasion and terrorist financing activities.
Protection of Personal Information Act	2013	"a public or private body or any other person which, alone or in conjunction with others, determines the purpose of and means for processing personal information". This has implications for data storage and processing. The Act also promotes the responsible use of Big Data and analytics.
Other Acts:	Prevention of Organised Crime Act of 1998, Patents Act of 1978, Copyright Act of 1978.	

Source: Compiled using Mukora (2014), Itzikowitz and Gunning (2017), SARB (n.d.)

Apart from these Acts, there were further Acts enacted to allow entities that were not registered to provide financial services to people in South Africa. These Acts include the Mutual Banks Act, 1993, the Co-operatives Act, 2005, and the Postal Services Act, 1998 (Mukora, 2014). There has been a call for more specialised laws to be enacted in the Fourth Industrial Revolution in order to allow innovation that promotes financial inclusion. The current Acts are limiting to non-bank industry players who would like to issue electronic money.

From a regulatory standpoint, 'sandboxes' could be created by regulatory bodies to provide an environment in which firms can experiment with creating innovative financial solutions on a small scale in order to improve product development before the product is released on a wide scale. The benefit of the sandbox is that the regulations are implemented in a way that is fair but also does

not constrict innovation. The sandbox approach would be effective as long as customer rights are protected and businesses have the freedom to create in a cost-effective manner. This requires supervisory entities that are effective in monitoring and political will on the part of the government. Currently, no regulatory sandbox exists for FinTech in any of the BRICS countries. This is worrying as the sandboxes may be particularly useful in assisting FinTech companies from developing countries to reach a level at which they could fiercely compete for markets in developed countries. The WEF notes that in order to increase competitiveness, there has to be a rise in productivity as well as an economic environment created in which emerging business models and technologies can foster growth (Schwab, 2017:9). Hence, sandboxes would create an environment that would be conducive for better product development and emerging business models. This is important because regulation affects the diffusion cycle and the length of the S-curve. If the financial services market is overregulated, the S-curve will be longer (elongated) and this effectively means that overregulation would be a barrier to the diffusion of FinTech in the South African economy.

2.7.1.2 Policy response of South Africa to financial inclusion

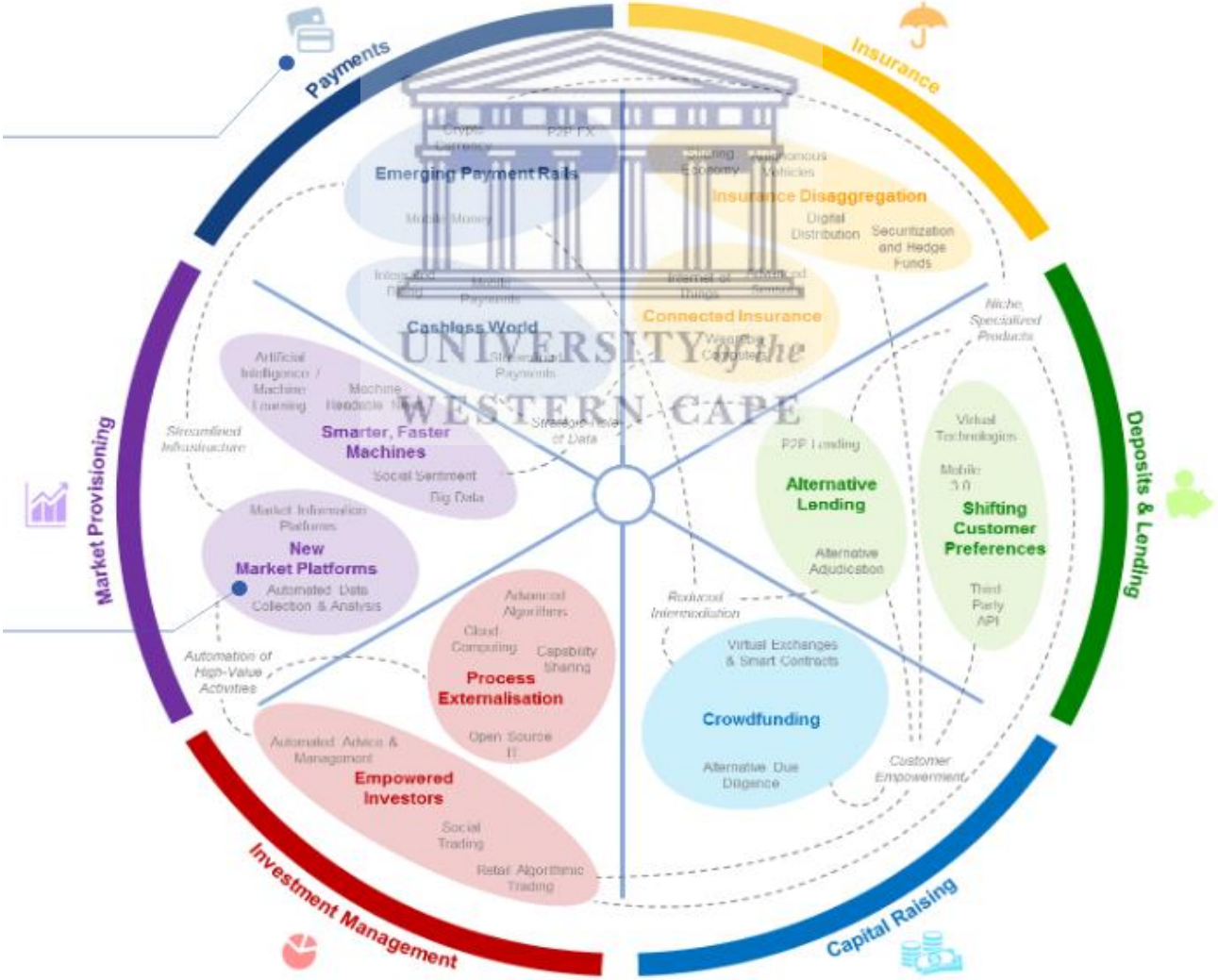
Among the SARB's priority goals guiding the development of the SA payments system, as highlighted in its Vision 2025 document, is financial inclusion (SARB, 2018:7). The SARB regards financial inclusion as a cross-industry public policy initiative that can be achieved by meeting other payments system goals such as interoperability, cost-effectiveness, regional integration and financial stability. (SARB, 2018:7).

The SARB envisions a payments system with competition that drives financial inclusion and economic development; a legal and regulatory framework for the payments system that includes banks, non-banks and FinTech firms; and greater innovation that leads to pricing that is fairer and benefits consumers (SARB, 2018:13). The Reserve Bank recognises that it is important to have an electronic payments system with standardised technology, data, and service level agreements (SARB, 2018:18). Furthermore, in order to achieve access at the electronic payments, savings and insurance levels that serve bottom-of-the-pyramid consumers, collaboration between FSPs and non-financial firms is a necessity (SARB, 2018:20). This will reduce inequality and lead to an improvement in the welfare of hitherto financially excluded South Africans (SARB, 2018:21). Among the key strategies of the SARB worth highlighting are:

1. Assessing the appropriateness of allowing non-banks to provide transaction accounts.
2. Launching consumer financial literacy initiatives.
3. Reviewing the type of framework that would be required before authorising non-banks to directly participate in the payments system without needing to partner with a registered bank (SARB, 2018:21).

The banking industry can be classified into various sub-sectors, including retail, investment, commercial and private banking and asset management. The focus of this study is on commercial banking but it also considers investment banking and retail banking as secondary sub-sectors for discussion.

Figure 11: Financial Technology Ecosystem and Business Model



Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

2.7.2 Supply side

There are four major types of financial services, namely payments, savings, credit and insurance (Rhyne & Kelly, 2018:2). Digitalisation has happened at a payments level where an increasing number of people are using debit cards, cell phones and the internet (Rhyne & Kelly, 2018:2). Account ownership therefore does not entirely capture the notion of financial inclusion. Some digitalisation has also happened in lending, savings and insurance.

2.7.2.1 Payments

The payments segment of the financial ecosystem has seen significant increasing shifts away from visible to invisible channels of paying and sending money (McWaters & Galaski, 2017:37). These channels include both mobile and online banking. Watson notes that with the advent of digital currency and digital wallets, disruption in the banking sector occurs primarily at the front-end (Watson, 2016:5). Payment services have transformed in terms of the customer interface. More convenient ways of transacting C2C and C2B have disrupted the banking sector. What remains relatively undisrupted is the back-end of the payment service, as these services are still reliant on the banking system's infrastructure (Watson, 2016:9).

Watson (2016:9) highlights that, with more disruptions in payment services, banks are finding it hard to stay abreast of their customer spending patterns, as customers are primarily using the back-end settlement services of banks and using less of their front-end services. This may have long-term implications for the banking sector in terms of their ability to satisfy the customer.

A significant point of contention and interest in the payments section of the financial ecosystem is cryptocurrency. Kshetri (2017:1) describes a blockchain as a secure online ledger of transactions. The blockchain is a decentralised system that is accessible by all parties and is not controlled by a single entity, e.g. the US Federal Reserve. The blockchain is uniquely resistant to fraud and corruption in a way a traditional system of transacting is not because the ledger-like, tamper-proof transparency between parties ensures that the current funds are not only transferred to the correct recipient but that the recipient has received the funds. Through the application of advanced technologies such as blockchain, the financial sector will have increased efficiency in the medium to long-term as a result of reduced costs and increased speed (Watson, 2016:16). Kshetri (2017:4)

argues that blockchain technology could particularly benefit the global South by making up for poor institutions and high transaction costs. In South Africa, Bankymoon, a South African start-up using blockchain technology, allows schools to secure funds from donors that are directly linked to utility payments. This significantly removes the fear that donations/ investments will be mismanaged or misallocated, since donors can see for what funds are paying, e.g. electricity.

Despite the growing attention to and financial growth of various cryptocurrencies, most notably Bitcoin, it can be argued that none of the cryptocurrencies presently has gained an adequate level of acceptance by customers relative to the traditional payments system. Security concerns are also among the reasons why alternative payments systems and cryptocurrencies have yet to reach wide customer acceptance as a means of exchange or standard of deferred payment. Evidence from the UK's 'Faster Payments' system suggests that FinTech could actually enhance the traditional payments system rather than be at odds with it (McWaters & Galaski, 2017:47-48).

2.7.2.2 Savings

Savings behaviour in South Africa has been encouraged by collective savings groups and an effort by government to remove barriers to savings for lower-income consumers. In South Africa, stokvels are common. A stokvel consists of a group or collective of people who pool together their finances to save for burials, weddings, fundraising or investment opportunities. Each member pays in a set amount at regular intervals and each gets a turn to receive cash from the stokvel. These collectives are more common among lower-income individuals and may act as a means of financial inclusion for those that are not subscribed to formal banking institutions for various reasons, as the collective would hold the contributions in a bank account for safekeeping. Also, in South Africa, following the adoption of the Financial Sector Charter, most of the major banks launched the Mzansi account in October 2004, a transactional bank account that targeted lower-income South Africans. The Mzansi account positively contributed to savings uptake and improving financial inclusion by enabling millions of South Africans to be banked.

New automated savings reminders and commitment accounts are product designs that may overcome the behavioural biases of consumers to consume rather than save (World Bank People's Group of China, 2018:8). This is particularly helpful in the South African context where a 'lack of a savings culture' (Chauke, 2011:19) is often mentioned in reference to South African consumers saving/ consumption patterns. The supply side should be assisted in providing better savings

products that are linked to commitment features (Karlan et al., 2016:7). That is, savings products that encourage customers to commit to saving.

2.7.2.3 Lending

Measuring access to credit is difficult because consumers tend to under-report their credit/ loans in order to remain creditworthy (Karlan & Zinman, 2007:2). This affects the reliability of data on access to credit and underscores the importance of having a national database on credit access. This would prevent clients from taking multiple loans from different financial institutions, although it would not prevent consumers from accessing more credit through informal channels. The potential for improving data on credit/ loans has been improved through blockchain technology and emerging/ alternate data.

The lending market has expanded as more of the underserved market is being reached. New ways of evaluating the creditworthiness of underbanked and subprime customers have accelerated the growth in credit access in these markets (McWaters & Galaski, 2017:107). FinTech companies have enabled innovative ways of accessing funds through peer-to-peer lending and borrowing services. Jumo, a South African start-up, which markets itself as a low-cost financial service marketplace for buyers and sellers of loans, allows consumers and businesses to access funds through their platform as a marketplace to conduct business. The platform provides some information related to creditworthiness and risk, such as the mobile transaction frequency of an individual, in order for the lender to establish whether the risk profile of the borrower is acceptable.

2.7.3 Demand side

The demand side of financial inclusion consists of the consumer's perspective. According to Karlan, Kendall, Mann, Pande, Suri and Zinman (2016:6), the poor are faced with multiple market failures. A single approach will not and has not solved the issue (Karlan et al., 2016:6). Singular approaches such as microfinancing programmes do not in many instances reach the poorest people in society (Consultative Group to Assist the Poor, 2014). Livelihood programmes yield similar results (Consultative Group to Assist the Poor, 2014). The graduation/ BRAC model approach has been cited as a unique yet successful approach in graduating the poor into a long-term sustainable livelihood (Consultative Group to Assist the Poor, 2014). The integrated approach includes consumption support as well as training and equipping that leads the individual/ household beyond short-term survival into long-term food security, improved welfare and overall empowerment.

On the demand side, consumers may make suboptimal decisions due to a lack of knowledge. For example, lower-income households may subscribe to expensive insurance packages or not be insured at all (which may end up being more costly) due to a lack of targeted financial literacy interventions. Katoroogo (2016:25) notes that financial literacy is among the main prerequisites for sound, informed financial decision-making. Without financial literacy, consumers may struggle to assess the suitability of the full suite of financial products in such a manner that leads to a rational choice.

2.7.3.1 Payments

Digitalisation has happened at a payments level where an increasing number of people are using debit cards, cell phones and the internet (Karlan et al., 2016:2). Digital payments can act as a buffer against shocks and directly improve the welfare of the household (Karlan et al., 2016:3). This has been documented with M-Pesa, which has facilitated the seamless transfers of domestic remittances to households during times of vulnerability (Karlan et al., 2016:3).

Customers have been slower to shift away from card-based payments to mobile payments (McWaters & Galaski, 2017:37). The reluctance of customers to move between these two systems has been attributed to a lack of trialability. That is, not enough customers have been sufficiently convinced through demonstrations that mobile payments systems are more beneficial and secure than card-based payments systems (McWaters & Galaski, 2017:45). Notwithstanding the many mobile payment's options available, consumers perhaps lack awareness of where mobile payments are accepted due to a lack of marketing by stores. The widespread use of card machines may also have contributed to the slow adoption by consumers of mobile payments systems (McWaters & Galaski, 2017:45). This has been described as a lack of support from the ecosystem (McWaters & Galaski, 2017:45).

2.7.3.2 Mobile banking

Chigada and Hirschfelder (2017:3) state that the integration of the banking system is part of the critical functions of mobile banking. Lower-income classes, despite having individually weak purchasing power, have significant collective purchasing power (Chigada & Hirschfelder, 2017:3). Mobile banking therefore seeks to integrate this large population and its purchasing into the banking system. McCaffrey and Schiff (2017:10) suggest that an opportunity exists for FinTech

companies to enhance the current informal money management techniques employed by the lower-income market.

Mobile money will likely be adopted if it is perceived as a complementary product that brings additional value to existing channels or as a substitute that provides the same or better functionality with added value. On the other hand, if mobile money is perceived to provide the same functionality as existing services with little added value in terms of convenience, it will be viewed as neither complementary nor as a viable substitute. For example, if the unbanked believe mobile banking will cut costs and provide more convenience than traditional banking, they are likely to adopt it as a substitute/ alternative. FSPs will battle to convince already existing bank clientele who live close to ATMs and bank branches to adopt mobile money accounts. This is primarily because the product would be perceived as a substitute for traditional banking with little added value. The costs of signing up for the service in terms of the time it takes to sign up and learn to use the account would likely be regarded as too high to adopt.

2.7.3.3 Savings

According to Rhyne and Kelly (2018:12), saving is central to financial health. Neoclassical economic theories point to wages and the return on investment as determinants of savings. In addition, gender, age, age and gender of the household head, and the dependency ratio (the proportions of household members under 15 and over 65 years), all play a huge role in determining savings (Chowa, Masa & Ansong, 2012:280). Studies by Chowa et al. (2012:287) indicate that lower-income and rural individuals are less likely to save. Chowa et al. (2012) describe three theoretical perspectives that are important in determining savings behaviour: individual-orientated theories, sociological theories and institutional perspectives. The most well-established individual-orientated theories are neoclassical economics-based perspectives such as the life-cycle hypothesis (LCH) by Modigliani and the permanent income hypothesis by Milton Friedman. Both theories model savings as a function of income. The LCH identifies labour market participation as a key factor in determining savings (Chowa et al., 2012:281). Individuals outside of the labour force such as children and older adults are less likely to save (Chowa et al., 2012:281).

Using the LHC, Nduku and Simo-Kengne (2017) model South African savings behaviour as a function of the dependency ratio, real interest rate and income. Below is the equation they employ:

$$SR_{t=}\delta_0 + \delta_1 DR_t + \delta_2 Y_t + \delta_3 RIR_t + \varepsilon_i$$

Where SR is the savings rate, DR is the dependency ratio, Y is income, RIR is the real interest rate and ε is the error term used for capturing unobserved factors. World Bank data from 1970 to 2014 was used while and an autoregressive distributed model was employed for estimation. The dependency ratio was found to not have a long-term relationship with the savings rate in South Africa. Overall, the study finds that the LHC is not applicable in the South African context in determining savings behaviour. Other theories and perspectives may have more nuanced ways of modelling the peculiar savings behaviour in South Africa.

Sociological theories add education and socio-cultural factors as important determinants in modelling savings behaviour (Chowa et al., 2012:282-283). Socio-cultural influences such as the dependency of extended family members and the so-called 'black tax' may diminish the income that a South African individual has available to save (Du Plessis, 2008:65). The unique contribution of the institutional approach to modelling savings is that it recognises that individuals with less access to savings opportunities as a result of geographical distance, high transaction fees and the high cost of opening an account are less likely to save (Chowa et al., 2012:283). Dabla-Norris et al. (2015:3) list the cost of participation as an access determinant of financial inclusion. This cost is composed of fixed transaction costs, annual fees and the requirement of documentation (Dabla-Norris et al., 2015:3). Improving access to formal banking institutions, for example, through greater information diffusion, targeted incentives and credit access, will lead to an increase in savings. Karlan et al. (2016:2) concur that savings behaviour is positively affected by the elimination of account opening costs. The welfare effects of lower-income households accessing a savings account are well recognised (Dabla-Norris et al., 2015:2). Although saving is usually discussed separately from credit, an overlap certainly exists. Credit is, in fact, critical in planning consumption and ultimately how much income will be saved. Lower-income consumers who have less access to credit usually rely on savings in order to consume and invest (Du Plessis, 2008:61).

2.7.3.4 Lending

Credit is a crucial buffer against financial shocks. During financial shortfalls, savings are usually the first defence against deprivation. In the absence of savings, households have to rely on credit/ loans in order to prevent economic deprivation. Lower-income households, however, do not

always work in the formal sector and therefore may get paid in cash. They may also not have documentation to verify their identities. This market is therefore vastly underserved due to a lack of visibility. Lower-income households struggle to qualify for loans due to a lack of information, for example, lack of proof of income and proof of residential address. Lower-income households are also considered high-risk/ low-value clients because they work in occupations with less reliable income flows and do not have many high-value assets that may serve as collateral in cases of default. There may also be an assumption on the part of the lender that lower-income clients are less financially literate and therefore may mismanage their finances and delay or interrupt scheduled loan repayments. Consequently, lower-income consumers become vulnerable to formal or informal microlenders and credit instruments that offer low entry requirements (low initial interest rates which may seem affordable but which later balloon to unaffordable interest rates). An opportunity exists in formalising lower-income credit markets and increasing the uptake of digital identities among lower-income clients. This may provide big data that could increase credit accessibility and thus prevent the most vulnerable in society from falling into unfavourable/ exploitative loan agreements.

According to the CFI, the Findex data does not indicate that big data-based credit has substantially made credit more accessible (Rhyne & Kelly, 2018:3). Credit and loan products are an area that South Africans still do not see much benefit in engaging in, with most South Africans still listing friends and family as their main sources of credit and loans (Roberts, Struwig & Gordon, 2016:15). This could be due to a number of reasons, one of which is the fear of debt. More financial education on lending is required as well as better monitoring from regulators in order to protect vulnerable consumers.

Each of the financial services mentioned above has different implications for the micro, macro and socioeconomic environments. The socioeconomic implications can be seen in financial inclusion. Some of the determinants of financial exclusion in Africa include the cost of being financial included, geographical barriers, lack of documentation and, most commonly, a lack of money (Zins & Weill, 2016:49). The FinTech discussed can have huge implications for financial inclusion because, firstly, they reduce geographical barriers because they use the internet as a platform and, secondly, they eliminate documentation and sign-up costs to a large extent. Other socio-economic

barriers such as age and education are reduced due to the simplicity and convenience of payment services. A prime example of this is M-Pesa.

2.8 Conclusion

This chapter reviewed the theoretical literature on the evolution of FinTech and its role in financial inclusion. The chapter began by reviewing the revolutionary transitions in the global economy that were driven by disruptive technological innovation, before discussing in detail aspects of the digital economy including how both the demand side and the supply side have been disrupted by SMACT technology. This discussion traversed three key areas of digital disruption in banking, namely payments, savings and lending. The chapter discussed the different forms of SMACT data and how they are applied in the provision of financial services and to increase financial inclusion. The chapter also defined and discussed concepts such as big data, as applied to the banking industry. In the next chapter, empirical studies on SMACT will be reviewed along with its financial inclusion implications.

CHAPTER THREE: EMPIRICAL LITERATURE

3.1 Introduction

This chapter reviews a host of empirical literature on financial inclusion and digital disruption as well as how the two integrate through mobile banking. The chapter discusses the empirical literature by turns from a global, developing economy and South African perspective, focusing in each case on the implications of digital technology on innovation in financial services as well as its impact on labour.

3.2 Global perspective on the impact of FinTech

Although the impact of FinTech is yet to fully permeate the economy, it is disrupting traditional methods of banking at unprecedented rates (Grosskopf, Beyers, Van Velden, Roopnarian & Stonebridge, 2016:6). Globally, FinTech investments have grown dramatically since the beginning of the decade from $1.8 billion in 2010 to $19 billion in 2015 (Ghose, Tian, Dave, Levin, Shirvaikar, Ho & Horowitz, 2016:3). Grosskopf et al. (2016:6) estimated at the time of publication that FinTech investments will surpass $150 billion at a global level within the following three to five years. Most of the investments in FinTech have been noted to be in the payments area of business (Ghose et al., 2016:3). Ghose et al. (2016:9) predicted a rise in digital disruption by FinTech, as measured by the consumer banking revenue in new digital business models, from 1.1% in 2015 to 10% by 2020 in North America. While major banks continue to place their strategic focus on sustained innovation – that is, investing in improving their present capabilities, particularly at a transactional level (Grosskopf et al., 2016:6) – this may not be enough to meet the customer expectations that are yet to develop. Digital disruptors deployed by newcomers will increasingly and dramatically change the playing field if current FSPs fail to invest in disruptive innovation.

Studies from the Global Center for Digital Business Transformation (Bradley et al., 2015:8) and Grossman (2016) suggest that technology products and services, media, retail, financial services and telecommunications are currently most vulnerable to digital disruption. Grossman's (2016) findings were from a survey conducted by Russell Reynolds Associates of more than 2,000 C-level executives on how they perceived the impact of and barriers to technologies that affected 15

industries. Interestingly, the study by Russell Reynolds Associates (as cited in Grossman, 2016) found that most of the organisations (90%) stated that they had some sort of digital strategy.

The study identified two factors influencing how businesses adapted to digital disruptions (Grossman, 2016). Firstly, industries which had low barriers to entry were most affected by digitisation and the competition it brought (Grossman, 2016). Secondly, industries that had large legacy business models that provided most of their earnings were also the most affected by digitisation (Grossman, 2016). These organisations found adapting and changing challenging and as a result, suffered when their industries became more digitised (Grossman, 2016).

Corporate strategists are required to identify the causes of the market forces and trends to protect the firm's market position or gain new market share. There is no consensus in the literature on an optimal response strategy for dealing with digital disruptions or disruptive innovations in general. There is, however, support for firms reacting strongly and rapidly to digital disruptions as opposed to not reacting or applying a wait-and-see approach. Bughin and Van Zeebroeck (2017:3) investigated the magnitude of payoffs associated with various response strategies to digital disruption. The study used data from a McKinsey & Company global survey conducted by TNS. The sample consisted of 12,000 firms from over 60 countries. Out of that, a final sample of 2,000 firms was used for the study. The study measured digital turbulence (digital reactions among active firms in the same industry). The mean turbulence was found to be highest in the high technology and telecommunications industry. That is, firms in this industry are more actively reacting to digital disruptions and changing their corporate strategy or disrupting themselves to confront digital disruptions. The lowest level of turbulence was found in the manufacturing industry. Overall, the econometric analysis of the study found that digital disruption can lead to a reduction in profit growth by an average of 5 percentage points. The model also predicted as much as a 15% reduction in revenue growth for firms that employ a non-reactive strategy to digital disruption (Bughin & Van Zeebroeck, 2017:4).

Haddad and Hornuf (2018:10) use data from the Crunchbase dataset from the periods 2005 and 2014. The study assesses 2,849 FinTech start-ups in 69 countries. The Crunchbase dataset is combined with information from other datasets to capture the explanatory variables/ determinants of FinTech start-up formation.

The study finds a significant increase in FinTech start-up formation occurring from 2010 onwards (Haddad & Hornuf, 2018:15). This trend persisted until 2014 whereafter FinTech start-up formation declined. Excluding 2008, the amount of FinTech funding steadily increased from the year 2005 until 2011, after which the trends began to steadily reverse (Haddad & Hornuf, 2018:15). The FinTech sectors of financing, asset management and other business services all increased steadily without reversal until 2014 when each of them declined for the first time. The payments sector, however, showed significant resilience and growth that began accelerating after the 2008 financial crisis (Haddad & Hornuf, 2018:26). The payments sector did not decline in 2014 as the other sectors did, and continued to increase, even if at a slower rate.

In terms of market share, the financing FinTech sector had the greatest followed by the payments sector (Haddad & Hornuf, 2018:17). Overall, the study found that the United States had the largest FinTech market (Haddad & Hornuf, 2018:21). That is, as a proportion of the overall economy, the FinTech market in the USA comprises a greater share of the economy than other countries around the world. The United Kingdom and Canada respectively had the second and third-largest FinTech markets globally. India was identified as a leader among developing countries in terms of FinTech start-up formation, coming fourth globally and surpassing a number of developed countries (Haddad & Hornuf, 2018:21). The study found that a more fragile financial market was associated with a higher number of FinTech start-ups.

3.2.1 The impact of digital disruption on the workforce

The Fourth Industrial Revolution will impact more on some jobs than others and some people more than others. Jobs that are more routine and cognitive will more likely be replaced by automated technologies which will affect primarily low-skilled, less educated workers and women, according to ManpowerGroup (2017:5). There is a greater risk of downsizing as a result of disruptive technologies in jobs in sales and business administration, which are primarily occupied by women (ManpowerGroup, 2017:5). ManpowerGroup (2017:5) notes that, while there may be a reduction in routine jobs, less routine jobs that use creativity, emotional intelligence and non-cognitive skills that cannot be replicated by machines will see humans work with machines rather than be replaced by them. Less educated and less skilled workers need to be trained and upskilled in order to remain in the labour market. This is important because, at worst, the Fourth Industrial Revolution could mature concurrently with skills shortages and mass unemployment (World Economic Forum,

2016:v). Such unemployment would be of a structural nature and require time to resolve. Among the questions emerging are how much it will cost the economy to upskill low-skilled, less educated workers and how can sufficient non-routine jobs be created to impact positively on unemployment.

Evangelista et al. (2014:7) note that studies that have assessed the impact of ICT on the economy have by and large not assessed the capabilities of individual skilled or unskilled workers to use ICT in production. This is particularly relevant due to the skills-based nature of ICT in the economy (Evangelista et al., 2014:10) and particularly the tendency of the ICT sector to favour younger, more skilled and more educated workers. The study finds that ICT infrastructure did not change the employability of disadvantaged groups (Evangelista et al., 2014:25). Digital empowerment, on the other hand, has to do with enhancing participation and social and economic inclusion of marginalised or remote communities through using digital technology as a tool to increase information flows and communication among these communities (Mäkinen, 2006:386). An increase in digital jobs may offer employment opportunities for less skilled and less educated individuals. Digital jobs may especially benefit women and the disabled as well as other sub-populations that may face unfair labour discrimination based on their appearance or abilities (Harji, Best, Essien-Lore & Troup, 2013:4). Economic participation in the digital economy by marginalised groups can contribute significantly to reducing income inequality and social exclusion. Digital jobs have also been noted to be more resilient to the dynamic conditions of the economy and labour market as a result of the transferability of an individual across industries and levels in an organisation (Harji et al., 2013:4). For example, the ability to analyse data is a skill used in most industries from entry to senior levels. Digital jobs differ from traditional jobs in that the output of digital jobs is not a physical product or service but rather digital (virtual or electronic outputs) (Harji et al., 2013:1). This aspect of digital jobs may be good for the environment going forward as there is growing urgency to move towards environmentally sustainable economies that reduce the use of energy and material resources in production (World Economic Forum, 2016:10).

Evangelista et al. (2014) find that ICT usage affects labour productivity more than it affects other economic performance variables. This is attributed to the fact that ICT usage is inclusive of skills, diffusion, autonomy and intensity in using new technologies (Evangelista et al., 2014:24). These usage dimensions change as workers become more comfortable with new technologies, which means that, while productivity might be interrupted and less efficient when new technology is

introduced, efficiency and labour productivity later increase after workers become more accustomed to the technology (Evangelista et al., 2014:24).

The adoption of technology by consumers and the increased provision of financial services across digital platforms has meant that the type of employment needed in the financial services sector has changed. As the financial services sector makes increased use of data to understand and anticipate the behaviour of clients, job roles that are related to technology and marketing are in greater demand while jobs in administration are being automated. In its 2018 Future of Jobs report, the World Economic Forum indicates that the three job roles that are on the decline in the financial services sector are those of the salesperson, customer service representative and administrative assistant. The report also indicates the emerging role most in demand between 2013 and 2017 in the financial services sector was that of the software engineer (World Economic Forum, 2018:20). For the economy as a whole, software engineers and marketing specialists experienced the most significant increase in employment between 2013 and 2017 in Sub-Saharan Africa (World Economic Forum, 2018:21).

3.2.2 Financial inclusion from a global perspective

In 2011, the Global Findex database measured the saving, borrowing, payment methods and risk management behaviours of adults aged 15 and above in 148 countries (Van Oudheusden, Klapper, Demirgüç-Kunt & Singer, 2015:1). The index found unequal financial services usage among developed and developing countries (Van Oudheusden et al., 2015:1). Formal financial services were found to serve a significantly greater share of adults in developed countries compared with developing countries. In fact, the study reports that in high-income countries, 89% of adults compared to 41% in developing economies had access to a bank account at a formal financial institution (Van Oudheusden et al., 2015:2). With the marked rise in mobile penetration rates in developing economies and a significant acceptance of mobile banking options, the number with accounts (either through a mobile money provider or a formal financial institution) increased to 54% (Van Oudheusden et al., 2015:4).

Globally, the biggest reason for financial exclusion is the lack of sufficient funds. It can be argued that increasing financial inclusion requires an integrated approach that supports consumption growth as well as trains and equips people in a way that empowers them. This will lead to long-term socioeconomic upliftment so that individuals have greater need of a savings account and have

had the training to manage their finances in a sustainable manner. Digital finance could thus benefit those that are most vulnerable to financial exclusion (Karlan et al., 2016:1).

According to Karlan et al. (2016:1), market failures such as imperfect information, high transactional costs, lack of competition, enforceable property rights and some behavioural biases prevent traditional financial services from functioning optimally. The supply side may see two types of market failures related to information asymmetries; namely, moral hazard and adverse selection (Karlan et al., 2016:1). Moral hazard usually occurs when the incentives of customers are not aligned with those of FSPs. For example, consumers who have vehicle insurance may be more negligent and incur relatively high losses, knowing that they will be covered by their insurance company. Insurance companies therefore have to find ways to incentivise their customers to be more cautious. For example, insurance companies offer claim-free bonuses, discounts or cashback schemes to clients who go long periods without putting in a claim. With adverse selection, credit or insurance FSPs find it hard to determine which customers are potentially high or low-risk clients. In these cases, big data predictive models may be used to assess the default risk of clients (Karlan et al., 2016:3).

3.3 Developing country perspective

3.3.1 Innovation of new financial services

A study by Van der Boor et al. (2014:1600) finds that users developed more than half of the innovations in developing countries. Moreover, the study reveals that the average annual diffusion rate of user innovations was thrice quicker and twice broader than that of producer innovations (Van der Boor et al., 2014:1602). This could be due to the fact that user innovations identify better with user needs and therefore consumers are more likely to adopt innovations that meet needs rather than products or services that have been developed without a focus on meeting needs. This type of differentiation between user innovations and producer innovations parallels that of sustaining innovations and disruptive innovations. The latter being a parallel of user innovations and the former of producer innovations. Extending this logic further, it becomes clear that user innovations are particularly disruptive in that they are consumer-centric, as increasingly is the Fourth Industrial Revolution itself.

Producers only produced 45% of the mobile financial service innovations in developing nations (Van der Boor et al., 2014:1600). The same study also finds that need (related to safety, lowering prices and efficiency) was a significant driver in stimulating user innovation and the diffusion of user-developed mobile financial service innovations (Van der Boor et al., 2014:1600). The study also points out that an increase in parity in costs of ICT and subsequently the rates of technology adoption between developing and developed regions have also been a major contributor to user-created innovations flowing from developing to developed countries. This reduction in a technology lag has also subsided as a result of rapid cell phone adoption among people living in developing countries (Van der Boor et al., 2014:1601).

Interestingly, evidence from a behavioural science study in Kenya by Schaner (2017) finds that innovation that seeks to favourably improve the account terms of an individual can lead to increased account usage. In the case of the study, an ATM card which was randomly assigned to the study subjects indicated that by making the account cheaper and easier to use, test subjects that received the ATM card increased their account usage. Ultimately, the positive treatment effect occurred through a low-cost financial technology innovation, which positively improves outcomes for individuals with strong bargaining power[5].

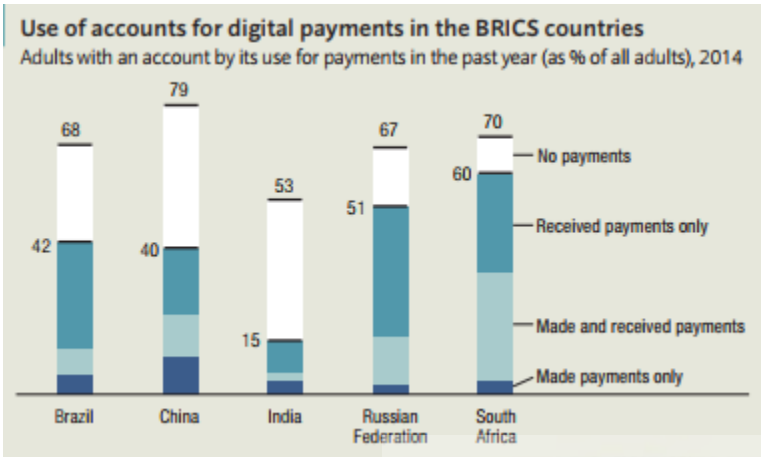
Increased financial innovation seen in mobile money innovations and mobile banking is being associated with economic growth. A study in Kenya found that the number of cheques cleared through an automated clearing house was negatively associated with economic growth (Mwinzi, 2014:31). That is, the more the economy moved away from cheques, the higher economic growth rates the country experienced. This is because a more effective payment system (mobile banking), which is more secure and convenient for customers to use, has led to greater consumer adoption of financial services (Mwinzi, 2014:34). As more citizens have been integrated into the financial services sector (financial inclusion), this has led to more productivity within the economy.

Despite South Africa being the only BRICS nation ranked outside the top 15 for FinTech start-up formation, South Africa, which was ranked 28th, was actually ranked the highest among the

[5] Jointly-owned accounts and accounts owned by men saw an increase in usage, but the treatment had no significant impact among women due to their relatively weaker bargaining power.

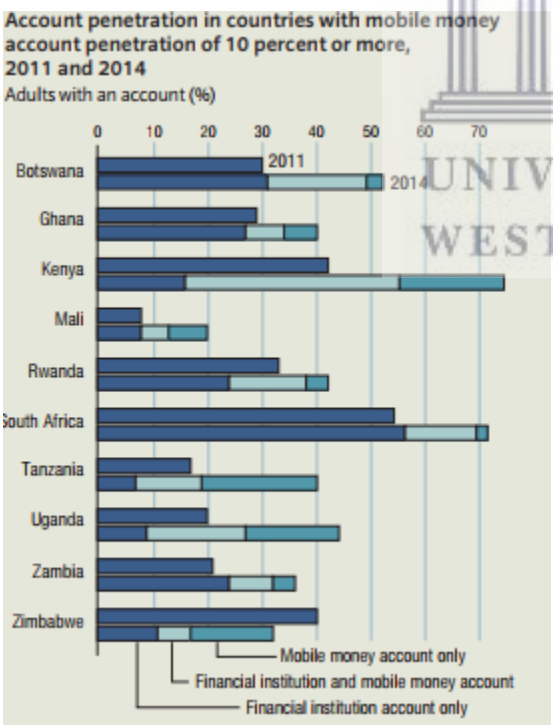
African countries (Haddad & Hornuf, 2018:21). Figures 12-15 below depict aspects of mobile money adoption in the BRICS countries.

Figure 12: Digital payments in BRICS countries, 2014



Source: Van Oudheusden et al. (2015)

Figure 13: Penetration of mobile money for African countries, 2011 and 2014



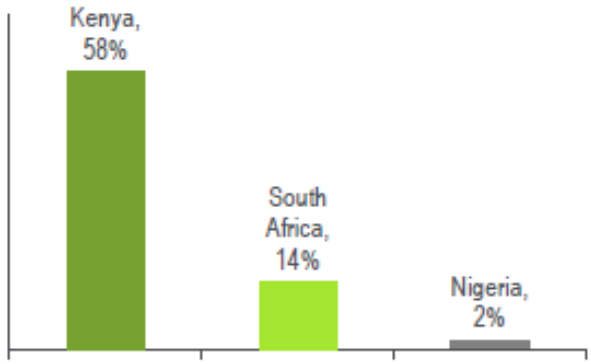
Source: Van Oudheusden et al. (2015)

3.3.1.1 M-Pesa

Despite a strong financial sector, South Africa lags behind Kenya in terms of mobile money usage, as can be seen in figure 14 below. This is attributed to significantly high debit and credit card penetration in South Africa (Ghose et al., 2016:48). In addition, mobile money has penetrated the Kenyan market as much as it has because regulators have been accommodating of mobile operators (Ghose et al., 2016:48). In Kenya, disruptive innovations such as the ATM have been exceeded by digital disruptions such as mobile banking which has been attributed to the increase in mobile subscriptions among lower-income groups (Okiro & Ndungu, 2013:147). The prominence of M-Pesa in Kenya, a Safaricom-powered service, has led to significant financial inclusion for the poor. M-Pesa enables individuals to have a mobile wallet that can be loaded with funds from various nationwide M-Pesa agents. The service effectively allows individuals to use their mobile wallet as their bank account to transfer, pay and deposit funds. The ease of registration and use has made the service a popular option for many Kenyans. According to Monks (2017), M-Pesa has 30 million users in a number of countries. In Kenya alone, M-Pesa has 18 million active users (Monks, 2017). The service was estimated to have lifted 2% of Kenyan households out of extreme poverty through facilitating access to financial services (Monks, 2017).

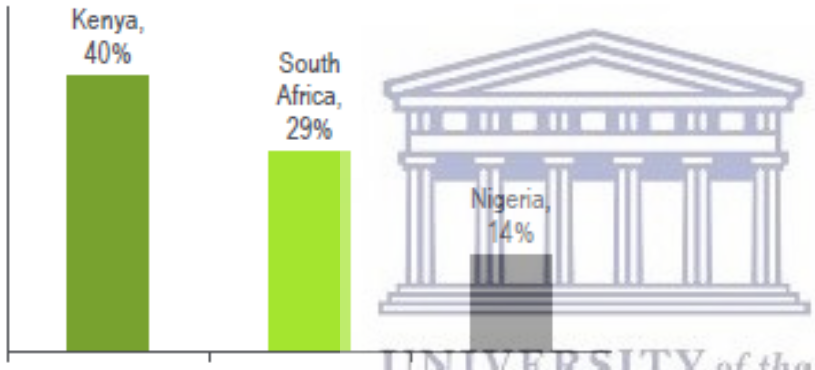
M-Pesa has arguably caused Kenya to have the highest proportion in Africa of a population conducting payment transactions on cell phones, despite Kenya not having the highest cell phone diffusion rate (Chigada & Hirschfelder, 2017:5). Consequently, M-Pesa has had a positive economic impact in Kenya through meeting money storage, money transfer and money security needs (Chigada & Hirschfelder, 2017:5). Being able to store income and send funds without worrying about it being stolen can be argued to have increased economic security, particularly among the poor in Kenya (Chigada & Hirschfelder, 2017:5). Okiro & Ndungu (2013:152) note that while Kenyan banks have their own mobile banking services, none are as prominent as M-Pesa. Each of these services nonetheless provides similar access to financial services without the customers having to leave their homes (Okiro & Ndungu, 2013:152-153).

Figure 14: Percentage of population having a mobile money account, 2014



Source: Ghose et al. (2016)

Figure 15: Transactions made from a bank account using a cell phone, 2014



Source: Ghose et al. (2016)

According to the Groupe Speciale Mobile Association (2017:17), there are half a billion registered users of mobile money accounts globally. Only 31% of these mobile accounts are active on a 90-day basis. In Sub-Saharan Africa, there are 277.4 million registered accounts, of which 100.1 million of them are active on a 90-day basis. In terms of activity, Sub-Saharan Africa appears promising, with only Latin America and the Caribbean having a higher proportion of active registered mobile money accounts (GSMA, 2017:17). McCaffrey and Schiff (2017:10) also state that there is a significant number of inactive mobile money services. Moreover, active users engage with mobile money infrequently and with very few of the services offered (McCaffrey & Schiff, 2017:10).

In the short-run, mobile money has a consumption smoothing effect in the consumption patterns of individuals faced with negative shocks (Suri & Jack, 2016:1288). A study on the impact of mobile money on consumption and poverty in Kenya (agent access-measured through the increased number of agents in a geographical area) found that log per capita consumption significantly increased as agent access increased (Suri & Jack, 2016:1289). The study also found that increased access to mobile money agents significantly reduced poverty (proportion of the population living below the $2 per day threshold) and extreme poverty (proportion of the population living below the $1.25 per day threshold) (Suri & Jack, 2016:1289). In fact, a minimum of 194,000 households was estimated to be raised out of extreme poverty through the diffusion of mobile money in Kenya (Suri & Jack, 2016:1289). Mobile money was noted to have provided a safe means of remitting and storing funds (Suri & Jack, 2016:1289). Due to the fact that remitters could safely send money home, it is argued that the main income earners of households felt encouraged to move to higher income-earning areas and this led to an overall rise in labour income among the study participants. From a gender perspective, the study indicates that more female-headed households benefitted from mobile money diffusion in Kenya. This was seen in significantly greater improvements in poverty status (poverty reduction) and consumption (higher consumption) in female-headed households relative to male-headed households (Suri & Jack, 2016:1289). This effect was significant, so much so that they estimate that approximately 185,000 women were led to change their main occupation into either business or retail (Suri & Jack, 2016:1289). Safer and cheaper long-distance remittances may have permitted greater freedom for female heads to move from one occupation to another (Suri & Jack, 2016:1289).

The increase in cell phone and internet penetration in Kenya has affected the performance of its financial institutions (Okiro & Ndungu, 2013:149). Okiro & Ndungu suggest that only institutions that adapted to the latest technology and new ways of conducting business will remain afloat (Okiro & Ndungu, 2013:149). Mwinzi (2014), who conducted a study on the effect of financial innovation on economic growth in Kenya, finds that mobile money innovations, as well as mobile banking, contributed positively to economic growth through increasing financial deepening in Kenya (Mwinzi, 2014:31). Okiro & Ndungu (2013:149) argue that there have been both costs and benefits for banking in the current age of rapid technological development. Benefits identified were associated with convenience, while costs identified were associated with security risks.

3.3.2 Financial inclusion in the developing country context

3.3.2.1 Mobile money

Maradung (2013) investigated Mobile Money Service (MMS) adoption determinants in Botswana. The study employs an adapted version of the Technology Acceptance Model (TAM) and considers the level of education, level of income, age, employment status, gender and bank account ownership as determinants of MMS adoption (Maradung, 2013:22). The study found that age, educational attainment, gender and employment status were significant determinants of mobile adoption in Botswana (Maradung, 2013:49).

Studies by Choudhury and Bhattacharjee (2015) on e-banking adoption among salaried employees in India found that individuals that reside in urban areas are more likely to adopt e-banking compared to rural dwellers (Choudhury & Bhattacharjee, 2015: 41-42). The study also found the more family earners there were, the lower the likelihood of e-banking adoption (Choudhury & Bhattacharjee, 2015:42). Higher educational attainment was found to increase the likelihood of the individual adopting e-banking (Choudhury & Bhattacharjee, 2015:42). This could be because more educated individuals are more likely to comprehend the benefits of e-banking and how to safeguard against the risks associated with e-banking. This reduces the fear factor that may be more prevalent among less educated individuals. In addition, more educated individuals also tend to live in urban areas and therefore are more likely to live near POS terminals and ATMs which support e-banking adoption. Goczek and Witkowski (2015:27) and Maradung (2013) in their studies on EU countries and Botswana respectively, also found that educational status is a significant determinant in e-banking options. Lastly, the more banking transactions individuals made, the greater the chance that they might adopt e-banking. This is expected as this indicates that financial inclusion has already happened, and the next step is simplifying the transaction process, which is easier than attempting to encourage adoption among individuals who, for example, withdraw all their income upon remuneration. It is important to note that findings from studies that do not focus on salaried workers, such as the Goczek and Witkowski (2015) and Maradung (2013) studies, will yield different results from a study like the Choudhury and Bhattacharjee (2015) study. The dissimilarities in outcomes are due to the fact that different adoption barriers exist for individuals that do not have permanent employment or are self-employed in the informal sector.

3.3.2.2 Rogers Innovation Diffusion Theory in mobile banking adoption

A number of studies have been conducted that have assessed the determinants of adopting mobile banking. The most commonly assessed factors are relative advantage, compatibility, complexity, observability and trialability. These factors are derived from Everett Rogers' Diffusion of Innovation Model (Rogers, 1995).

An acceptance study was conducted by Ramavhona and Mokwena (2016) in Limpopo, South Africa, to investigate the determinants of internet banking in this predominantly rural region. The theoretical framework employed was that of the Rogers' Diffusion of Innovation Model. The authors added the 'security of internet banking' as a determinant of adopting new innovation in addition to the other factors included in the model (Ramavhona & Mokwena, 2016:3). Against a backdrop of inadequate infrastructure in rural areas, access to internet banking services was quite low in the rural regions of Limpopo relative to urban regions (Ramavhona & Mokwena, 2016:2). The study found that 70.6% of the study respondents had no prior interaction with internet banking. Nearly two-thirds (62.5%) gave not having computers with internet access as the reason that they had never engaged with internet banking (Ramavhona & Mokwena, 2016:5).

Al-Jabri and Sohail looked at the adoption of mobile banking in Saudi Arabia. Al-Jabri and Sohail (2012) attribute the rise in mobile banking service offerings from banks to an increase in mobile subscriptions (Al-Jabri & Sohail, 2012:380). Using Rogers' Diffusion of Innovation theory, the authors explain the adoption of innovation using factors such as relative advantage, complexity, compatibility, observability, trialability and perceived risk (Al-Jabri & Sohail, 2012: 381-382).

Despite mobile banking enabling users to access and transfer funds without being at a bank, more than three-quarters of the users in Saudi Arabia visited their bank at least once a month. Interestingly, less than half of the users had used mobile banking for at least one year (Al-Jabri & Sohail, 2012:383). The study also found that relative advantage was positively related to mobile banking adoption (Al-Jabri & Sohail, 2012:387). That is, when people perceived that mobile banking had significant benefits over traditional banking, they were more likely to adopt mobile banking (Al-Jabri & Sohail, 2012:387). Saudi customers perceived mobile banking as useful, while a similar study in rural South Africa by Ramavhona and Mokwena finds that, in terms of relative advantage, internet banking was described by 57.5% of the study participants to increase the convenience of banking (Ramavhona & Mokwena, 2016:5). Greater efficiency and personal

autonomy in stewarding one's finances were seen as a benefit of internet banking by more than half of the study participants. The relative advantages of internet banking were weighed positively against the benefits of traditional banking.

Mobile banking has also simplified banking (Chigada & Hirschfelder, 2017:3). The simplification of banking through a rise in the independent use of mobile technologies to transact has improved banking skills (Chigada & Hirschfelder, 2017:4). Further underscoring that mobile banking has simplified banking, the study by Ramavhona and Mokwena (2016:5) reveals that 44.3% of the study participants concurred on the simplicity offered by internet banking. Only 13.8% of the study participants regarded internet banking as complex. The decrease in the need to interact with bank staff has also led to banks simplifying their operations as they now require fewer front-end staff. Overall, mobile banking has simplified transacting and transferring money by reducing paperwork and travel.

In terms of trialability, nearly two-thirds of the study participants were willing to try internet banking for at least a month (Ramavhona & Mokwena, 2016:5). Among the other studies on mobile banking, Brown. Zaheeda, Douglas & Stroebel (2003), as cited in Assensoh-Kodua et al. (2016:35), and Brown and Molla (2005), both indicate that trialability influences the adoption of mobile banking. The latter study focuses on cell phone banking while the former focuses on mobile banking and also revealed relative advantage, perceived risk and customer banking needs as key determinants of mobile banking adoption. Similar to Brown et al. (2003, cited in Assensoh-Kodua et al., 2016:35), the study by Shambare (2011, cited in Assensoh-Kodua et al., 2016:35), also highlighted perceived risk as a key factor in the adoption of mobile banking. The Shambare study, however, only looked at cell phone banking in Gauteng, Mpumalanga and Limpopo.

Like mobile banking (primarily referring to cell phone banking), internet banking allows individuals to have access to a multitude of financial services without physically going to the bank. The service has improved the efficiency of banking service delivery (Okiro & Ndungu, 2013:148). Unlike cell phone banking, internet banking growth has been constrained by a lack of access to mobile internet-enabled devices (Chigada & Hirschfelder, 2017:1). Part of the advantage of internet banking over mobile banking is that access is not restricted to a cell phone/ SIM card. Clients can access financial services from any device that has internet access. Such mobility, however, comes with the risk that devices may not always be secure enough. Reports of unsecured

wireless fidelity (WiFi) connected to malware-infected public computers are a regular reminder that the actual mobility of internet banking is somewhat overstated.

The study on Saudi Arabia (Al-Jabri & Sohail, 2012) also found observability to be positively related to mobile banking adoption. That is, when customers see the immediate benefits of mobile banking, they are more inclined to adopt mobile banking services. Furthermore, they found that compatibility was the most significant factor in estimating mobile banking adoption (Al-Jabri & Sohail, 2012:387). That is, because mobile banking integrates well with the lifestyles of customers, they are more likely to adopt mobile banking. In terms of how compatible internet banking was with the lifestyles of the study respondents in Limpopo, more than half (58.2%) of the study respondents regarded internet banking as compatible with their work style (Ramavhona & Mokwena, 2016:5). Most (81.4%) of the study participants agreed on the time and transport-saving benefits of internet banking.

Perceived risk was negatively associated with mobile banking adoption. For customers to adopt mobile banking, fears related to the insecurity of using mobile banking have to be addressed. The findings of Ramavhona and Mokwena suggest that, notwithstanding the challenge of having adequate resources, security concerns are a significant obstacle to internet adoption (Ramavhona & Mokwena, 2016:7). More than half of the study participants regarded physical bank branches as more secure or safe compared to internet banking services (Ramavhona & Mokwena, 2016:7). The study participants also perceived that banks were not taking responsibility for adequately securing their internet services (Ramavhona & Mokwena, 2016:7).

3.4 South African perspective

The availability of new technologies, high mobile penetration and well-established capital markets that efficiently allocate resources from surplus to deficit units are preconditions associated with an increase in FinTech start-ups (Haddad & Hornuf, 2018:3). However, the readiness of a country's digital network is dependent on access to the internet and ICT infrastructure. According to the Internet World Statistics (2017), as at 31 March 2017, internet penetration in Africa had reached only 28.3% of people, significantly behind the world's average internet penetration rate of 49.7%. Broadband is fairly important not only to South African consumers but to the industry as well. Greater access to and quality of broadband will spur innovation. Digital innovation in particular is

being positively effected with a host of apps that use the internet to enhance the business consumer interface, particularly in the food industry, where food delivery services such as Uber Eats are digital disruptors in that they have challenged the food delivery process and have made it easier for consumers to enjoy their favourite meals without having to travel.

The World Economic Forum has created a network readiness index to benchmark how capable a country is of leveraging ICTs for gain in the Fourth Industrial Revolution (Baller, Dutta & Lanvin, 2016:v). In 2016, South Africa was ranked 65th out of 139 countries in terms of network readiness (Baller et al., 2016:16). This figure is up from its rank of 75th out of 143 countries in 2015 (Baller et al., 2016:16). South Africa also ranked 65th in terms of 'business and innovation environment' and 26th for 'political and regulatory environment' (Baller et al., 2016:17). The country ranked 33rd in the overall environment sub-index (Baller at al., 2016:17). These results compare very favourably for South Africa relative to other Sub-Saharan Africa countries. However, the results from the report also indicate that despite South Africa having the infrastructure (ranked 44th out of 139), there are still skills (ranked 95th out of 139) and affordability (ranked 74th out of 139) constraints that prevent South Africa from thriving through its ICT infrastructure (Baller et al., 2016:18). Interestingly, the report reveals that while business ICT usage is markedly high (ranked 32nd out of 139 countries), individual ICT usage in South Africa (ranked 77th out of 139), and even more concerning, government ICT usage (ranked 105th out of 139), are severely lagging (Baller et al., 2016:19). Despite the comparatively moderate economic impact of ICT in South Africa (ranked 57th out of 139), the social impact of ICT (ranked 112th out of 139) is poor (Baller et al., 2016:20). This is a cause for concern, taking into account South Africa's socioeconomic challenges and inequalities, as the social impact dimension involves the degree to which ICTs facilitate school internet access, government efficiency and access to health care, education and financial services (Baller et al., 2016:35-36). The e-participation index was taken into account as a measure of the extent to which government uses digital technologies to engage with the public, e.g. publishing data on a public governmental platform or online service delivery forums for feedback to the government (Baller et al., 2016:35-36). If government processes and data do not digitise it will be fairly difficult to consider a country capable of leveraging its technologies to improve its economy. Hence, the e-participation index is crucial as the digitisation of the government can lead to more transparency and enhanced bureaucratic processes.

For the SMACT technologies to have positive socioeconomic implications for the most vulnerable in South Africa, having access to the internet and ICT is crucial. Furthermore, in order to increase financial inclusion for the unbanked population, the country has to improve internet access rates and the ownership of personal computers and other internet-enabled devices.

In 2012, only 19.5% of households in South Africa reported ownership of a computer (StatsSA, 2013:18). The figures were lowest in the Eastern Cape (9.7%) and highest in the Western Cape (34.1%) (StatsSA, 2013:18). Further underscoring the inequality in ownership, StatsSA reported that, while roughly a quarter (25.8%) of households in urban areas owned a computer, only 6.1% (roughly 1 in 20) households in rural areas owned a computer (StatsSA, 2013:18). Disparities are worse from an income inequality point of view, whereby 53% of the wealthiest households (quintile 5) owned computers, while only 4.1% of the poorest households (quintile 1) owned computers (StatsSA, 2013:19). This is particularly concerning in rural communities given the spatial inequalities created in communities in which very few members have computer access. This constrains the ability of such areas to participate in the ever-growing knowledge economy and lack of participation will widen the gap between those with access (high-income urban residents) and those without access (lower-income rural residents).

In a sense, a discussion of the above disparity is moot if everyone does not enjoy equitable access to electricity. StatsSA reported that overall household electricity access in 2012 was 85.3% (Harris, 2016:21). The City of Cape Town (2016:46) lists a generally unreliable electricity power supply as part of the reason why Africa only makes up a small proportion of global B2C e-commerce with a lack of secure payment options for those wanting to engage in online transactions and a generally low level of internet penetration on the continent playing a role. It should be noted, however, that while electricity access in terms of being connected to the national grid is a problem more in sparsely populated rural areas than urban communities, access in terms of affordability affects both the rural and urban poor. In other words, the problem of network readiness in South Africa relates more to poverty than infrastructure.

3.4.1 The impact of digital disruption on the workforce

The goal for e-Education in South Africa is digital empowerment, to enhance the abilities of individuals to participate in a knowledge society rather than merely adding computer literacy skills to an individual's skills set (Chetty, 2016:14). Increased digital skills, as well as greater

information sharing on social networks, will enable individuals to find employment opportunities or engage in entrepreneurial activities that will contribute to economic growth. Evangelista et al. (2014:24) found that, among European Union countries, digital empowerment affected economic growth and employment more than other performance variables (e.g. labour productivity). The study revealed digital empowerment to be not only positively related to employment but that digital empowerment could further lead to a greater likelihood of employment for women and chronically unemployed individuals (Evangelista et al., 2014:25). Digital empowerment is therefore vital for the inclusion of poor and socioeconomic groups into labour markets and subsequently, increased participation in the financial services sector (remunerated labour produces more disposable income and a greater awareness of opportunities to participate in the economy).

In the first quarter of 2016, the finance and other business service sectors employed as many as 2,218 million people in South Africa (BANKSETA, 2017:20). Moreover, in relation to the other sectors in the economy, this sector employed 14% of the employed population, only exceeded by Trade (20%) and the community and social services sector (23%) (BANKSETA, 2017:21). Of the employees working in the banking sector, the four largest banks in South Africa employ roughly two-thirds (67%) of the staff in the sector (BANKSETA, 2017:24). In terms of working location, the majority of the sector's employees are based in Gauteng (61%), Western Cape (12%) and KwaZulu-Natal (11%) (BANKSETA, 2017:24). The employees in the sector are also young. BANKSETA (2017:26) notes that more than half (53%) of the employees in the sector are below the age of 35 years.

ICT skills are among the most crucial skills demanded in this new age of technology (BANKSETA, 2017:42). Moreover, rather than replacing staff with machines, it can be argued that more ICT upskilling of staff has to occur for FSPs to be able to meet the needs of the young, dynamic and technology-savvy consumer. BANKSETA (2017:41) notes that vacancies in the banking sector were largely in Information Technology and Customer Expectations. Table 3 below indicates that the number of banks tellers' vacancies dropped in 2014 to less than a third of the number of bank teller vacancies that existed in 2012. These changes appear to have affected the front-end of banking. Back-end automation could also be to blame for the decline in office administrator vacancies over the periods 2012 and 2014. A clear rising trend can also be seen in the number of ICT Systems Analyst vacancies between 2012 and 2014. Overall a skills mismatch

in the banking sector has occurred. From a demand perspective, skills that are currently required, or needed in the future, are IT-related skills (BANKSETA, 2017:53). More specifically, programmers and process engineers (BANKSETA, 2017:8). The supply stream for the banking sector indicates that the majority of the human resources supply are studying in the Business and Management fields rather than in IT, consequently leading to a misalignment between the demand and supply of workers.

Table 3: Number of Bank Vacancies by Occupation, 2012, 2013, 2014

Code	Occupation	Vacancies 2012	Vacancies 2013	Vacancies 2014
133104	Application Development Manager	353	558	306
421101	Bank Teller	316	260	97
421102	Bank Worker	136	895	635
422206	Call or Contact Centre Agent	134	234	126
121901	Corporate General Manager	251	244	110
121902	Corporate Services Manager	1,503	2,101	1,624
122105	Customer Service Manager	756	1,021	1,022
112101	Director (Enterprise/ Organisation)	287	271	310
411101	General Clerk	344	300	145
251101	ICT Systems Analyst	1,039	2,282	2,326
242101	Management Consultant	182	296	322
334102	Office Administrator	1,680	1,349	856
122102	Sales Manager	302	384	388
252201	Systems Administrator	275	463	678
Others	Others	675	1,957	2,083
Total		**8,233**	**12,615**	**11,028**

Source: BANKSETA (2017)

Table 4 describes the number of workers employed in 2016 in the banking sector by occupational skill category and by province. In absolute terms, Gauteng employs the largest number of workers across all occupational groups. Twenty percent of the banking sector workers in Gauteng belong to the 'professional' occupational group. The only other provinces to employ at least 10% of its workers as professionals are KwaZulu-Natal and the Eastern Cape.

Table 4: Number of Bank Employees by Province and Major Occupational Group, 2016

Occupational Group	Eastern Cape	Free State	Gauteng	KZN	Limpopo	Mpumalanga	North West	Northern Cape	Western Cape
Plant and Machine Operators	1	0	263	61	4	0	0	0	2
Clerical Support Workers	280	46	51,755	1,056	96	204	66	4	6,464
Elementary Occupations	56	0	876	31	12	13	2	0	99
Managers	265	99	22,212	502	229	228	32	3	6,315
Professionals	107	5	25,501	373	71	8	0	0	600
Service and Sales Workers	104	162	7,275	472	40	22	10	0	288
Skilled Workers	0	0	218	26	0	0	0	0	17
Technicians and Trade Workers	179	3	12,816	454	798	147	11	13	2,463

Source: BANKSETA (2017)

There is a clear lack of skilled workers in the banking sector across all the provinces. Based on the BANKSETA (2017) data it is evident that the banking sector is currently mostly populated by clerical support workers and managers. Table 5 below indicates that the majority of workers in the banking sector have only a matric-level certificate. The next most common qualification is a diploma. This is to be expected, especially considering that the banking sector mostly consists of clerical workers. The biggest question going forward as banks become branchless is where these clerical workers will go? What added employment challenges will South Africa face if banks downsize significantly as they adopt digital methods of banking? Furthermore, how can banks ensure that workers are able to learn skills that will make them useful and not redundant in the Fourth Industrial Revolution?

Table 5: Educational Qualifications of Bank Employees by Gender, 2016

	Below Grade 9	Grade 9	Grade 10	Grade 11	Grade 12	Diploma	First degree	Honours/ Master's	Doctoral
Male	320	125	564	599	36,202	13,033	10,923	5,523	229
Female	482	206	1,124	1,314	60,020	23,244	12,861	4,542	163
Total	802	331	1,688	1,913	96,222	36,277	23,784	10,065	392

Source: BANKSETA (2017)

A factor that influences labour productivity in the South African banking sector is the skills mismatch. As a result, some posts remain vacant for prolonged periods of time which may negatively affect labour productivity in the sector (BANKSETA, 2017:51). Moreover, an abundance of workers with low skill levels results in lower productivity than the sector would potentially have if it had more skilled workers.

3.4.1.1 Innovation of new financial services products

The entrepreneurial ecosystem in South Africa, as defined by the Global Entrepreneurship Monitor (Herrington & Kew, 2016), indicates that although reasonable commercial and legal infrastructure and adequate physical infrastructure exist, and internal market dynamics are above average, the overall ecosystem could be improved. The entrepreneurial ecosystem in South Africa requires further investment in ICT in order to leverage resources for entrepreneurs to develop FinTech solutions that solve problems in their communities as well as contribute to financial inclusion. Another prerequisite to improving the entrepreneurial ecosystem is ensuring that the country has a quality education system. The supply of entrepreneurs will increase which will lead to innovation and stronger competition among incumbent companies and start-ups. FinTech start-ups are more likely to form in countries with a greater supply of entrepreneurs (from a greater supply of labour), more mobile subscriptions, a more well-established capital market and greater availability of advanced technologies (Haddad & Hornuf, 2018:21). The United Kingdom's lead over other European countries as a FinTech hub has been attributed to its conducive regulatory system, its potent tax incentives and having London as a financial centre (Haddad & Hornuf, 2018:16). This suggests a crucial role for the government in facilitating an innovative, competitive and regulated entrepreneurial environment, especially in banking. Government has, however, not been doing enough in the entrepreneurial ecosystem environment in South Africa. This is clearly indicated by the Global Entrepreneurship Monitor expert ratings that point out that South Africa lags behind

the global average in terms of government policies and governmental entrepreneurship programmes.

3.4.2 Financial inclusion in South Africa

Based on the 2014 Findex data, the World Bank reports that the proportion of people in South Africa that are 15 and older and have a bank account has reached 70% (World Bank, 2014:11). This is a rise from 54% in 2011, which indicates that South Africa is making some progress in achieving financial inclusion for all. While uptake rates are important, it is equally important to investigate whether the opened accounts remain open (that is, continue to be used) or are dormant/ inactive. The usage of an account is a critical measure of how effective the account is in meeting the consumer's need. This is referred to as the depth of financial inclusion. Moreover, over and above using an account, it is also important that customers have access to a broad variety of financial services, other than a simple transaction account that is used to deposit and withdraw. According to Finscope (Finmark Trust, 2016:5), banking in South Africa primarily occurs for transactional purposes (99%). Insurance (19%), credit (18%) and savings (14%) are less noteworthy drivers, relative to the transactional need for banking (Finmark Trust, 2016:5). While formal financial products are largely driven by credit (69%) and insurance (66%), informal financial products primarily involve burial societies (62%) (Finmark Trust, 2016:5). Overall, this indicates that while account uptake rates may be high, South Africans are not fully interacting with the full suite of financial services.

3.4.2.1 Mobile banking

Okiro & Ndungu (2013:148) define mobile banking as the presentation and delivery of financial services through mobile telecommunication technologies. Assensoh-Kodua et al. (2016:34) conducted a meta-analysis of the literature on mobile banking in South Africa. The meta-analysis included articles that were published between 2003 and November 2014. The study found no literature on mobile banking continuance behaviour in South Africa (Assensoh-Kodua et al., 2016:39). Furthermore, no studies were found that investigated the preference of mobile devices used for mobile banking nor financial services behaviours in South Africa (Assensoh-Kodua et al., 2016:39). Moreover, the only literature which was found focused on the acceptance of mobile banking in South Africa (Assensoh-Kodua et al., 2016:39).

The proliferation of mobile banking is associated with a corresponding rise in cell phone adoption, particularly in Sub-Saharan Africa (Chigada & Hirschfelder, 2017:1). Mobile banking has also integrated into the banking system more significantly as a result of technological advancements in South Africa (Chigada & Hirschfelder, 2017:3). This is seen in the relatively high mobile broadband and smartphone penetration in South Africa compared with other African countries (Chigada & Hirschfelder, 2017:3).

Digitalisation and mobile banking not only provide consumers with access to money without carrying cash, but open up opportunities for exposure to online lending markets. Finmark Trust (2017:4) recommend mobile money as a substitute for both formal and informal accounts. The interoperability of mobile money across formal and informal markets is thus the key to South Africans drastically reducing their daily cash transactions.

3.4.2.2 Internet banking

Through regression analysis, a study in rural South Africa identified the key determinants of internet banking as perceived trialability and awareness (Ramavhona & Mokwena, 2016:6). Other significant determinants of internet banking adoption include perceived compatibility and security. Overall 61.6% of the variation in the model (estimating internet adoption) could be explained by the explanatory variables. That is, 61.6% of the variation in internet adoption could be explained by the factors perceived compatibility, security, trialability, awareness, complexity and relative advantage (Ramavhona & Mokwena, 2016:6). In contrast, a study in Saudi Arabia found that complexity and trialability were insignificant determinants of mobile banking adoption in that country (Al-Jabri & Sohail, 2012:387).

3.4.2.3 Microlending

South Africans borrow through informal channels such as friends or family. Credit is largely used for consumption activities (current spending) rather than productive activities. This is particularly unsustainable. The adoption of loan offerings by FSPs has been slowed down by the fact that many consumers fear defaulting on loan repayments (Kessler et al., 2017). It was further noted that one of the main reasons that borrowing occurs is to meet the need for quick finance for emergencies. Friends and family provide fast credit and do not require any paperwork. Informal channels allow borrowers to avoid long bank queues and having to provide reasons for borrowing as well as paperwork. The fact that a substantial number of low-end market transactions are cash-based

increases the risk of individuals needing small loans. Forgetting one's cash at home or misplacing cash means that the individual has to make use of some sort of emergency funds. Without mobile banking or debit/ credit cards the individual may become vulnerable to the high borrowing costs associated with microlenders and loan sharks (mashonisas).

3.4.2.4 Savings

In a survey, the Boston Consulting Group found that 60% of South Africans had not saved in the preceding year (Kessler et al., 2017). The savings rate has declined in South Africa at a household level (Kasongo & Ocran, 2017:1). Data from the World Bank indicates that post-apartheid, as a percentage of South Africa's GDP, gross savings were at their highest in 2010 at around 18%.

Botha, Simleit and Keeton (2011) used 1981 Q1 to 2009 Q4 quarterly data from the South African Reserve Bank as well as data from Thomson DataStream to investigate the determinants of household savings behaviour in South Africa. Their study found that recent household savings trends in South Africa have been counter-cyclical. That is, as real GDP increases, household savings decline (Botha et al., 2011:8). Findings from Kasongo and Ocran (2017:24) also suggest that the relationship between GDP and savings in South Africa is counter-cyclical. During times of economic prosperity, households are less likely to save and more likely to spend as they expect that this economic trend will persist into the future.

Using World Bank data, Nduku and Simo-Kengne (2017) found that higher real interest rates decreased the savings rate in South Africa. Interestingly, the authors argue that intergenerational transfers, as well as income uncertainties, were noteworthy disincentives to save in the South African context (Nduku & Simo-Kengne, 2017:29-30). Savings in South Africa can also be held in the form of non-monetary goods such as livestock, grain and trading goods (Nduku & Simo-Kengne, 2017:30). These interesting perspectives on savings behaviour in South Africa further paint a unique picture that differs from that of developed countries.

3.4.3.5 Banking and remittances

According to Kessler et al. (2017), the financial inclusion estimates of SA can be misleading. Despite the high uptake of transaction accounts, the majority (60%) still transact via cash (Kessler et al., 2017). The estimates of financial inclusion can be expected to be lower among lower-income consumers. The actual usage of transactional accounts is also low, which could be attributed to the economy being largely cash-based. According to the Global Findex database (Van Oudheusden et

al., 2015:84), an average of 70% of all adults in South Africa owned an account in 2014. The comparatively lower 58% penetration rate for the poorest 40% of households indicates that the poor are still significantly underserved by financial service providers (Van Oudheusden et al., 2015:84). Domestic remittances have a particularly important role in reducing poverty among the poorest in the economy. In South Africa, the annual transaction value of domestic remittances is estimated to be between $11 billion and $13 billion (Technoserve, 2016:3). This figure is estimated to exceed that of international remittances six-fold (Technoserve, 2016:3). Technoserve (2016:6) reports that 24.3 million people in South Africa are domestic remittance users (send/ receive/ both send and receive). Interestingly, only half of South Africans who sent and received domestic remittances did so through a formal bank (Technoserve, 2016:8). A challenge to this channel is that funds are relatively non-exchangeable between banks (Technoserve, 2016:8). This is linked to the relatively high bank charges associated with such transactions. Retailers command 20% of the domestic remittance market (Technoserve, 2016:8). The challenge with this channel of remitting is the long waiting lines that are common toward the end of the month, as many queue to perform the same transaction. About 25-30% of domestic remittances are transferred by cash (Technoserve, 2016:8) with participants exposed to theft, distance and physical challenges. Despite the significant penetration of cell phones in South Africa, less than 5% of the domestic remittance market is covered by mobile/ digital banking providers (Technoserve, 2016:8). One of the reasons for M-Pesa's success in Kenya was the large number of agents that were well located among customers for easy access to cash. As at 30 June 2016, there were at least 158,777 agents serving as outlets for mobile money (Technoserve, 2016:16). Unlike Kenya, South Africa lacks agents willing to hold large amounts of cash as cash-in/ out outlets (Technoserve, 2016:8). There has been a significant migration of customers from retail banking to traditional banking at the incumbent banks (Technoserve, 2016:8-9). With such a large market of diverse channels for domestic remittances, especially in the cash remittance channel, a significant opportunity exists for the financial inclusion of this market.

3.4.3.6 Access to financial services

Ensuring that domestic remittances are transferred efficiently and safely could consequently reduce poverty in South Africa, particularly in rural areas. It is evident that the payments sector of financial services provision is a battleground for incumbent banks and retailers. Although banks have the greater market share, retailers are fighting back through eliminating some of the

requirements set by banks in order to transact, such as having a bank account. In 2014, three-quarters of adults in South Africa were banked (Chetty, 2016:15). Chetty (2016:15) notes that the increase in the number of individuals that are banked is due to the peer to peer mobile payment system allowing individuals to be financially included without requiring documentation such as proof of residence to open a bank account.

Matsebula and Yu (2017:11), using four waves from the NIDS dataset, find that some indicators of financial inclusion show that access to financial services has increased over the years. From 2008 to 2014/2015, the percentage of households that had at least one household member with a bank account increased from 57% to 78% (Matsebula & Yu, 2017:11). However, there was a decline over the years between 2008 and 2014/2015 in the percentage of households with at least one household member that accessed home loans/ bonds, from 8.63% to 5.68%. Many South Africans (90% in 2015) have also become aware of savings accounts (Roberts et al., 2016:15). The uptake of savings accounts in South Africa of the population aged 16 and above reached 52% in 2015 (Roberts et al., 2016:15). Awareness of mobile banking has also grown significantly (Roberts et al., 2016:15). Matsebula and Yu (2017:18) also found that financial inclusion was positively correlated with higher-income households. Conversely, lower-income households and households with fewer members that were employed were found to have a higher likelihood of being financially excluded (Matsebula & Yu, 2017:18).

3.4.3 FinTech use at the firm level

Despite a reduction in South Africa's GDP in the first quarter of 2016, the financial services sector still grew by 1.9% (BANKSETA, 2017:21). FinTech could contribute significantly to the economy but could also make a financial system increasingly harder to monitor and exacerbate systemic financial sector instability (Bank of England, 2017:38). Some FinTech companies act as alternative financing sources with lower lending requirements for customers. This may challenge the ability of regulators to manage risk in the financial sector (Bank of England, 2017:38). Despite the fierce competition from FinTech companies, major banks in South Africa have continued to increase their profits. Grosskopf et al. (2016:4) attribute the strong performance in the second half of 2015 among major banks in South Africa to their strong franchises and diversified profit pools within a tough economic climate. Banks also increased their expenditure on IT year on year to meet the growing need to protect client data from cybercriminals and meet the increasing consumer appetite

for an online interface (Grosskopf et al., 2016:5). In addition, the heightened IT regulatory requirements have also contributed to higher IT expenditure (Grosskopf et al., 2016:21). As a result, overall costs of operating have increased for banks as IT expenditures took precedence over managing costs (Grosskopf et al., 2016:5).

3.4.4 Firm value in financial services and digital disruption

3.4.4.1 Cost structure

The cost structure of banks includes funding (deposit/ non-deposit) as well as operational costs. Operational costs of traditional banks differ starkly for online FSPs and include wages, water, electricity and building maintenance costs. The reduction of most of these operational costs is usually associated with banks becoming more branchless. It has historically been challenging for FSPs to overcome economic barriers to increasing accessibility. From an operational perspective, opening bank branches in remote or rural areas in order to serve lower-income customers can be challenging. Building and operational costs of brick-n-mortar branches cannot be covered by revenue obtained from bottom-of-the-pyramid customers (World Bank People's Group of China, 2018:6). Even though banks have the desire to improve financial inclusion, it has to be in line with their vision, mission and value proposition so that they remain commercially viable and sustainable.

The Third and Fourth Industrial Revolution transformed banking models and enabled relatively cheap digital channels that can extend financial services to previously excluded customers. These digital channels have allowed banks and customers to overcome both economic and geographical barriers to improving access to financial services.

3.4.4.2 Value proposition

Although banking rates and fees are most important in persuading customers to migrate away to a competing online/ non-bank company providing financial services, other critical factors include customers' access to a variety of financial services, a superior digital experience as well as the simplicity of setting up an account (Colwell, Schrezenmaier, Neufeld, Turner & Ebstein, 2016:6). A physical presence/ geographical convenience was regarded as a critical factor by 60% of customers in deciding whether to take up financial services provided by a non-bank company (Colwell et al., 2016:8). Poor accessibility to financial services can thus negatively affect the value

proposition of financial services in meeting consumer needs (World Bank People's Group of China, 2018:5).

Customers have generally been more likely to remain with well-established banks and less likely to switch FSPs in developed countries compared to developing or emerging markets (Dietz, Khanna, Olanrewaju & Rajgopal, 2015:1). In a 2016 customer banking survey, Colwell et al. (2016:4) find that, in most developed countries (including USA, UK, Germany), the notion that banking is provided by banks (brick-and-mortar or click-only) is more common than in emerging economies (such as Indonesia, India, Brazil, Hong Kong), where primary FSPs could be new non-bank entrants that offer financial services among other services.

3.4.4.3 Customer segments

Colwell et al. (2016:2) note that current changes in the banking sector include front-end customer transaction processing being streamlined through digital channels, increasing availability of banks through extended working hours (in order to compete with 24/7 FinTech companies), and a rise in niche markets where niche banks focus on specialised groups of people, e.g. lower-income customers. For instance, simple low-cost, no-frills transaction accounts are attractive to lower-income customers as it meets their daily basic needs (World Bank People's Group of China, 2018:8).

In a 2016 customer global banking survey, Colwell et al. (2016:5) find that more than half (55%) of customers regard themselves as digitally savvy yet not financially savvy. This indicates that there could be potential for offering this segment digital banking services. The segment is particularly attractive to FinTech companies and incumbent banks who are trying to keep up in the Fourth Industrial Revolution. More recently, further customisation financial products to suit customers' needs are more readily available as a result of advances in data analytics and digital finance (World Bank People's Group of China, 2018:8).

3.4.4.4 Channels

BANKSETA (2017:33) identified retail companies, telecommunication companies and technology companies as the three major disruptors in the banking sector. Each has disrupted the traditional channels through which consumers were provided with financial services. Retail companies caused disruption in the banking sector through digital wallets and providing consumers with access to credit. This put them in competition with financial service providers in

some of their (the banks) key activities. Telecommunication companies are also participating in financial service delivery, especially in Africa, through cell phones. Mobile banking providers, therefore, comprise of both telecommunication companies and banks. Technology companies such as PayPal have gained significant prominence globally as an online payments system facilitating money transfers between peers. This traditionally bank-related activity has become an area of contestation for technology firms and banks, with technology firms gaining traction rapidly as a result of the online conveniences they may provide. It is worth noting that banks do collaborate and engage in joint ventures with retail companies, telecommunication firms and technology firms in the provision of technology-savvy financial services.

3.4.4.5 Customer relationships

Social media has aided retail banks in marketing and communicating with their customers. Retail banks have also used social media to collect insights and information from their consumers (BANKSETA, 2017:42). The relationship between customers and banks is changing with the increased use of self-service and automated services through ATMs and internet banking through artificial intelligence. In addition, digital personal assistants are increasingly being used to deliver financial services to customers, e.g. Siri, Alexa.

3.4.4.6 Revenue streams

The income sources of FSPs vary depending on the type of institution. For example, retail banking revenue sources are different to investment banks' revenue streams. For incumbent commercial banks, revenue streams may arise from interest from lending (to individuals, corporations or other banks), interest income from investments (e.g. government bonds), cash management and deposit account services (DeYoung & Rice, 2004:36). Other fee-generating activities for FSPs include investment banking services, insurance service, the brokerage of securities and merchant banking (DeYoung & Rice, 2004:36). There is still debate in the literature as to whether bank performance is better if banks focus on interest income or on non-interest sources of income. Although interest income has a certain credit risk associated with it, it also diversifies away from operational risk associated with income sources such as bank fees from deposit account services or brokerage commissions. Striking a correct balance is therefore key in managing operational risk and credit risk.

FinTech companies are challenging the income sources of incumbent banks. Although incumbents have more financial resources, lending markets are more niche-focused and FinTech companies have focused on providing lending services to the traditionally underserviced, lower-income market. Evidence from the UK and China indicates that FinTech companies also have more access to funding as a result of banking licences being made more accessible (Tse, 2017).

Strategic alliances and joint ventures between FinTech companies and incumbent banks could reduce costs for banks, increase revenue streams and increase the customer experience (with more services provided). FinTech partners would benefit from greater access to funding while incumbents could diversify their risk by obtaining new revenue streams. Key partnerships can therefore mutually benefit and expand both entities' operations.

3.4.4.7 Key partnerships

Greenberg and Simbanegavi (2013:26) find the current banking sector in South Africa exhibit monopolistic behaviour. Given the high concentration ratio in the banking sector in South Africa, the government needs to ensure that customers are not financially excluded through high banking fees. Moreover, collusive cartel-like behaviour should be strictly discouraged by regulators through effective policies and monitoring.

Greater disruption from FinTech companies can lead to a reduction in costs for customers and an overall improvement in customer convenience elsewhere as the incumbent banks would have to improve customer experiences to remain relevant. The major banks have responded by developing services that facilitate mobile banking for customers, such as FNB's eWallet and ABSA's CashSend.

3.4.4.8 Key activities

Banks have transitioned from traditionally competing on price and products to a focus on customer experience and convenience (Colwell et al., 2016:1). This could be due to the standardisation of banking products over time such that customers are less able to distinguish banks from each other (Colwell et al., 2016:1). The customer experience is therefore becoming a key differentiating aspect for banks (Colwell et al., 2016:1). New FinTech companies aggressively compete on the basis of customer experience and the superior convenience that they offer over traditional banks (Colwell et al., 2016:1). A 2016 global survey by Colwell et al. (2016:5) found that 41% of

customers would change their primary FSP without hesitation if they found another with a superior digital offering or experience.

3.4.4.9 Key resources

Key resources that exist for banks include physical, intellectual and human resources. Physical resources for commercial banks include bank branches, ATMs and vehicles. Intellectual resources are becoming increasingly important as banks innovate applications to meet the needs of their customers. Patents and other intellectual property assets such as online Internet Protocol (IP) addresses and user interfaces are key to the smooth running of banks and FinTech companies in the digital revolution. If a digital application is developed, it should be protected just as much as banks would invest in insurance and security to protect their physical resources. Lastly, human resources are also vital to the day-to-day front and back-end operations of banks. Even online banks require human resources to maintain and design the web interface and to answer more complex customer inquiries. The use of human resources may, however, become less pertinent as artificial intelligence and robo-advisers are used more prominently by FSPs in future.

3.5 Conclusion

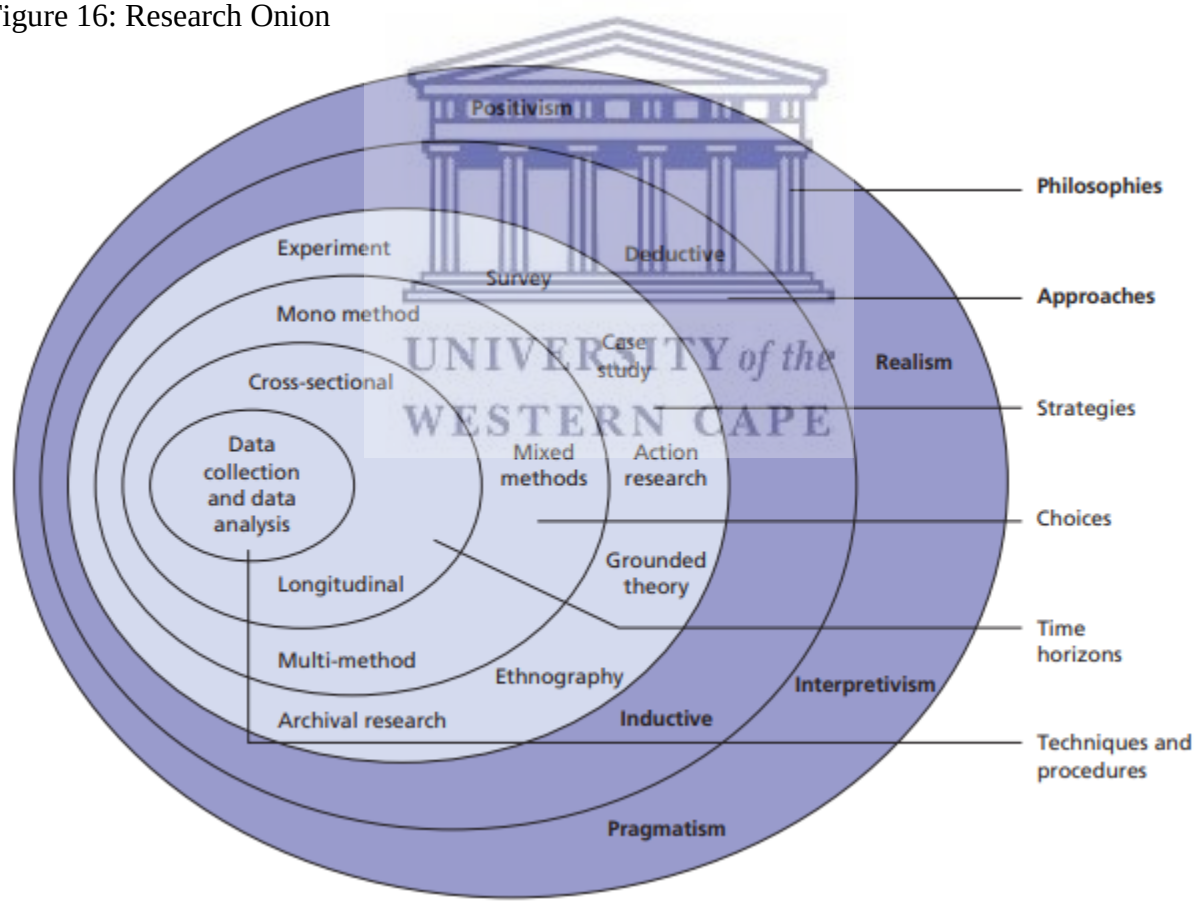
This chapter reviewed empirical literature on the impact of digital disruption on banking from global, developing country and South African perspectives. The chapter then discussed financial inclusion and the impact of digital disruption on firm value. Moreover, the chapter included evidence of the adoption of digital financial services and specifically mobile banking, in South Africa. Overall, it has been shown that the Fourth Industrial Revolution has transformed the financial sector. As banks have become more digitised and have seen the benefit of adopting digital technologies, consumers have at the same time *digitalised*, adopting mobile technologies to participate in the digital economy. While financial inclusion rates in South Africa are quite high, there is still much to be done to improve the depth and reach of financial inclusion. Further, the quality of financial inclusion is yet to be fully understood in the South African context. That is, how factors such as financial literacy, consumer protection and affordability play a role in driving up the use of a broad range of financial services in South Africa, and specifically how digital financial services impact on financial inclusion. The next chapter describes the methodological approach adopted by this study to investigate these aspects.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Introduction

This chapter discusses the methodology used in the study. Firstly, the chapter lays out the research paradigm for the study through the research onion by Saunders, Lewis and Thornhill (2009). In following the chronological order described by the research onion, the first section discusses the research philosophy of the study. The next section discusses the research approach to the study. Next, the methods used to collect quantitative and qualitative data for the study are explained. The chapter concludes by describing the issues and criteria employed to ensure the reliability and validity of the research conducted and the findings obtained.

Figure 16: Research Onion



Source: Saunders et al. (2009)

4.2 Research Philosophy

According to Saunders, Lewis, and Thornhill (2009:118) the research paradigm of a study presents the way in which the researcher examines social phenomena from which insights can be drawn and explanations attempted. Saunders converges the four research philosophies into a table which is presented below.

Figure 17: Research Paradigm

Research philosophies	Positivism	Realism	Interpretivism	Pragmatism
Ontology: the researcher's view of the nature of reality or being	External, objective and independent of social actors	Is objective. Exists independently of human thoughts and beliefs or knowledge of their existence (realist), but is interpreted through social conditioning (critical realist)	Socially constructed, subjective, may change, multiple	External, multiple, view chosen to best enable answering of research question
Epistemology: the researcher's view regarding what constitutes acceptable knowledge	Only observable phenomena can provide credible data, facts. Focus on causality and law like generalisations, reducing phenomena to simplest elements	Observable phenomena provide credible data, facts. Insufficient data means inaccuracies in sensations (direct realism). Alternatively, phenomena create sensations which are open to misinterpretation (critical realism). Focus on explaining within a context or contexts	Subjective meanings and social phenomena. Focus upon the details of situation, a reality behind these details, subjective meanings motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data
Axiology: the researcher's view of the role of values in research	Research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance	Research is value laden; the researcher is biased by world views, cultural experiences and upbringing. These will impact on the research	Research is value bound, the researcher is part of what is being researched, cannot be separated and so will be subjective	Values play a large role in interpreting results, the researcher adopting both objective and subjective points of view
Data collection techniques most often used	Highly structured, large samples, measurement, quantitative, but can use qualitative	Methods chosen must fit the subject matter, quantitative or qualitative	Small samples, in-depth investigations, qualitative	Mixed or multiple method designs, quantitative and qualitative

Source: Saunders, Lewis, and Thornhill (2009)

The Research philosophy of a study contains the assumptions that the researcher holds (Saunders et. al, 2009:108). This in turn provides the reader with an understanding of how the researcher views the world (Saunders et. al, 2009:108). The assumptions that the researcher holds will inform the research methods and strategy of the study (Saunders et. al, 2009:108). According to Saunders et al. (2009:108) the most significant influence on the research philosophy that the researcher chooses to adopt is how they view the relationship between knowledge and the process by which knowledge is created. Varying ideals on this process will lead to nuances in what type of results are generated from a study. In the research onion above (See figure 9), Saunders et al. (2009) presents four types of research philosophies, namely; Positivism, Realism, Interpretivism, and Pragmatism.

Positivism which is more associated with the natural sciences follows a strict logical-flow where only observable phenomena generates validates data (Saunders et. al, 2009:113). A scientific approach is therefore employed to generate knowledge. An existing theory is used to test a hypothesis (Saunders et. al, 2009:113). The researcher then decides on a research strategy to collect data in order to test the hypothesis (Saunders et. al, 2009:113). The data collected for such studies tend to be fairly large and the process used, highly structured (Saunders et. al, 2009:108). In a similar manner to positivism, realism follows a scientific approach to develop knowledge (Saunders et. al, 2009:114). Realism however delineates from positivism in that it emphasises the differences between objective reality and the reality that is in the mind of the researcher (Saunders et. al, 2009:114). Due to the fact that the researcher will have insufficient information, realism argues that the interpretations should as a result be confined to a specific context. Interpretivism is opposed to law-like rigid assumptions/generalisations. Interpretivism argues that rich insights are complex in nature and that research should rather be conducted among people rather than objects (Saunders et. al, 2009:116). Interpretivism focuses on the roles the humans play as 'social actors' (Saunders et. al, 2009:119). As a result, studies that follow the interpretivist philosophy tend to conduct in-depth qualitative insights on small-samples (Saunders et. al, 2009:119). This study however follows a pragmatic philosophy. Pragmatism argues that the researcher does not have to adopt one position. In fact, the philosophy argues that what is most important is 'appropriateness' when devising an approach to answer a research question (Saunders et. al, 2009:109). As a result, studies that follow a pragmatic research philosophy tend to follow a mixed-methods approach in where a combination of approaches are used based on how appropriate the

approach is to answer a specific research question (Saunders et al., 2009:109). This study followed this approach as very little information exists on digital financial inclusion in South Africa. This will require multiple methods to unpack and interpret, in a way that is appropriate and sensitive to the research objective at hand.

4.3. Research approach

There are three types of research approaches, namely inductive, deductive and abductive. The indictive research approach is referred to as 'theory building' (Saunders et al., 2009:125). With inductive reasoning, the results the study are used to develop a theory. On the other hand, deductive reasoning which is also referred to as a 'hypothesis testing' is an approach where an existing theory is tested with data in order to verify the theory (Saunders et al., 2009:124-125). It is argued that it may be advantageous to combine the two research approaches as this may overcome some of the weaknesses of each approach and leverage some of the benefits that each approach provides (Saunders et al., 2009:127, Mitchell, 2018:105). This study made use of mainly abductive reasoning which is a combination of inductive reason and deductive reasoning. Deductive reasoning will be used since some theories on the topic have already been developed. There is some understanding on the state of financial inclusion and digitisation in South Africa. However, there is still very little rich data that has been collected on this topic in the South African context and therefore there is a gap for new theories to develop. Without sufficient local data on the topic, prior conclusions on the economic impact of FinTech in South Africa may have been limited to, for example, the impact of internet or cell phone banking. With limited prior research on the topic, inductive reasoning requires the researcher to collect data and develop a theory from what is observed. In the case of this study, much of the information extracted from the key informant interviews informed the theories that were developed afterwards. The relationship between theory and research in the study was therefore inductive which ultimately makes the research approach abductive due to the use of both deductive and inductive approaches.

4.3.1 Nature of the research

The nature of the research in this study is exploratory, explanatory as well as descriptive. The primary motivation for the study was to understand the economic impact of FinTech on financial service providers as well as consumers. Much of the research is therefore explanatory. The

descriptive aspect of the study includes describing the current state of digital disruption from FinTech in the economy.

4.4 Research design

According to Babbie and Mouton (2001:76), research designs consist of three factors. In developing a research design, one should firstly distinguish between whether the study is empirical or non-empirical. If the study is empirical, the questions asked pertain to scenarios that are, have or will actually be observed. Non-empirical studies ask questions that will not be answered through using observed data. Secondly, the development of a research design requires the author to be clear on whether the study will make use of primary or secondary data or both. Thirdly, the research design of the study should discern whether the study will make use of numeric or textual data. An empirical primary data design which uses both numeric and textual data has been employed for this study. Since the aim of the study is an impact assessment, the questions asked pertained to observed events and factors surrounding the observed events which make the study empirical. Primary data and secondary data collection were required for the study to present a holistic perspective on the topic. This approach to collecting data was selected because there were insufficient secondary datasets accessible for analysing the use of FinTech and its impact. Furthermore, because of the rapid pace of technological innovation and adoption, even databases that have slightly dated cannot solely be relied on. Lastly, the study made use of textual data that became numeric through coding the information collected. Therefore, the data is both numeric and textual.

4.5 Research methodology

The study followed a mixed method approach including both qualitative and quantitative methodologies. Both primary and secondary data sources were utilised for the study. Qualitative primary data was collected through semi-structured interviews. The discussions were recorded and transcribed by the researcher. The quantitative secondary data was sourced from Finmark Trust. Other secondary data sources such as academic literature, government policy documents and research reports were also reviewed in order to inform our study.

4.5.1 Quantitative approach

Both descriptive and econometric analysis formed part of the quantitative analysis undertaken in this study. The purpose of the quantitative analysis was to explain the relationship between specific variables; for example, savings behaviour in relation to socioeconomic factors. This type of research methodology was particularly useful in answering the research question regarding how the diffusion of SMACT technology has contributed to financial inclusion in the South African financial services sector. The methodology therefore focused on establishing relationships between variables on the demand side of financial inclusion.

4.5.1.1 Data

The information sourced from the Finscope survey primarily served as an input into the descriptive analysis of how the uptake, access, usage and channel choice are affected by digital disruption, socioeconomic status and financial literacy. The rich information extracted from the descriptive analysis also provided an overview of trends in mobile banking adoption among lower-income South Africans, to assess whether payment channels are becoming more digital or not. That is, are lower income South Africans still heavily affected by geographic barriers or are they making more use of cards and other mobile devices to deposit and withdraw cash? This is relevant in understanding the gaps for improving the quality of financial inclusion, from a payment's perspective. Econometric analysis was also conducted to provide a deeper understanding of how savings and internet banking uptake was affected by the lower-income South African consumers becoming more digitally savvy.

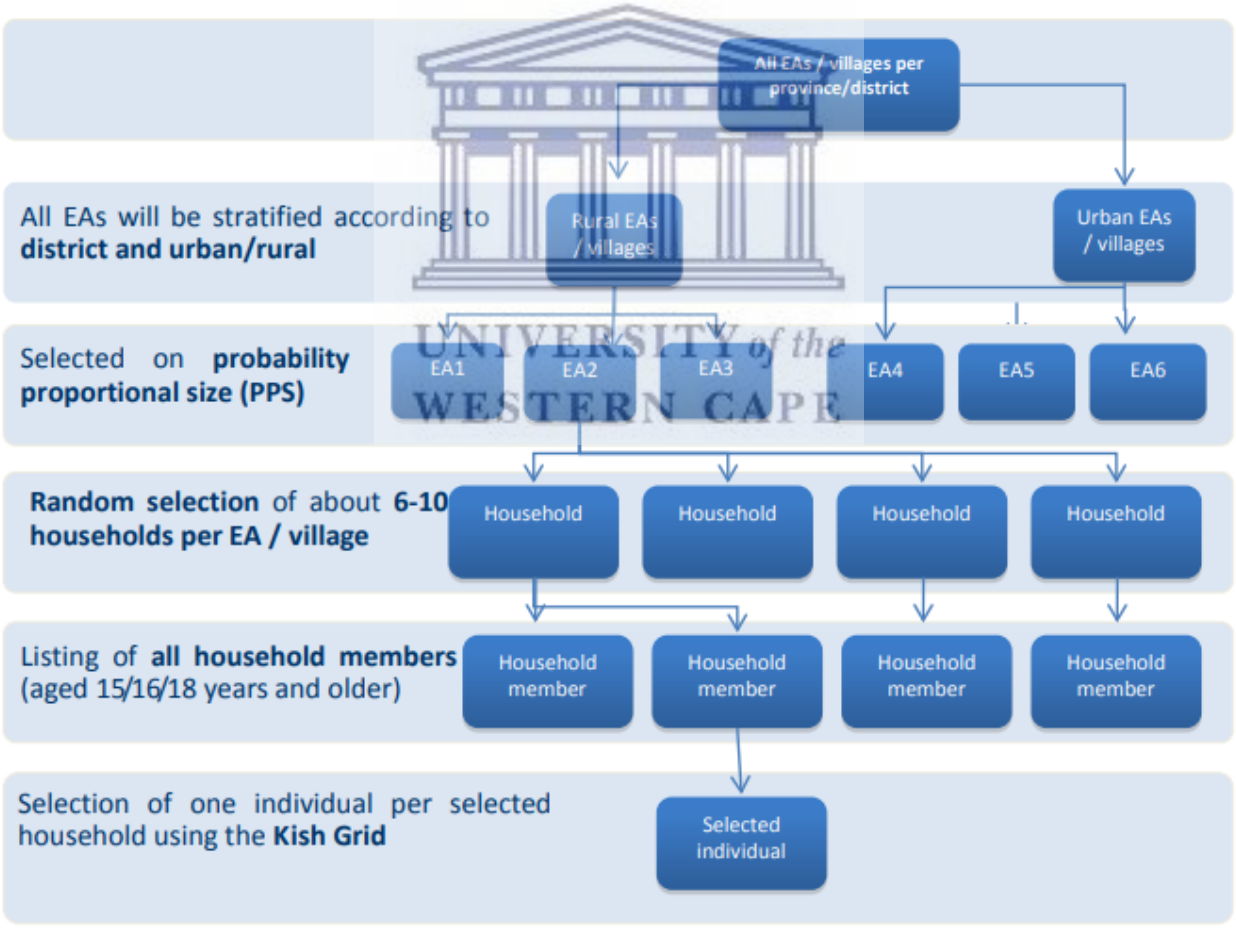
Secondary data analysis was conducted using data from the Finscope consumer surveys. The Finscope dataset offers a nationally representative sample which has both individual and household-level data. The Finscope consumer survey is conducted in a number of countries globally. So far, the survey has been carried out annually in South Africa by Finmark Trust since 2002. The Finscope survey was carried out in order to collect information on the status and developments made in terms of financial inclusion in South Africa. The data available for the study included the years 2005 to 2015. Only the years 2012, 2013, 2014 and 2015 were used for the analysis. The focus of the analysis was to compare the years 2012 and 2015. However, prior to making a comparison, it was of significance to the study for there to be representation of the financial inclusion trends over the complete dataset used for the study. Due to limitations discussed

later, the study had to draw some information from 2013 as the information was not present in the other years. This data source was used as it allows us to review trends in financial activities of adults in South Africa.

4.3.1.1.1 Sampling procedure

Finscope draws its primary sampling unit (PSU) using the probability proportional to sample size method. A multi-stage sampling methodology was used in which the first stage included the selection of specific enumeration areas based on the PPS method, using census data. From the enumeration areas selected, households are selected randomly. Individual adults were randomly selected from the households using the Kish Grid. The diagram below illustrates the Finscope sampling methodology (Finmark Trust, 2016:4).

Figure 18: Finscope sampling methodology



Source: Finmark Trust (2016)

Finscope data was selected to meet the demand-side data needs of the study because the data includes questions on savings, payments and borrowing. Moreover, the survey asks study participants questions regarding their use of digital devices and various technologies. This provides valuable information on emerging data sources that could be availed for FSPs to analyse. The data also provides opportunities for researchers to link specific banks to the banking experience of an individual. For example, if a study respondent feels that the bank borrowing rates are too high, we are able to link this information to their bank. This provides input into the qualitative aspect of the study where semi-structured interviews were conducted. The interviewer can go to Bank A, knowing that there are customers at that bank who feel discouraged from borrowing due to the high cost of borrowing. This may lead to a more dynamic discussion on what is being done in terms of product-fit for lower-income segments, as well as challenges the banks may have in serving this underserved customer segment.

4.5.1.2 Quantitative data analysis

The descriptive and econometric data analysis was conducted using Stata 14. The descriptive analysis describes trends in savings uptake as well as characterises the savings uptake by socioeconomic status. In addition, the different trends in payments and payment channel usage also form part of the descriptive analysis. The majority of the analysis compares 2012 to 2015 to reveal the differences and similarities in financial inclusion between the two time periods.

The econometric analysis seeks to assess the relationship between digital disruption and the quality of financial inclusion. More specifically, the study investigates how factors such as digital device ownership and digital savviness impact on savings uptake and mobile banking.

Pairwise correlation analysis was employed to assess whether the various financial products are independent of each other or whether perfect/ high multicollinearity exists. There would be a need to investigate each financial product if they were independent of each other. The formula below was employed in assessing the correlation coefficient of the variables.

$$r = \frac{\sum(Y_i - \bar{Y})(X_i - \bar{X})}{\sqrt{\sum(Y_i - \bar{Y})^2 \sum(X_i - \bar{X})^2}}$$

The pairwise correlation table below indicates that there is not a strong correlation between the savings, credit, transaction and remittance strands. This means that the variables needed to be

investigated independently of each other. This was found to be a consistent finding in both 2012 and 2015.

Table 7: Pairwise correlations on financial product strands, in 2012

Pairwise correlations

Variables	Savings	Credit	Transaction	Remittance
(1) Savings	1.000			
(2) Credit	0.522*	1.000		
(3) Transaction	0.328*	0.377*	1.000	
(4) Remittance	0.143*	0.127*	0.121*	1.000
* shows significance at the .01 level				

Source: Author's own calculations using Finscope data

Table 8: Pairwise correlations on financial product strands, in 2015

Pairwise correlations

Variables	Remittance	Credit	Savings
(1) Remittance	1		
(2) Credit	0.134*	1	
(3) Savings	0.139*	0.367*	1

Source: Author's own calculations using Finscope data

The descriptive analysis of the study included assessing the three aspects, beginning with uptake rates. This consisted of reviewing the various financial access strands over the periods 2012 to 2015 to understand the type of financial uptake that was taking place and the degree of success South Africa has attained in achieving financial inclusion. Next, it was crucial that financial inclusion was assessed by income categories to ascertain which groups were most vulnerable to financial exclusion. More cross-tabulations by gender and geographical area type were performed to understand the profile of a financially excluded South African. A huge part of the study is the digital aspect. From a descriptive point of view, an analysis was done on the ownership of cell phones, access to the internet and data bundles, as well as how these factors correlate with the vulnerable individual's chance of being financially included. Savings and credit uptake strands were also assessed descriptively as it is important to look beyond account ownership to gain a more holistic overview of financial inclusion.

In terms of the literature on the definition of lower/middle income groups, we find that the African development bank (2011) defines middle income as those earning between $2 and $20. According to (Zizzamia, Schote, Leibbrandt & Ranchhod, 2016:7) $2 falls below the South African lower

bound poverty line which makes this estimation unusable in the South African context. Visagie (2013:3) notes that there is the literal/actual middle which is the median income of the dataset. However, in order to put this into a range, one can consider the middle income those earning between 50% and 150% of the literal median income (Visagie, 2013:3). As such, we find that the median income in our data is R1500. The range for the middle-income group therefore could range between R750 and R2250. The weaknesses with this approach, is that in the South African context, it would not be fair to consider an adult earning R750 as middle income. In fact, many of the studies that use the median (50^{th} percentile) approach tend to have significantly low middle class boundaries compared to studies that use absolute thresholds. Another important factor to consider is the sample size of a study. The 2013 Finscope dataset, excluding individuals under the age of 18 consists of 3767 study participants. Non-response is also quite high for the categorical income variable where roughly 25% of the sample either refused to answer or was uncertain. This however fairs better compared to the other income variables. Another problem with the income variable is income ranges vary in a way that limits how accurately lower/middle/high income groups can be defined. For instance, the sixth income group ranges from R3000 to R5999. The capabilities of an individual who earns R3000 and one that earns R5500 greatly differ. As a result, any judgement on what group to classify as lower/middle/high income will include some degree of subjectivity. As a result of the R3000 to R5999 category being quite wide, the researcher considers adults who earn less than R3000 as lower income.

Table 2:Size of South African middle-class definitions

Definition	Authors	x∈middle class	Middle class boundaries (monthly) in NIDS wave 4 (01/2015 prices)	South African middle-class population share (%)			
Based on percentiles of the cumulative distribution Dt(y)	Levy et al., 2014 Finn et al., 2013b	D_t^(-1) (p_40)≤y(x)≤ D_t^(-1) (p_70)	R590≤y(x)≤ R1,571	30	30	30	30
	Easterly, 2001	D_t^(-1) (p_20)≤y(x)≤ D_t^(-1) (p_80)	R335≤y(x)≤ R2,521	60	60	60	60
	Solimano, 2008	D_t^(-1) (p_30)≤y(x)≤ D_t^(-1) (p_90)	R443≤y(x)≤ R5,094	60	60	60	60
Based on the median (p50) of the distribution	Blacburn and Bloom, 1985	0.6*D_t^(-1)(p_50)≤y(x)≤ 2.25*D_t^(-1) (p_50)	R484≤y(x)≤ R1,913	38.6	41.2	39.3	40.2
	Visagie and Posel, 2013	0.5*D_t^(-1) (p_50)≤y(x)≤ 1.5*D_t^(-1) (p_50)	R403≤y(x)≤ R1,209	37.7	39	37.1	37
	Birdsall et al., 2000	0.75*D_t^(-1)(p_50)≤y(x)≤ 1.25*D_t^(-1) (p_50)	R605≤y(x)≤ R1,008	17.2	16.9	17.8	16.4
Based on absolute thresholds	Banerjee and Duflo, 2008	$2≤y(x)≤ $10 a day (2005 PPP)	R479≤y(x)≤ R2,397	40.7	37.2	42.4	46
	AfDB, 2011	$2≤y(x)≤ $20 a day (2005 PPP)	R479≤y(x)≤ R4,794	50.4	45.1	51.1	56.4

	Excl. floating class	$4≤y(x)≤ $20 a day (2005 PPP)	R959≤y(x)≤ R4,794	28.2	24	28	33.5
	Lower middle class	$4≤y(x)≤ $10 a day (2005 PPP)	R959≤y(x)≤ R2,397	18.5	16.1	19.2	23
	Upper middle class	$10≤y(x)≤ $20 a day (2005 PPP)	R2,397≤y(x)≤ R4,794	9.7	7.9	8.7	10.5
	Visagie and Posel, 2013	$8≤y(x)≤ $58 a day (2005 PPP)	R1955≤y(x)≤ R13,968	22.3	19.4	20.2	23.4
	Lopez-Calva and Ortiz-Juarez, 2014	$10≤y(x)≤ $50 a day (2005 PPP)	R2,397≤y(x)≤ R11,984	17.8	16	15.6	18.4
	Kharas, 2010; UNDP 2013	$10≤y(x)≤ $100 a day (2005 PPP)	R2,397≤y(x)≤ R23,969	19.9	18.3	17.5	20.7
Mixed thresholds	Birdsall, 2010	$10 a day(2005 PPP)≤y(x)≤ D_t^(-1) (p_95)	R2,397≤y(x)≤ R8,324	15.8	13.9	12.9	16.3

Source: Zizzamia, Schote, Leibbrandt and Ranchhod (2016)

4.3.1.2.1 Empirical estimation strategy

The empirical questions of the paper include the second and third research questions. Credit and payments are also important areas that were analysed descriptively. The study focused on savings behaviour in the econometric analysis. This was only done for 2013 as the financial literacy index is only included in 2013. The study also ran two other regressions; namely a regression for formal financial inclusion, and a regression for internet banking uptake. The empirical model that was employed is as below:

$Y_{it} = a_i + x_{it}B + u_{it}$ (i=1,….N ; t=1,….T)

Outcome variable Y is denoted by Y_{it}. The subscript *i* refers to the *i*th observation. The subscript *t* refers to the period at which *i* is observed. The three models were specified as follows:

Internet banking uptake=β_0+ β_1Income+ β_3EducationalAttainment+ β_4Employmentstatus+ β_5Financialliteracy+ β_6Age+ β_7GeographicalalAreatype+ β_8Grantrecipient+ β_9Cellphoneownership+ β_{10}InternetAccess+ β_{11}Gender+*u*

Formal Financial Inclusion=β_0+ β_1Income+ β_3EducationalAttainment+ β_4Employmentstatus+ β_5Financialliteracy+ β_6Age+ β_7GeographicalalAreatype+ β_8Grantrecipient+ β_9Cellphoneownership+ β_{10}InternetAccess+ β_{11}Gender+*u*

Savings=β_0+ β_1Income+ β_3EducationalAttainment+ β_4Employmentstatus+ β_5Financialliteracy+ β_6Age+ β_7GeographicalalAreatype+ β_8Grantrecipient+ β_9Cellphoneownership+ β_{10}InternetAccess+ β_{11}Gender+*u*

The model is a regression that estimates internet banking uptake, formal financial inclusion and saving behaviour, based on a host of explanatory variables.

4.3.1.2.2 Outcome variable: Formal financial inclusion/ savings/ internet banking uptake

The Finscope survey includes section F13 on the frequency at which an individual uses a financial service. Question 3 asks how frequently an individual makes use of internet banking on a scale of ‘Never/ Don’t Know’ to ‘At least once a week’. The variable which has four different categories

was transformed into a dummy variable where adults who used internet banking anywhere from ‘less often’ to ‘at least once a week’ were regarded as internet banking users. Those that selected ‘don’t know/ never’ were regarded as non-users.

The Finscope account ownership access strands were split into ‘Formally banked’, ‘Formal non-Bank’, ‘Informally banked’ and ‘Financially excluded’. The outcome variable for formal financial inclusion was created by collapsing formally banked and formal non-bank users into one category. The category represented all the adults who had provided KYC information in order to make use of financial services. The adults were therefore part of the regulated formal financial sector.

The Finscope survey includes section K which focuses on savings and investments. Question K6 specifically asks the study respondent the following question: “What amount of the money that you get each month would you say that you save or put aside each month?”. From this, the study respondent provides a value that is captured in savings categories ranging from ‘Do not save’ to ‘R10,000 or more’. A dummy variable was created, in which adults who did not save were given a zero, and adults who did save, formally or informally, were given a one.

Table 9: Description of variables

Variables	Type of variable	Description
Savings/ Formal financial inclusion/ Internet banking	Dummy variable	Saves=1 Does not save (Reference group) =0 Formal financial inclusion=1 Formal financial exclusion=0 Internet banking user=1 Internet banking non-user=0
Income	Categorical variable	No Income (Reference group) R1-R999 R1,000-R1,999 R2,000-R2,999 R3,000-R5,999
Educational attainment	Categorical variable	No Schooling (Reference group) Primary School Some High School Matric Apprenticeship Diploma University degree Other
Employment Status	Dummy variable	Unemployed=1 Employed (Reference group) =0
Financial literacy	Categorical variable	Financially Literate=7-10 Somewhat Financially Literate=4-6 Financially Illiterate=1-3 (Reference group)
Age	Categorical variable	18-29 years (Reference group) 30-44 years 45-59 years 60 and above years
Geographical area type	Categorical variable	Rural (Reference group) Urban Formal Tribal Urban Informal
Grant recipient	Dummy variable	Grant recipient=1 Non-grant recipient (Reference group) =0
Cell phone ownership	Dummy variable	Cell phone owner=1 Non-cell phone owner (Reference group) =0
Internet access	Dummy variable	Internet access=1 No internet access (Reference group) =0
Gender	Dummy variable	Female=1 Male (Reference group) =0

4.3.1.2.3 Explanatory variables

Income

Neoclassical economics points to income as an important determinant for savings. The higher an individual's disposable income, the more likely an individual is to save (Parker, 2010:4) Low per

capita income is indicated as a limiting factor in improving financial inclusion in developing Asian economies (Park & Mercado, 2015:2).

Gender

Studies by Johnson and Nino-Zarazua (2011:3) and Mndolwa (2017) point to gender as a determinant in financial inclusion. Women are less likely to have access to financial products as a result of social and economic barriers.

Education

Johnson and Nino-Zarazua (2011:3) found an association between education and access to financial services in Kenya and Uganda.

Employment status

Employment status is an important factor in determining financial inclusion. In fact, Mndolwa (2017) found that employment is the most significant factor in determining financial inclusion among women in Tanzania.

Financial literacy

Financial literacy is a particularly important indicator of the quality of financial inclusion. The World Bank (2012) and Amadzic, Massara and Mialou (2014) suggest financial literacy as a determinant of the quality of financial inclusion. The financial literacy index, similar to Ndlovu (2018), was formulated based on questions that Finscope asks pertaining to the understanding of financial products. The responses of the study respondents to this question were aggregated and transformed into a dichotomous variable based on a predetermined cut-off. The reliability/ internal consistency of the index was tested by assessing the Cronbach's alpha of the index. The alpha score computes the average covariance between items and the total score. This alpha score indicates whether each factor included in the index is a consistent measure of the financial literacy index. The higher the score, the more likely that each factor is measuring financial literacy. The alpha score was computed as follows:

$$\alpha = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum_{i=1}^{k} \sigma_{y_i}^2}{\sigma_{x_i}^2}\right)$$

The α computed is Cronbach's alpha which ranges from 0 to 1. The k refers the number items in the scale. The variance that is related to the i^{th} item is captured by $\sigma_{y_i}^2$. The variance that is related to the total of the observed scores is captured by $\sigma_{x_i}^2$.

Age

Johnson and Nino-Zarazua (2011:3) found an association between age and access to financial services in Kenya and Uganda.

Grant recipient

In South Africa, where the account ownership among grant recipients has been significantly driven by the introduction of the South African Social Security Agency (SASSA) card, assessing whether an individual is a grant recipient becomes a relevant factor to access, usage and quality determinants of financial inclusion. The largely electronic system now used for the SASSA card may have significantly shifted the payment modes used by grant recipients. Thus, it suffices to investigate how being a grant recipient affects an individual's payment mode.

Geographical area type

Johnson and Nino-Zarazua (2011:3) found no association between geographical location type and financial access.

4.5.1.3 Limitations of the research: Finscope data issues

Over the years, the Finscope consumer survey has transformed and become shorter while including more questions related to technology. In 2010 and 2011, the Finscope consumer survey included far too many headings, some of which were ambiguous. They were: The bigger picture, Employment/ income and expenditure, Financial decision-making and knowledge of financial products, Banking penetration, Transaction channels, Mzanzi, Borrowing (credit/ loans), Insurance, Funeral cover, Savings, Household conditions, Access to services, Natural capacities/ capabilities, Vulnerabilities, Lifestyle indicators, and Demographics. In 2012, a very clear change can be seen in the structure of the Finscope consumer survey. This revised structure has been carried through until present. The 2013 questionnaire includes questions on whether the financial situation of the household had improved. This was not included previously but became a feature of the Finscope consumer surveys in subsequent years. In 2013, the first section was also renamed

and slightly reordered. Section A was renamed in 2012 to 'Household structure, Services and Community' from 'Household structure, Services, Community and Cell phone Usage'. This change was made to reflect the removal of the questions on cell phone usage from the section. Cell phone usage questions were moved to Section E (financial providers and using cell phones for financial services). Another interesting dissimilarity can be found in the 2015 Finscope consumer survey which does not have a section B, as in the previous years. Instead, section M is added. The reason for this change is unclear.

The 2015 questionnaire includes 12 sections, ranging from sections A to M (with no section B). Section E includes an additional battery of questions regarding technology usage and its impact on the life of the study respondent. Section E is therefore no longer referred to as "Financial Providers and Using Cell Phones for Financial Services" but rather "Using Cell Phones for Financial Services and Technology" to reflect the additional questions. Since not only the structure of the Finscope consumer survey has changed, but the questions as well, it becomes difficult to interrogate the data cross-sectionally over all the waves of Finscope. Consequently, it may be more helpful to interrogate the waves that include similar questions.

Overall, dissimilarities among the Finscope waves necessitate that either there is a focus on one year or a number of years are assessed, but this has to be done systematically and with justification. This study made use of more than one year as financial inclusion is dynamic. It does not suffice to assess financial inclusion at one point in time without any benchmark. Databases such as the World Bank Findex database cannot be compared to the Finscope study as the sample sizes greatly differ. The Finscope datasets generally range between 3,000-6,000 while the Findex consists of 1,000 study respondents. The Findex database is even smaller if study respondents younger than 18 are excluded. Therefore, comparability of the two databases for this study is not possible. The study therefore made use of the years 2012 to 2015 in its analysis. The progression of South Africa towards financial inclusion is assessed over the waves for study respondents at least 18 years of age. This limitation is put in place as study respondents in high school are far less likely to need a financial account. The exaggerated lower demand at this age means that including this group would overestimate financial exclusion in South Africa. It is expected that at 18 years old, students may need an account to transact as they are adults with their own personal identification documents. For non-students, employment is a greater driver of the need to open up an account. This suggests

that studies that include study respondents younger than 18 years of age without justification may be incorrectly assuming a similar probability of uptake when the drivers of demand do not suggest this.

Although Kosyura, DasGupta, Dueck-Mbeba, Khan & Cairns-Smith (2018:1) make a strong case for youth financial inclusion and that young people do demand financial services, this does not perfectly translate into young people exhibiting similar financial inclusion rates to other age groups. In fact, for the age group that is younger than 18 years of age, i.e. school-age children, preliminary analysis from Finscope indicates that roughly in 2012, the financial exclusion rate for the 16 to 17-year-old age group was 68%. In 2015, 40% of this age cohort was financially excluded. This is double the financial exclusion rate of the 18 to 29 years age group which had the second=highest financial exclusion rate. The need aspect definitely features strongly in these results. While this means that more young people are taking up financial services, we are yet to get to a point at which they demand financial services at similar rates to their older counterparts. Another factor that is important to consider for this age cohort is that the sample size was between 110 and 140 across the years used for this study. Consequently, the study excludes the 16 to 17-year-old age group based on the dissimilarities in demand for a banking account between this age group and the other age groups, as well as the small sample size which may affect the inferences that could be made about this specific age group.

While all the waves were used, the study regression analysis could only make use of the year 2013. This is because the year 2013 includes questions on financial literacy.

4.5.2 Qualitative approach

A qualitative research methodology was employed for this study. A qualitative research methodology focuses on contextualisation, as well as a detailed description of what has occurred. This type of methodology is best suited to answer the research question as detailed descriptions of the South African FinTech ecosystem and the manner in which the SMACT technologies are employed in the banking industry and will be insightful and indicate avenues for future research on the topic. An inductive research approach is used for the study which also supports a qualitative research methodology as most suitable for the research topic and tackling the research question.

4.5.2.1 Data collection

In-depth interviews were conducted with key informants to assess: 1) the current quality of digital payments, digital credit and digital savings products in South Africa; and 2) the impact that data generated from SMACT technologies has had on financial inclusion, specifically on the quality of financial inclusion.

Primary data was collected as part of the qualitative aspect of the study. Semi-structured key informant interviews were conducted in two phases. The first phase, between 1 April and 31 May 2018, the second phase between 15 September and 15 October 2018. The first phase was the pilot of the study in which the author tested the research instrument to assess whether the correct information was being extracted from the key informants. In this stage, four key informants were interviewed. The researcher created a second iteration of the research instrument which could better capture the required data. This phase consisted of six interviews. The findings of the first phase were primarily used to understand the environment in which FSPs operate. The second phase focused within the environment and how agents within the system interacted and how that affected financial inclusion. Overall ten interviews were thus conducted for the study. A point of saturation was reached at the tenth interview. This occurred due to the lengthy discussions that had already taken place with other key informants. The interviews lasted between 45 minutes and 1 hour and 15 minutes each. The data collection process was solely conducted by the author. The insights of the key informants were transcribed and integrated with the secondary data findings in the discussion of the study. The data collection strategy is discussed in more detail below.

4.5.2.1.1 Data collection strategy

Babbie and Mouton (2001:80) suggest an open and flexible research strategy that makes use of a combination of information sources. For example, key informant interviews, case studies and literature reviews in order to provide valuable insight on the topic of research. This study made use of primary data supported with some secondary data. The researcher used key informant interviews as well as case studies as primary data sources.

There are different types of techniques that could be used for collecting data, namely questionnaires, and interviews that are structured, unstructured or semi-structured, each with its own restrictions. On the one hand, structured questionnaires are particularly rigid and do not offer room for in-depth insights. On the other, structured interviews provide more freedom for the

interviewer and interviewee than questionnaires, which ultimately allows for more insight and depth into the phenomena being studied. Semi-structured interviews provide the interviewer with the flexibility to ask additional questions or to not ask certain questions. The interviewer's questions could be either open-ended or close-ended. This study made use of semi-structured interviews. The semi-structured interview format was used to avoid the length of time an unstructured interview may have and the engagement limitation of a structured interview. The interviews were also semi-structured as this format was considered particularly free-flowing and able to offer more insight into digital disruption in the banking industry. This served to assist in providing more concrete and context-specific information. The study also opted for the semi-structured approach as the key informants came from different backgrounds. It would not be appropriate to ask an academic the same questions as a regulator or an individual working at an FSP. A decision was therefore made to compile different questionnaires that accommodated the background of the key informant. The first phase interviews specifically included questions on the environment and allowed informants the freedom to engage about their experiences with FinTech and SMACT technology. This informed the study more fully on whether (in the experience of the interviewees) South Africa had an enabling environment that promoted financial, economic and digital inclusion.

There are two categories of sampling procedures, namely random and non-random. A probability sample is a random sample. This means that the study participants were all equally likely to be selected to participate in the study. This allowed the researcher to make generalisations about the wider population from a relatively few observations. A non-probability sample is non-random. The findings from this type of research are not generalisable to the population. The findings for non-probability studies tend to be context-specific and therefore are particularly useful in qualitative studies. The sample also usually relies on the availability of the subjects. Examples of non-probability sampling techniques include purposive sampling, snowballing and quota sampling.

The recruitment process for this study made use of the purposive sampling technique. A purposive sample is a sample that is non-representative of the larger population from which it has been extracted. The samples for the study are not large enough for inferences to be made about the population with accuracy. Rather than inferential statistics, largely descriptive statistics were used

for the study, presented as descriptive graphs and tables. This is also referred to as non-probabilistic sampling because the probability of selecting a respondent from the population is not equal among the population. Therefore, the sample selected is non-random. With purposive samples, the objective is to select a specific group of people from the population. The findings of the study, therefore, cannot be replicated nor generalised as the responses received from the study participants depend on the participants recruited and their opinions, which may change if prompted to participate in the study at a different point in time. The benefit of having a purposive sample is that the sample is more likely to provide the researcher with the information sought as well as save the researcher the time and costs that would be high with a random sample. The study aimed to select key informants who were well informed about FinTech and the banking industry. The key informants could also be more familiar with digital disruption and technological innovation rather than banking. A diverse group of key informants was therefore selected for the study to provide a multi-dimensional perspective on the research topic. The table below lists the backgrounds of the key informants interviewed for this study.

Table 10: List of key informants in the study

Key informant	Background	Channel
1	Academic with banking industry experience	In person
2	Consultant/ Researcher with experience in financial inclusion	In person
3	Consultant working in financial services	In person
4	Researcher (information systems knowledge)	Skype
5	Researcher with experience in financial inclusion (also with experience in the banking industry)	In person
6	Regulator	Skype
7	Senior FSP representative	Skype
8	Regulator	Telephonic
9	Regulator	Telephonic
10	Regulator	Skype

The sample for the study was therefore small and not representative of all experts on digital disruption in the South African banking industry. Some of the sample members resided in areas in which face-to-face interviews were not possible without the researcher having to travel. The author used Skype and telephonic interviews as alternative engagement tools. Where the interviews could not be completed in one sitting, a future date was arranged to complete the interview. The author formulated an additional survey on Survey Monkey on questions not addressed and sent this to the

phase one key informants as well as phase two key informants that the author felt could provide more feedback. This ensured that any gaps that existed after the interviews were adequately addressed. Referrals from key informants were also pursued by the researcher as this allowed the researcher to more easily identify the next relevant interviewee.

4.3.2.1.2 Research instruments

The qualitative research instrument used for the study was employed in primary data collection. The research instrument included the key questions that were asked during the semi-structured interviews. The instrument was aligned to the aims and objectives of the thesis. See Appendix C for the questionnaire. The second research instrument that was used after the interviews was a survey monkey questionnaire that asked the key informants how they perceived digital financial services in South Africa met the various quality aspects of financial inclusion.

The research instrument probed the following in the context of the aims and objectives of the thesis.

- Welfare
- Convenience
- Transparency (reducing asymmetric information in pricing, and products and clients)
- Financial literacy
- Product fit
- Consumer protection
- Affordability

Operationalisation choices

Range of variation

In order to measure the full range in variation, a categorical aspect was included in the interview for the interviewee to express the extent to which SMACT technologies were disrupting segments within the economy. An ordinal Likert scale was therefore used in the study for collecting data. For the pilot questionnaire on the macro environment, the scale ranged from 1 to 7. This measured the perceived impact. For the second and third questionnaires, the Likert scale ranged from 1 to 5. After the pilot interviews, the author learnt that the key informants who gave scores between 3 and

4 were unsure of the impact. Moreover, the scale was too wide. Due to the fact that the sample was small, this increased the risk of the average scores being greatly affected by outliers. The Likert scale was therefore reduced to a 5-point scale. The 5-point scale was also used in the survey monkey questions. For example, the respondents were asked to score the affordability of digital payments products in South Africa for lower income customers on a range of 1 to 5, where 1 was a strong no, 2 was a "no", 3 was "unsure", 4 was "yes" and 5 was a "strong yes".

4.5.2.2 Limitations of the qualitative research

The study was restricted in a number of aspects. Due to the fact that the study participants most likely worked in the same geographical area, their responses were expected to be biased towards the perspective of their geographical economic context. The views on certain issues might also thus be shared.

4.6 Triangulation

The validity of the study's results was improved through triangulation. At a data collection level, the process of triangulation involves using different sources of data. The study made use of data from finscope, survey data from survey monkey, and in-depth interview data. This is done to ensure that the findings are robust. Some of the insights that were provided in the macro analysis provided explanations for some of the case study results that might be ambiguous. The case study micro-analysis questions allow for a greater assessment of the use of FinTech within the FSP context. On the other hand, the open-ended questions provided insight that allowed understanding of the context behind the various shifts and changes in the banking industry and how that related to the financial inclusion and welfare of lower-income populations.

The reliability, clarity and consistency of the measurement instrument were improved through having a pilot run of the interview to test the effectiveness of the measurement instrument. Any arising problems were handled in the pilot run and assisted the researcher to develop a more robust measurement instrument as well as avoid duplicating questions. This was done by splitting the interviews into two phases. The first phase allowed the author a better understanding of the information that existed and what type of questions would best extract this type of information from key informants.

The results of the pilot test were very general and mostly thin in terms of detail. The researcher used the pilot results to better understand the topic and gain insights into how the fourth industrial revolution has impacted more than just the financial sector in South Africa, but the economy as a whole. The researcher transcribed the findings of the pilot interviews and identified key themes that were apparent in the qualitative data. The results were used for describing the enabling environment section of chapter six. The researcher decided to redo the questionnaire as the key learning from the interviews was that a narrower focus on digital financial services and the banking industry would provide richer insights. While reference was made the regulatory environment during the interviews, the details were not very clear. The researcher had to ensure that in the second round of interviews, regulatory body employees were included. Another key learning was that some of the experts had great insights on one section e.g. regulation; but a thin understanding of another section e.g. the use of different types of data. As a result, the researcher devoted more time during the interviews to the questions that the respondent might have a deeper knowledge of and towards the end of the interview, the sections that the expert may not have the experience or concrete evidence to give detail answers on.

Another method of triangulation is peer debriefing. This method draws on insight from peers that are not involved in the research assignment for the purpose of ensuring that the data collected was valid. Guba (1981:85) consider peer debriefing as a process by which inquirers can test their increasing insights and capture searching questions that may be posed by colleagues and other professionals. This approach of peer auditing was used by the researcher as a means of triangulation.

4.7 Research verification and trustworthiness

The research verification and trustworthiness of quantitative and qualitative studies include different verification criteria and approaches to ensure that the findings of the study are robust. The validity and reliability criteria of quantitative studies differ from studies that are primarily qualitative. A different set of criteria is used for studies that are primarily qualitative.

Credibility

Credibility in qualitative research is equivalent to internal validity in quantitative research. One technique for ensuring credibility is triangulation (Bryman & Bell, 2007:411).

Transferability

Transferability refers to the degree to which the study results might be used in another context. This is one of the data quality issues that are associated with semi-structured and in-depth interviews (Saunders et al., 2009:335). Qualitative studies ought to include a thorough description of the context to provide readers with enough information for them to decide whether the findings were transferable to another unique context (Lincoln & Guba, 1985, as cited in Bryman & Bell, 2007:413).

Dependability

Dependability can be seen in the same light as reliability. This deals with the trustworthiness of the research process in terms of record-keeping. Researchers ought to recruit peers as auditors to ensure that interview transcripts are stored properly and interpretations of data are done accurately (Bryman & Bell, 2007:414). This ensures that the correct procedures are followed throughout the research process. The researcher ensured that the study's findings are dependable and consistent by following the suggestions and feedback from peers throughout the research process.

Confirmability

Confirmability refers to objectivity and considers the fact that researchers may be subjective and may manipulate their data and findings. Confirmability asks whether the research findings could be confirmed by other researchers. To ensure this confirmability, the researcher made use of peers as auditors.

Ethical considerations

The rights of the participants of the study are of utmost importance and the procedures used by the researcher acknowledged this. Participation in the study was voluntary and the participants could choose whether to remain completely anonymous or decide the degree of anonymity (e.g. name, organisation, experience in industry) with which they felt comfortable. Such requests by the participants were respected by the researcher. The researcher also personally conducted the interviews to avoid falsification of information and to ensure that questions were fully understood by the study participants.

Ethical clearance

The researcher prioritised receiving the ethical authorisation required to conduct the study. The researcher received ethical clearance from the University of the Western Cape Senate Research Ethics Committee and at the Economic and Management Sciences Faculty.

Confidentiality and the right to anonymity

Maintaining the privacy and anonymity of the respondents is of utmost priority and is the responsibility of the researcher. The name, organisations and addresses of the respondents were not disclosed without agreement between the respondent and the researcher.

4.8 Conclusion

This chapter described the methodology of the study. A mixed methodology was chosen, in which both qualitative and quantitative data were collected. The chapter described the data collection methods and the sources. Primary data from key informant interviews was collected as part of the qualitative methodology. Secondary data from Finscope was used as part of the quantitative methodology. The chapter concluded with a section detailing the measures that were put in place to ensure the trustworthiness of the findings. The next chapter discusses the quantitative findings of the study.

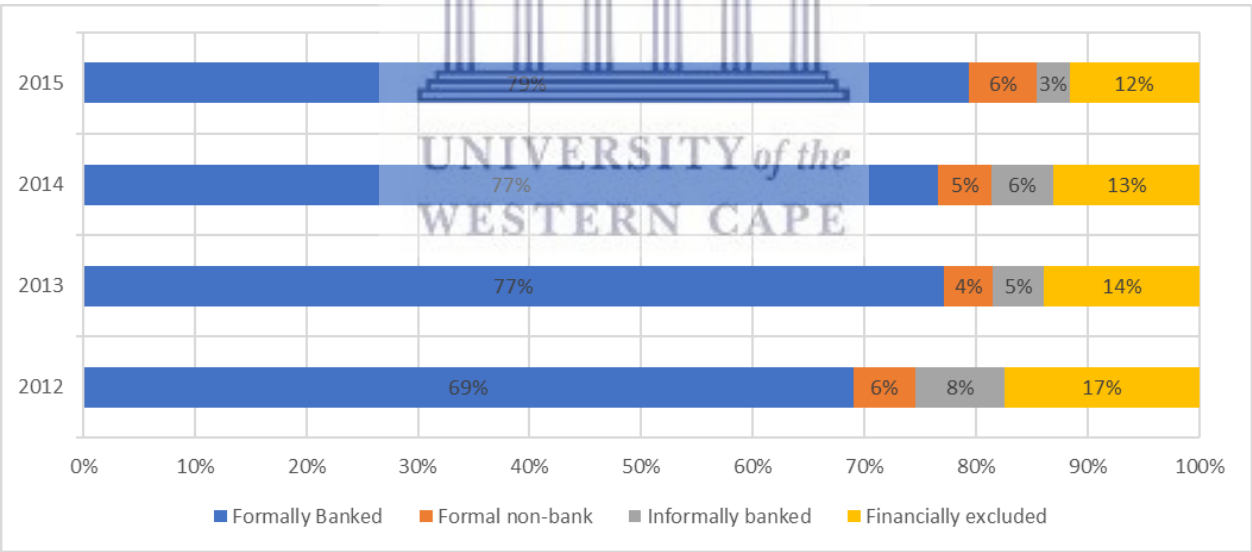
CHAPTER FIVE: QUANTITATIVE FINDINGS

5.1 Introduction

This chapter discusses the quantitative findings from the Finscope data. The aim of this chapter is to meet two research objectives, namely to describe the financial inclusivity of digital financial services in South Africa from a demand-side perspective, and secondly, to assess the uptake, access and usage trends of financial services in South Africa. The chapter begins by discussing the uptake of bank accounts in South Africa in order to assess the financial inclusivity trends in South Africa. This is followed by a discussion of the access to financial services. Finally, the chapter compares the uptake, access and usage rates to provide a holistic picture of how South Africa is performing in terms of financial inclusion.

5.2 Uptake

Figure 19: Financial access trends in South Africa, 2012-2015

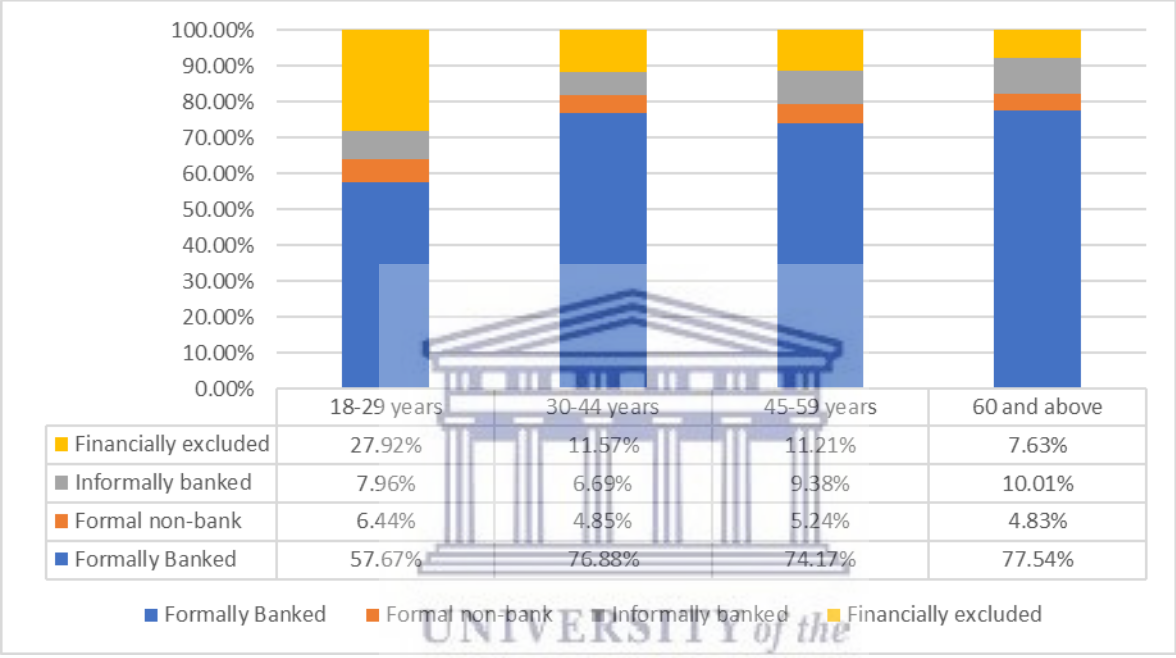


Source: Author's calculations using Finscope data

Over the past four years, South Africa has made significant strides in developing a more financially inclusive society. In 2012, roughly 22 million South Africans were served by formal banks, while an additional 1.8 million South Africans were banked by formal non-banks. In 2012, as many as 5.6 million South Africans were financially excluded. The intervening years since have seen

increases in cell phone uptake as well as improvements in ICT infrastructure which have enabled an environment in which FSPs could advance their financial inclusion agenda. As a result, in 2015 roughly 28 million South Africans were served by formal banks, while an additional 2.2 million were banked by formal non-banks. By 2015, 4.1 million South Africans were financially excluded, indicating a 6% reduction in financial inclusion in just four years.

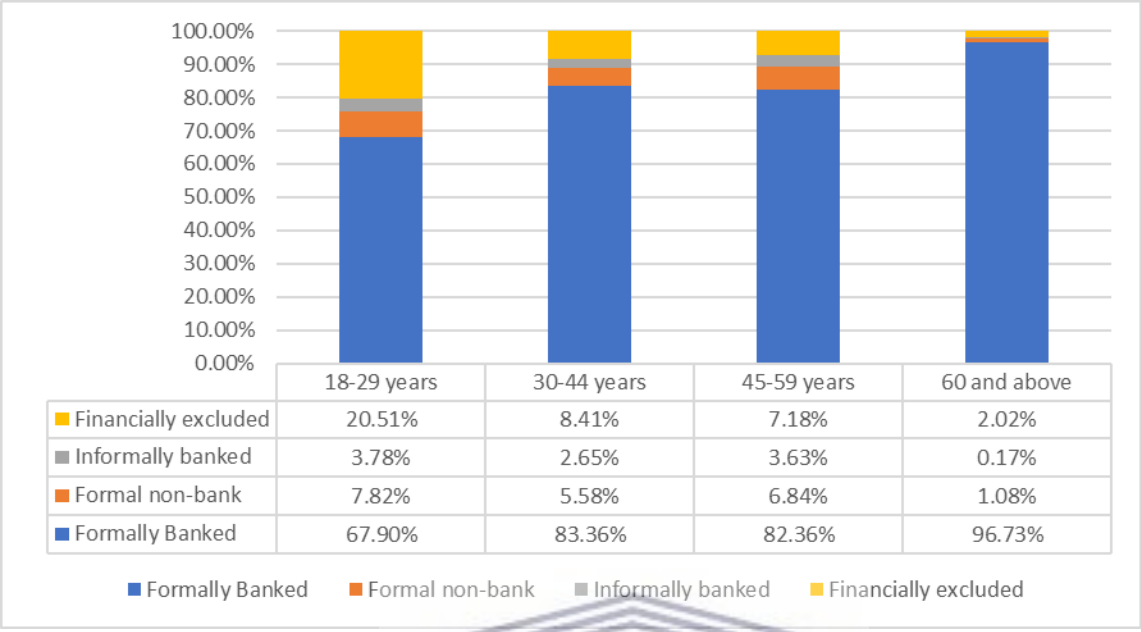
Figure 20: Financial access strands by age in 2012



	18-29 years	30-44 years	45-59 years	60 and above
Financially excluded	27.92%	11.57%	11.21%	7.63%
Informally banked	7.96%	6.69%	9.38%	10.01%
Formal non-bank	6.44%	4.85%	5.24%	4.83%
Formally Banked	57.67%	76.88%	74.17%	77.54%

Source: Author's calculations using Finscope data

Figure 21: Financial access strands by age in 2015

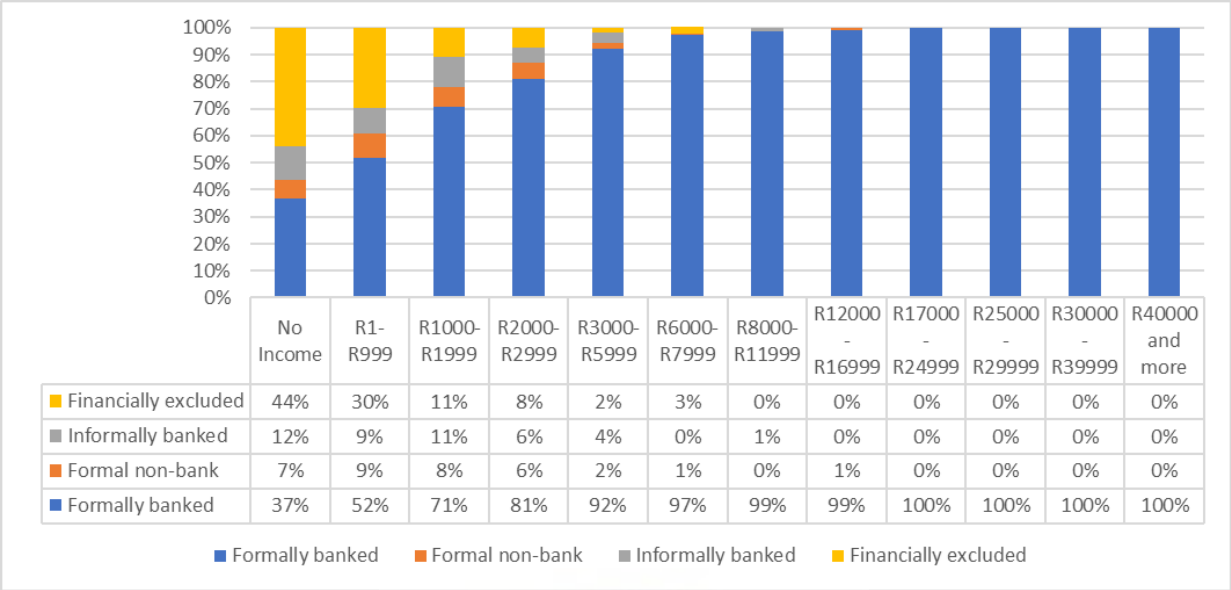


	18-29 years	30-44 years	45-59 years	60 and above
Financially excluded	20.51%	8.41%	7.18%	2.02%
Informally banked	3.78%	2.65%	3.63%	0.17%
Formal non-bank	7.82%	5.58%	6.84%	1.08%
Formally Banked	67.90%	83.36%	82.36%	96.73%

Source: Author's calculations using Finscope data

A clear trend exists between the uptake of formal financial services and age. Whilst a significant improvement can be seen in financial inclusion among adults between the age of 18-29 years from 2012 to 2015, this age group still significantly lags behind the other age cohorts. The dramatic differences in the financial exclusion rates could be associated with a number of factors. For adults aged 60 and above, the accessibility of financial services for those who are lower income is significant due to their eligibility for the old-age grant. For adults who are middle to high-income, the need to have an account to receive a pension could also be strong motivating factors and determinants for as to why the financial inclusion rates are so high among this age group. A plausible explanation for the exaggerated financial exclusion rates among the 18-29 years old age group is that employment tends to one of the stronger determinants of employment (which will be demonstrated later). Whilst the Finscope data does not provide the option of identifying students, it can be argued that the significantly larger student population in this age category is not employed yet and therefore may not have the employment motive for taking up financial services.

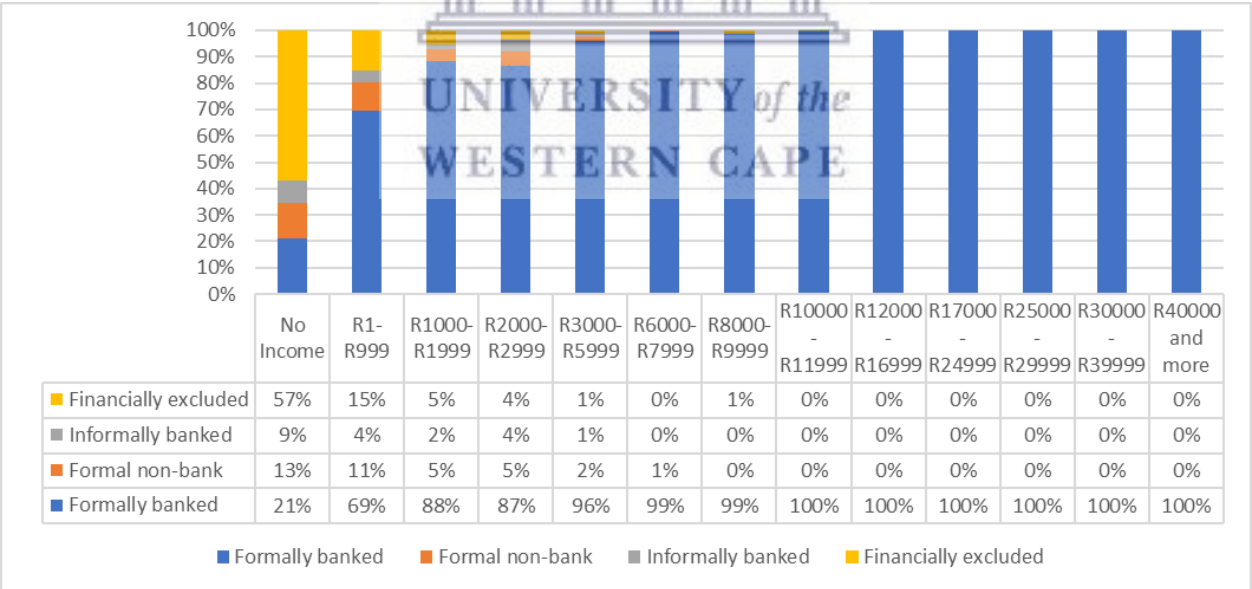
Figure 22: Financial access strands by per capita, per month income categories, in 2012



	No Income	R1-R999	R1000-R1999	R2000-R2999	R3000-R5999	R6000-R7999	R8000-R11999	R12000-R16999	R17000-R24999	R25000-R29999	R30000-R39999	R40000 and more
Financially excluded	44%	30%	11%	8%	2%	3%	0%	0%	0%	0%	0%	0%
Informally banked	12%	9%	11%	6%	4%	0%	1%	0%	0%	0%	0%	0%
Formal non-bank	7%	9%	8%	6%	2%	1%	0%	1%	0%	0%	0%	0%
Formally banked	37%	52%	71%	81%	92%	97%	99%	99%	100%	100%	100%	100%

Source: Author's calculations using Finscope data

Figure 23: Financial access strands by income category, per capita per month, in 2015



	No Income	R1-R999	R1000-R1999	R2000-R2999	R3000-R5999	R6000-R7999	R8000-R9999	R10000-R11999	R12000-R16999	R17000-R24999	R25000-R29999	R30000-R39999	R40000 and more
Financially excluded	57%	15%	5%	4%	1%	0%	1%	0%	0%	0%	0%	0%	0%
Informally banked	9%	4%	2%	4%	1%	0%	0%	0%	0%	0%	0%	0%	0%
Formal non-bank	13%	11%	5%	5%	2%	1%	0%	0%	0%	0%	0%	0%	0%
Formally banked	21%	69%	88%	87%	96%	99%	99%	100%	100%	100%	100%	100%	100%

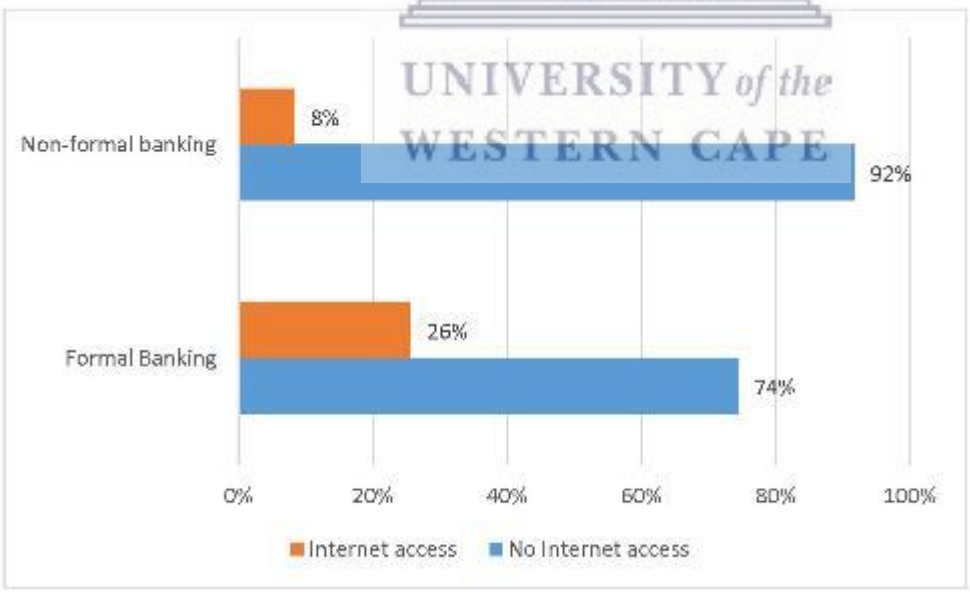
Source: Author's calculations using Finscope data

Financial exclusion rates follows socioeconomic strata. Lower-income individuals are more likely to be financially excluded compared to high-income individuals. Interestingly, there are more

similarities in financial inclusion rates for lower-income, middle-income and high-income adults. The largest dissimilarity exists between adults who have an income and those who do not. This is a crucial point to consider because, based on Findex data financial exclusion results, the most cited barrier to financial inclusion in South Africa is a lack of an adequate income. This supports the notion that financial inclusion interventions should be integrated with other forms of socioeconomic interventions. From a comparative point of view, financial inclusion rates improved from 2012 to 2015 for almost all categories except adults in the 'no income' category. See Figures 17 and 18 above. In fact, 400,000 more adults are financially excluded in 2015 in the 'no income' category, compared with 2012.

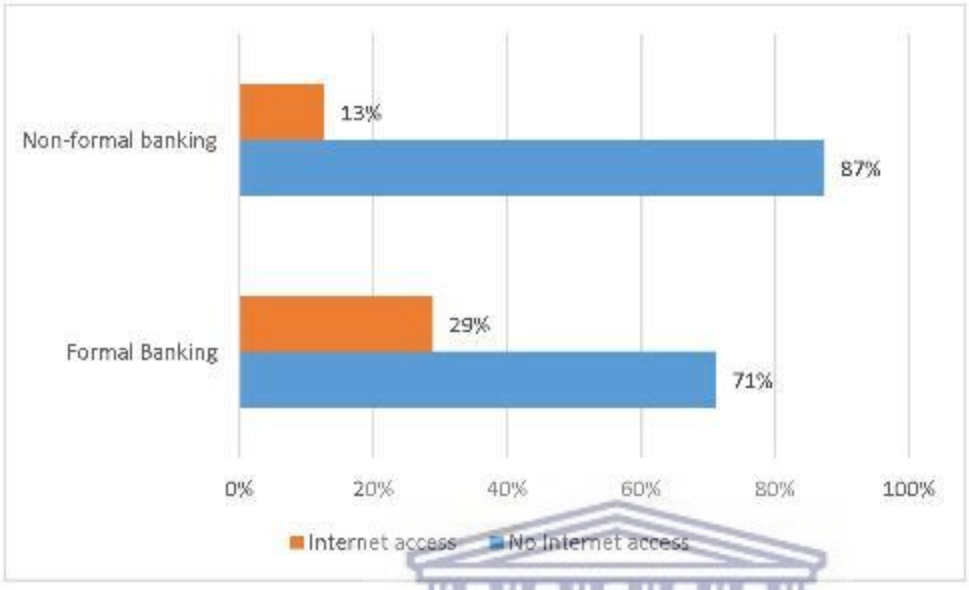
The explanation for why some individuals who had no income were banked and some were not has a digital component. In 2012, approximately 25% of adults who were formally banked but had no income had internet access. Only 8.32% of their no income counterparts who were not formally banked had internet access. Having access to the internet is therefore a pathway to being formally banked for individuals who do not have an income. See Figures 24 and 25 below

Figure 24: Formal banking uptake by internet access, in 2012



Source: Author's own calculations using Finscope data

Figure 25: Formal banking uptake by internet access, in 2015



Source: Author's own calculations using Finscope data.

Access to digital technology has definitely played a role in reducing barriers to the formal uptake of financial services. According to the Finscope data, in 2012, only 16% of the adult population used their cell phones to access the internet. By 2015, this figure had doubled to roughly 32% of adults who used their cell phones to access the internet. Only 26%% of lower-income adults in 2015 made use of data bundles. While having a cell phone almost always means that a lower-income adult has internet access, making data bundles more affordable is the key to enabling internet access among the lower-income population. The Pairwise correlation below indicates a positive correlation between lower-income consumer making use of data bundles and accessing the internet. It also indicates that the notion that cell phone adoption can be equated with digital adoption is not true as having a cell phone is not strongly correlated with internet access nor making use of a data bundle. For lower-income adults who have access to the internet, data bundles appear to be a key pathway to internet access as WiFi access is not universally dispersed across socio-demographic regions. The little access that lower-income adults have had has not only promoted more awareness of financial products, but has also allowed for FSPs to capture consumer data such as mobile app data and social media data which FSPs have used to further improve their

reach. Coupled with the widened reach of incumbent banks, the FinTech industry is thriving in South Africa and has also made significant contributions to financial inclusion over the past four years.

Table 11: Pairwise correlation on digital technology in 2015

Pairwise correlations

Variables	Internet access	Use of data bundle	Cell phone ownership
Internet access	1.000		
Use of data bundle	-0.670*	1.000	
Cell phone ownership	0.089*	-0.084*	1.000

* shows significance at the .01 level

Source: Author's calculations using Finscope data.

Financial inclusion, digital inclusion and economic inclusion are important for the no income group. The data indicates that they are economically excluded, i.e. they are not employed. The data also indicates that they have been financially excluded. From a digital standpoint, this population segment does have access to cell phones. In fact, according to the Finscope data, in 2012, 93% of no-income adults reported that they owned a cell phone. However, asked whether they accessed the internet from their cell phone, only 13% of no income adults said that they did. Upon further interrogation, it became clear that in 2012, only 16% of adults without any income source made use of the internet at all, which ultimately indicates significant levels of digital exclusion taking place at that level. Economic exclusion coupled with digital exclusion creates a serious concern for this segment of the population. Without improvements in either the economic or digital inclusion rates, it is not feasible to expect much improvement in the financial inclusion rates for this segment. From an individual standpoint, an adult without any form of income has no income to save, most likely will not qualify for a loan and will not make use of digital payments unless they anticipate remittances from income-earning household members. An integrated approach is needed to tackle this problem, as roughly two million adults who had no income were financially excluded in 2015.

In terms of the lower-income category which consist of adults earning less than R3000 per month, financial exclusion between 2012 and 2015. This indicates that significant success has been achieved in reducing financial exclusion for lower-income South Africans. In 2012, cell phone

uptake rates of lower-income adults were 94% and internet penetration rates were at 11% for lower income adults. Improvements in cell phone and internet penetration in 2015 for lower-income adults may have had a significant impact on financial inclusion rates. In fact, while cell phone and internet penetration rates for the no-income group remained stagnant at 93% and 15% respectively, cell phone penetration rates for the lower-income segment increased to 96% in 2015, indicating significant improvements. In terms of internet penetration rates, the lower-income segment showed significant improvements with internet penetration rates increasing from 11% in 2012 to 15.32% in 2015. Due to the strong uptake of mobile devices, there are new possibilities for FSPs and FinTech companies to understand both the lower-income segment and those without an income through call detail records, mobile app data and even social media. In 2012, 25% of adults without an income used the internet on their cell phones. In addition, in 2015, 25% of this segment also accessed Facebook on their cell phones. FSPs and FinTech companies have a unique opportunity to make use of these data sources to anticipate the needs of this income group and develop dynamic financial services that will meet the daily needs of this income segment.

Table 32: Probit regression estimating the probability of being an internet banking user in 2013 for adults with an income less than R3,000

Average marginal effects Number of obs = 951

Delta-method

	dy/dx	Std.Err.	z	P>z	[95%Conf.	Interval]
Financial literacy						
Somewhat financially literate	0.0483311	0.0417223	1.16	0.247	-.0334431	.1301052
Financially literate	0.0320428	.0278552	1.15	0.250	-.0225525	.0866381
Income categories						
R1 - R999	-.0275509	.0274104	-1.01	0.315	-.0812742	.0261724
R1,000 - R1,999	-.034665	.0274312	-1.26	0.206	-.0884292	.0190993
R2,000 - R2,999	.0111091	.0290175	0.38	0.702	-.045764	.0679823
Unemployed	.0112422	.0103987	1.08	0.280	-.009139	.0316234
Grant recipient	.0154889	.0149573	1.04	0.300	-.0138269	.0448048
Female	-.0226938	.0132162	-1.72	0.086	-.0485971	.0032095
Age categories						
30-44	.0126989	.0100014	1.27	0.204	-.0069034	.0323012

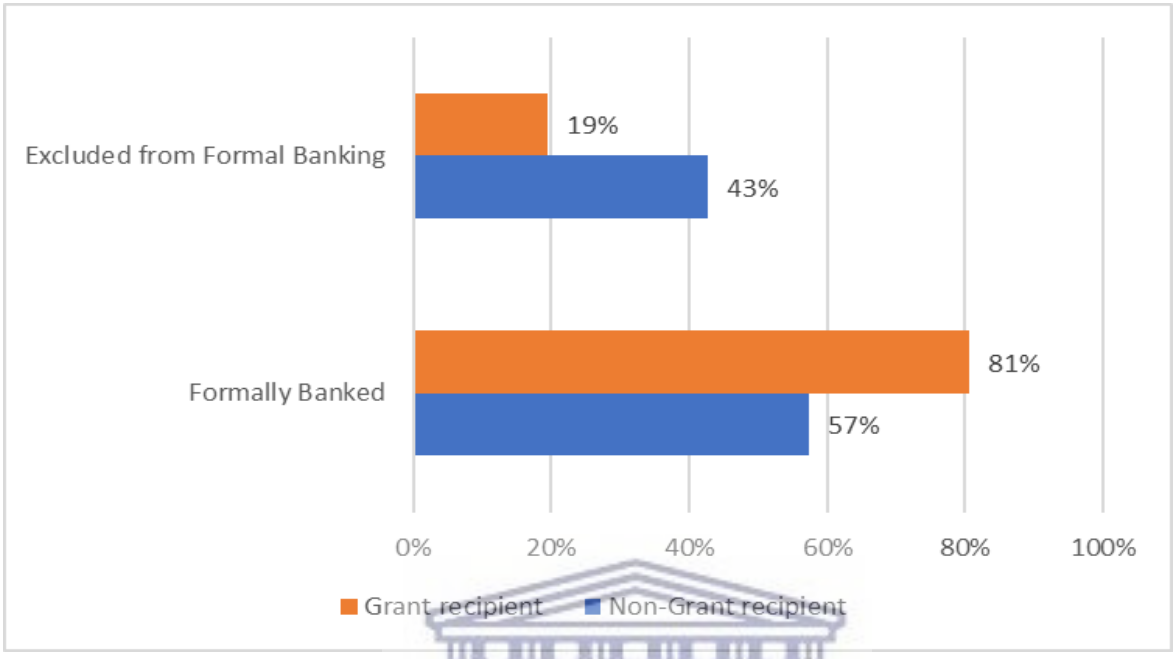
45-59	-.0038532	.0081147	-0.47	0.635	-.0197577	.0120514
Geographical area type						
Urban	-.0022885	.0130773	-0.17	0.861	-.0279194	.0233425
Formal						
Tribal	-.009706	.0142918	-0.68	0.497	-.0377174	.0183054
Owns a cell phone	-.0119215	.0154116	-0.77	0.439	-.0421276	.0182846
Internet Access	.0237239	.0112667	2.11	0.035	.0016415	.0458063

Note: dy/dx for factor levels is the discrete change from the base level.

Source: Author's own calculations using Finscope data

The regression above investigates the factors that determine the chances of a lower-income adult making use of internet banking. The year 2013 was used due to the fact that it was the only year that included financial literacy questions. Internet access and age were found to be significant determinants of internet banking usage among the lower-income group in South Africa. The younger, more digitally savvy adults who have been relatively more exposed to digital technologies are making use of these platforms for banking purposes. Lower-income adults who had access to the internet were 2.4 percentage points more likely to use internet banking than lower-income adults who did not have access to the internet. Since lower-income adults tend to use data bundles as their main mode of accessing the internet, telecommunication companies could consider providing free internet access to essential services such as health and finance. Removing such an entry barrier could drive up internet banking among the lower-income group.

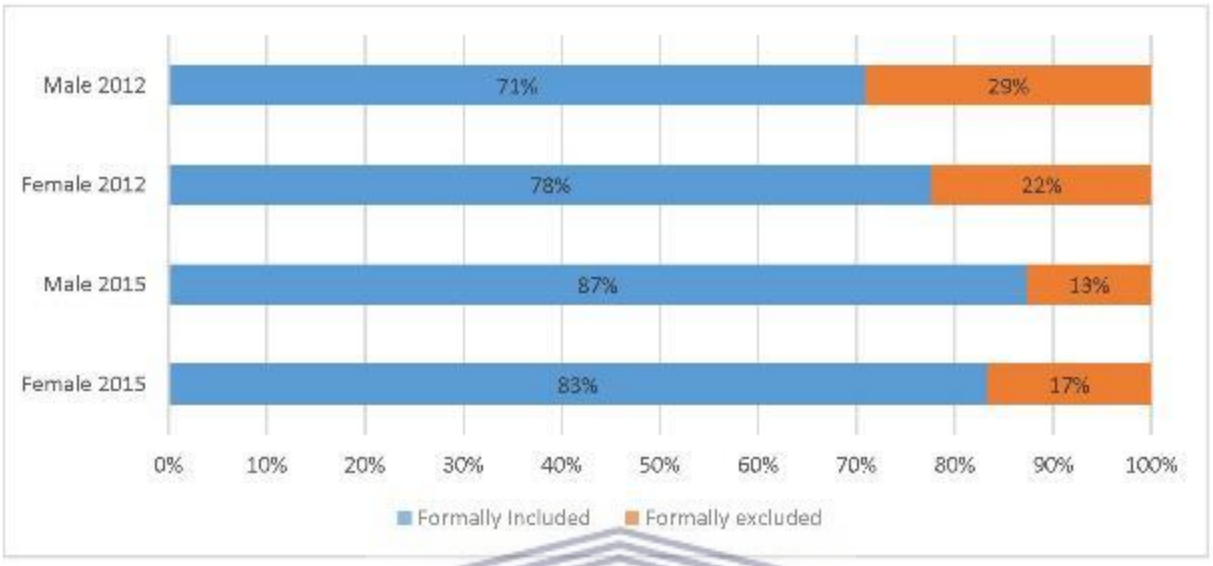
Figure 26: Formal banking uptake by grant recipient status for adults earning less than R3,000 per month, in 2012



Source: Author's calculations using Finscope data

The lower-income segment is more likely to make use of informal channels of banking. Within that segment, social grant recipients are less likely to be financially excluded or to make use of informal channels. South Africa's social grant system has enabled many lower-income adults to have formal banking accounts when, in the absence of such a system, that vulnerable group of individuals would either have been financially excluded or would have made use of informal financial services. The figure above indicates that roughly 81% of social grant recipients made use of formal banking channels. In contrast, roughly 57% of non-grant recipients who earned less than R3,000 made use of formal banking channels.

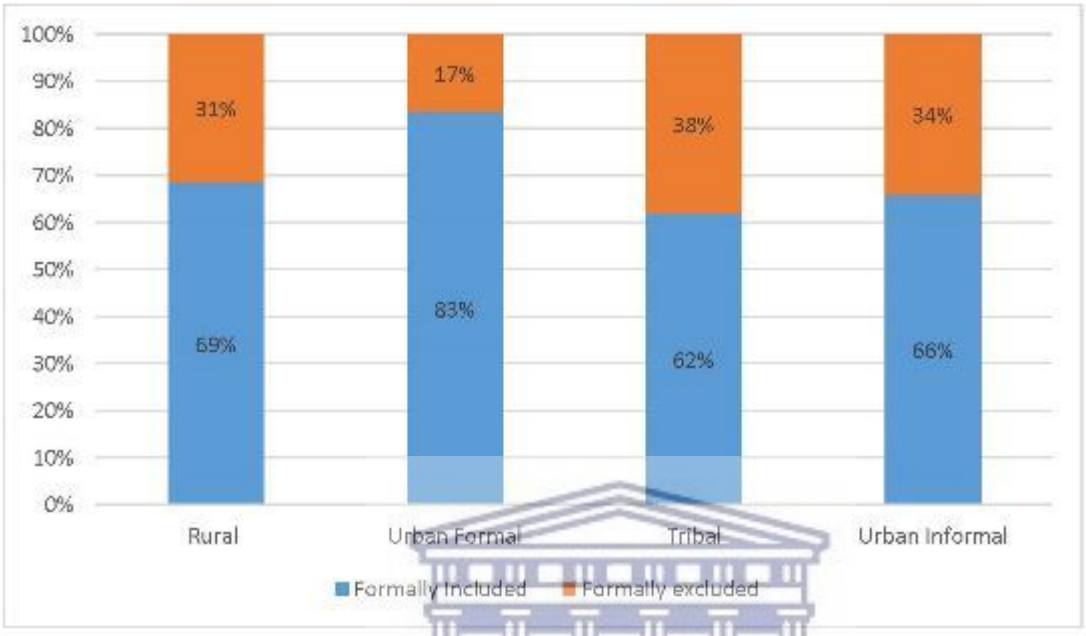
Figure 27: Comparative analysis of formal financial inclusion and formal financial exclusion, by gender



Source: Author's calculations using Finscope data

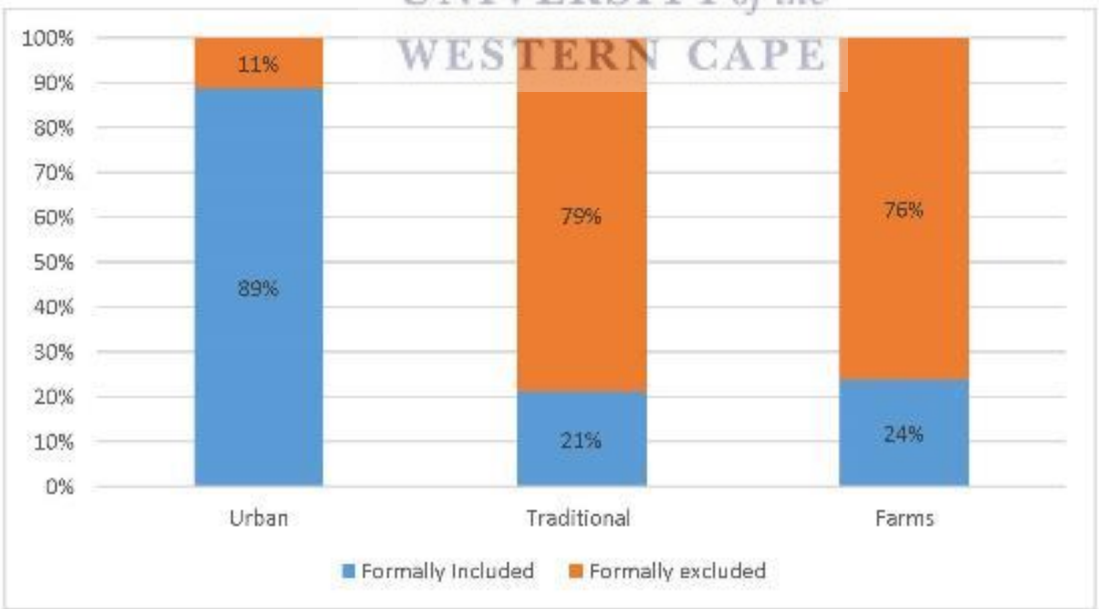
From a gender perspective, we have seen a reversal of the formal financial inclusion standings. The graph above indicates that although both genders are better off in terms of formal financial inclusion relative to 2012. There quite a few reasons for why males saw a more significant increase in formal financial inclusion as well as why women are still lagging behind from the outset. The most significant reason was that far more women stated that they didn't have a bank account because they did not understand technology. In fact, in 2015, 98% of women who were excluded from formal financial services stated that they did not have a bank account because "I don't understand technology". Other prominent reasons that were given include, "I don't understand how it works"(94% of formally financially excluded women) and "The bank is too far away from where I live, work or travel to" (90% of formally financially excluded women)More needs to be done to further the uptake of formal financial services among women in South Africa.

Figure 28: Formal financial exclusion by geographical area type, in 2012



Source: Author's calculations using Finscope data

Figure 29: Formal financial exclusion by geographical area type, in 2015



Source: Author's calculations using Finscope data

Despite differences in the way geographical area types were categorised between 2012 and 2015 in the Finscope data, it is clear the majority of the formally included reside in formal areas, while the formally excluded reside in more rural areas. This is an access problem as more formal institutions are located in urban areas. Moreover, the ICT infrastructure in rural areas compares poorly to urban areas (Sithole et al., 2013:71). Therefore, fewer adults living in these regions make use of formal financial services.

Table 13: Probit regression indicating the probability of adults being formally financially included in 2013, for adults who had an income of less than R3,000

Average marginal effects Number of obs = 1037

Delta-method

	dy/dx	Std.Err.	z	P>z	[95%Conf.	Interval]
Income categories						
R1 - R999	.0292128	.0453681	0.64	0.520	-.059707	.1181327
R1,000 - R1,999	.1536312	.0577297	2.66	0.008	.0404831	.2667792
R2,000 - R2,999	.2438912	.0570414	4.28	0.000	.1320921	.3556903
Unemployed	-.0931891	.0407277	-2.29	0.022	-.173014	-.0133642
Grant recipient	.4291743	.0444248	9.66	0.000	.3421032	.5162454
Female	-.015242	.0348827	-0.44	0.662	-.0836109	.053127
Age categories						
30-44	.0968671	.0358137	2.70	0.007	.0266735	.1670607
45-59	.1920397	.0442711	4.34	0.000	.1052698	.2788095
60 and above	.186813	.1074902	1.74	0.082	-.0238639	.39749
Geographical area type						
Urban Formal	-.0404072	.0460002	-0.88	0.380	-.1305658	.0497515
Tribal	-.0418812	.0474123	-0.88	0.377	-.1348076	.0510452
Urban Informal	-.0785425	.0564464	-1.39	0.164	-.1891755	.0320904
Owns a cell phone	-.0304376	.065395	-0.47	0.642	-.1586094	.0977343
Internet Access	.1909718	.0518372	3.68	0.000	.0893728	.2925709
Education						
Primary school	.1642476	.0987732	1.66	0.096	-.0293443	.3578395
Some high school	.335179	.0965649	3.47	0.001	.1459154	.5244427
Matric	.4329229	.098753	4.38	0.000	.2393706	.6264752

Diploma	.4259622	.1423163	2.99	0.003	.1470273	.7048971
Other	.3718209	.1923494	1.93	0.053	-.005177	.7488187

Note: dy/dx for factor levels is the discrete change from the base level.

Source: Author's own calculations using Finscope data

Lower-income individuals tend to make use of formal finance less often than their higher-income counterparts. The regression above describes the probability of an adult being formally financially included, which combines users of banking institutions with adults who make use of formal non-bank institutions that provide financial services. As income increases, the probability of a South African lower-income adult making use of a formal bank or non-bank institution for financial services sharply increases. For instance, relative to adults who had no income, adults in the R1000 to R1999 and R2,000 to R2,999 income brackets were respectively 16.78 percentage points and 29.29 percentage points more likely to be formally financially included. Similarly, adults without employment were 9.03 percentage points less likely to be formally financially included. Therefore, on the one hand, having an income which may come from domestic remittances or employment are crucial determinants of whether an adult has the need to be formally banked. On the other hand, once an adult has some form of income, the level of income is also a strong factor that determines whether she might need formal banking, assuming need is the main driver of opening a formal bank account.

Social grant recipients were 42.92 percentage points more likely to experience formal financial inclusion relative to non-social grant recipients who were lower-income adults. Bearing in mind that the new South African Social Security Agency (SASSA) had digitised the social grants in 2012, at the time of the interviews, a significant proportion of the social grant recipients had registered with the newly digitised SASSA system. In fact, the 2013 Finscope data indicates that 93.22% of adults who were social grant recipients had registered on the new SASSA system. With the caveat of limited functionality, the SASSA card provided entry-level access to formal finance for the newly registered social grant recipients. As a result, they were far more likely to be formally financially included relative to their lower-income counterparts.

Adults between the ages of 30 and 44 as well as adults between the ages of 45 and 59 were more likely to be formally financially included compared to adults between the ages of 18 to 29. This may be associated with the fact that middle-aged adults are more likely to be in high-income

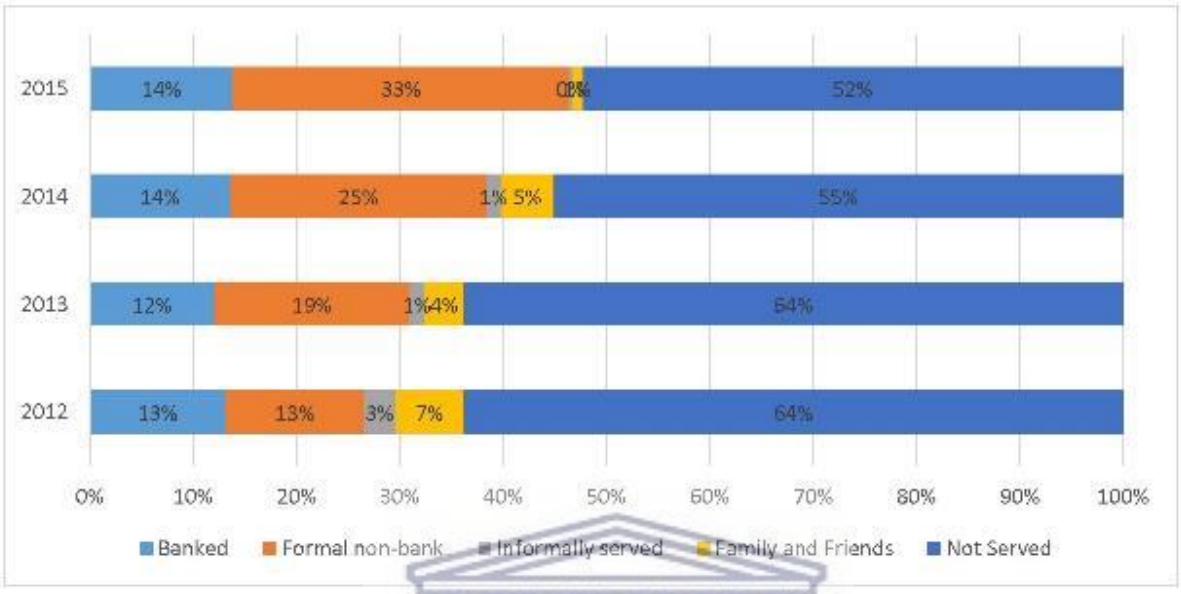
positions relative to young adults, and as a result are more likely to be formally financially included. This may also be associated with the fact that at different stages in life, individuals have different needs. As a result, adults who may require home loans may realise the importance of a financial history/ record and thus may find it more appropriate to be formally banked.

Internet access plays a role in formal financial inclusion. Adults with internet access were 19.10 percentage points more likely to be formally financial included. This may be so for a number of reasons, including information awareness. Access to digital technologies can therefore be an entry point into formal banking. This may also make the transition to digital banking easier for consumers who already have access to the internet.

Education was also found to be a strong determinant of whether a lower-income adult would be formally financially included or not. The more educated an adult was, the more likely they were to be formally financially included. Compared to adults with no education, adults with a matric certificate were 47.12 percentage points more likely to be formally financially included. While the study was unable to review how financial illiteracy specifically played a role in formal financial exclusion due to high collinearity, assuming that need is the main driver of formal finance uptake, less educated adults may not perceive that they need a formal bank account. As a result, they are more likely to be completely financially excluded and to make use of informal finance. There may also be interaction effects between their education and income/ employment likelihood which may further explain their exclusion.

5.3 Credit

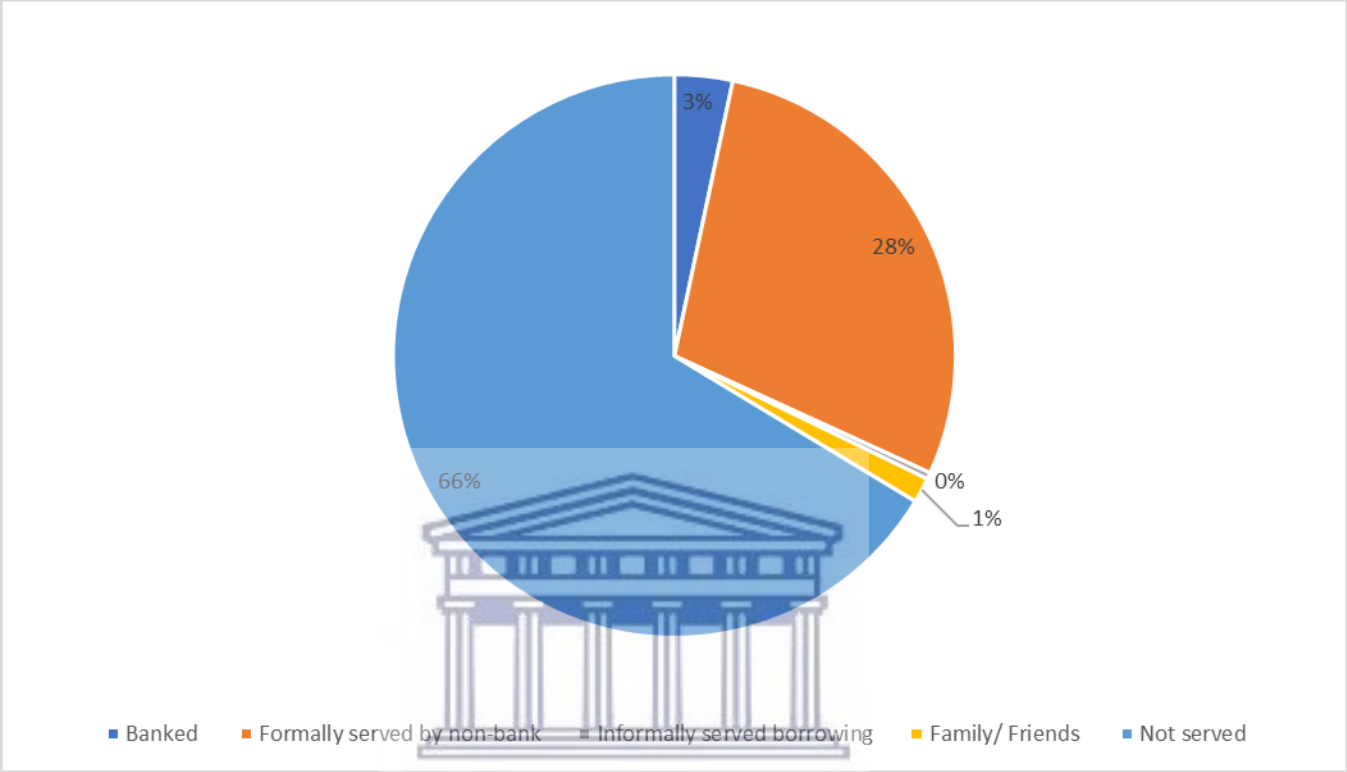
Figure 30: Credit access strands



Source: Author's calculations using Finscope data

From a credit perspective, uptake rates at banking institutions are poor. There has not been much change over the past four years in the uptake of credit from banking institutions. However, formal uptake rates have substantially increased over the past four years. This has largely been driven by the rise in the uptake of credit at formal non-banking institutions, including store credit and other forms of non-banks. This indicates that more non-banks have encroached into finance, specifically lending. A positive finding is that fewer of the population are borrowing using informal mechanisms or from friends and family and are making use of formal credit services.

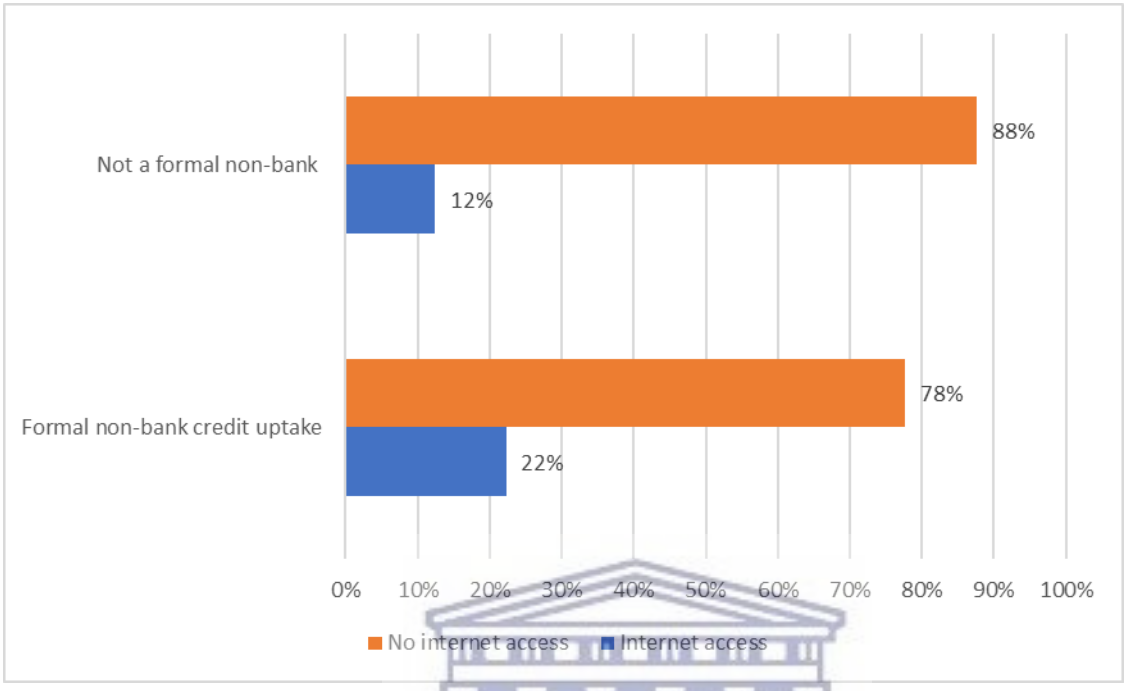
Figure 31: Credit borrowing by access strands in 2015 for adults earning less than R3,000 per month



Source: Author's calculations using Finscope data

While 13.87% of the entire population made use of banking institutions for borrowing, only 3.34% of adults who earned less than R3,000 borrowed from formal banking institutions. However, 28.48% of this lower-income group borrowed from formal non-banks. Upon further interrogation, in 2015, 13.93% of the adults earning more than R3,000 who borrowed from a formal non-bank (e.g. a store) were paying back a bond or home loan. In contrast, 17.25% of adults who earned less than R3,000 a month and borrowed from formal non-banks were paying off bonds or home loans in 2015. Thus, a connection can be made between the reason for lower-income individuals borrowing and their preferred access mechanism. One conclusion is that formal non-banks have made it easier for lower-income adults to access home loans in South Africa. This was a strong trend both in 2012 and in 2015.

Figure 32: Credit uptake and internet access in 2015 for adults earning less than R3,000 per month

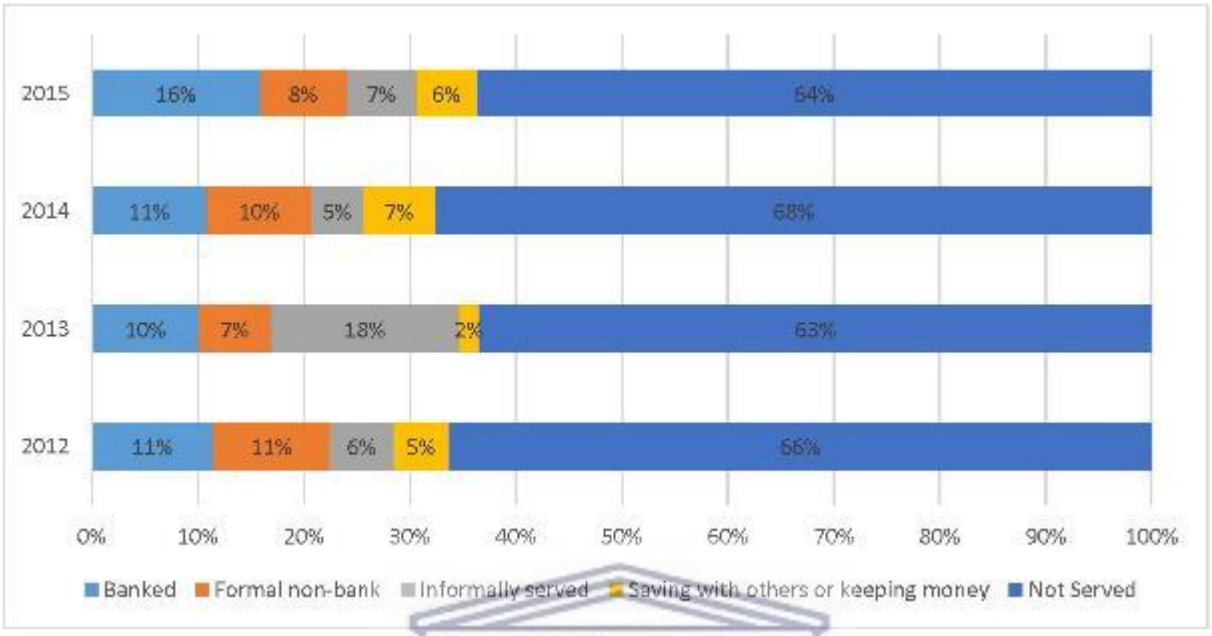


Source: Author's calculations using Finscope data

Lower-income adults who had internet access were more likely to make use of formal non-bank credit providers relative to those that did not have internet access. This indicates that one of the mediums that formal non-banks use to interact with the lower-income market is the internet. This has led to a significant increase in the uptake of formal credit as internet access has broken the geographical barrier to accessing credit that may exist for lower-income consumers who do not reside near credit providers.

5.4 Savings

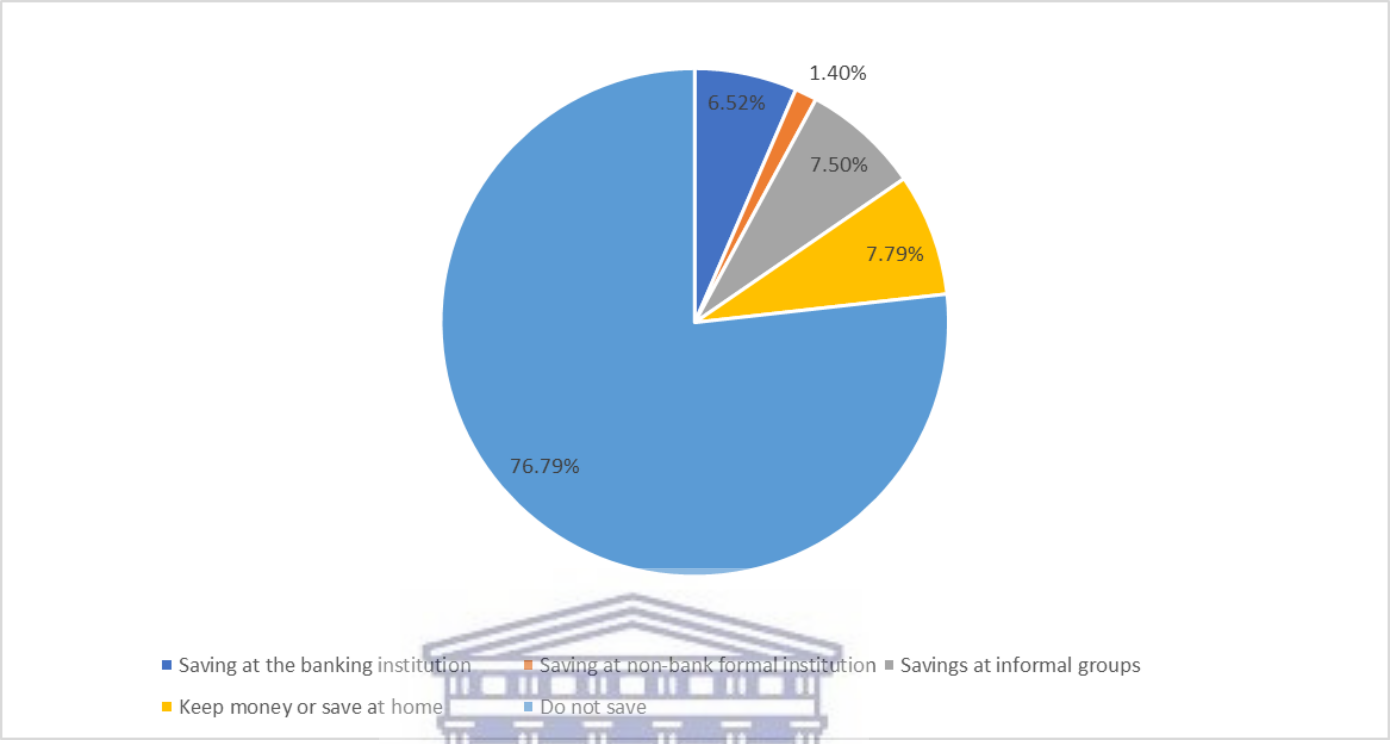
Figure 33: Savings uptake by access strand between 2012 and 2015



Source: Author's calculations using Finscope data

The uptake of savings products at banking institutions remained stagnant between 2012 and 2014. In 2015, this increased sharply to 15.93%. Unlike credit, not much progress has been made in reducing the proportion of adults who do not save. While formal non-banks have been able to transform the credit space in South Africa, little has changed in the savings arena for the majority of the population.

Figure 34: Savings access strands for lower-income adults, in 2015

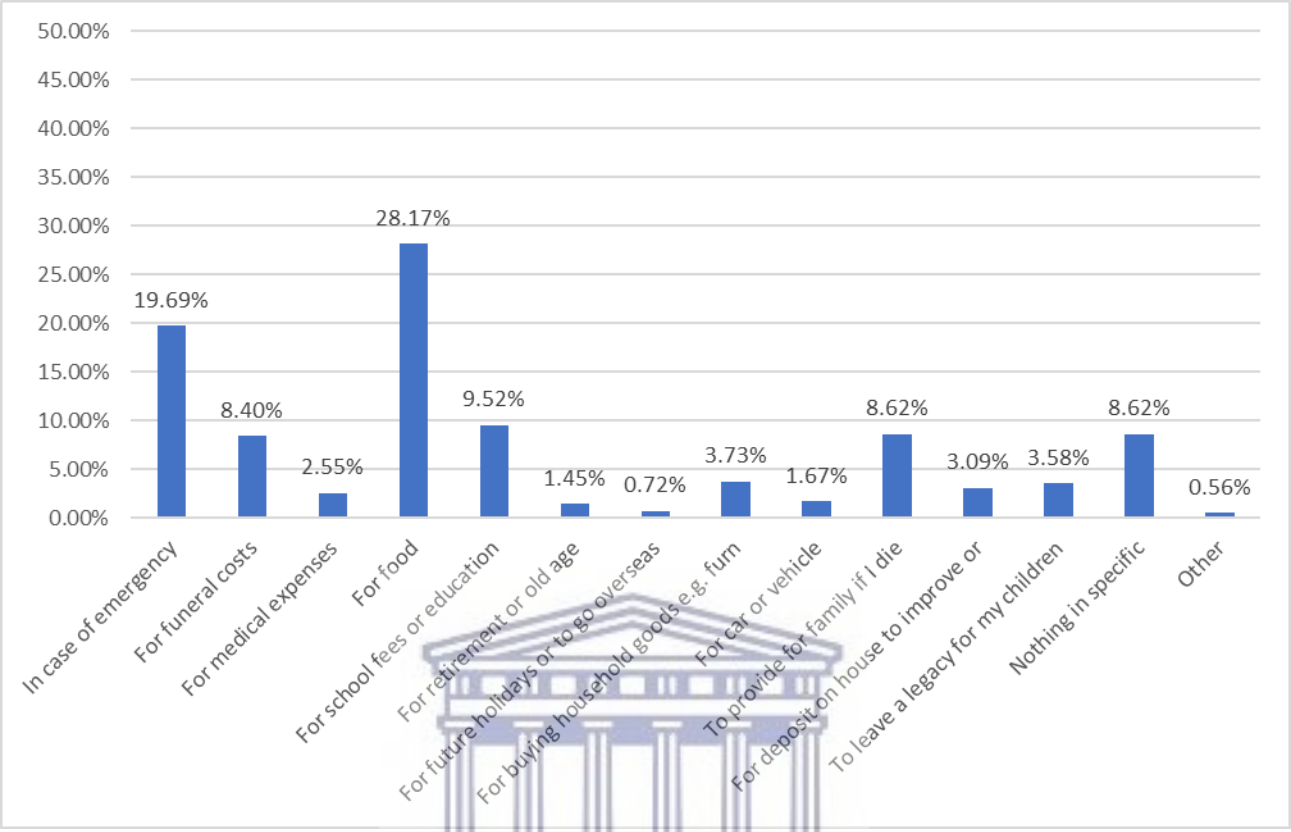


Source: Author's calculations using Finscope data

The savings of adults earning less than R3,000 per month are far below that of the rest of the population. More than 70% are not saving at all. There are a few dynamics that affect savings for the lower-income group. Two of the most cited reasons for why adults who earned less than R3,000[6] per month did not save was, 'I don't have money to save or invest' which was cited by 25% of lower-income adults, as well as 'I do not have a job', which was cited by 42% of lower-income adults. It is therefore plausible that the major barrier to saving for lower-income adults in South Africa is a socioeconomic barrier. Regardless of how well a savings product fits a consumer, it is challenging for FSPs to encourage a savings culture among lower-income adults without an adequate income.

[6] Excludes adults with no income.

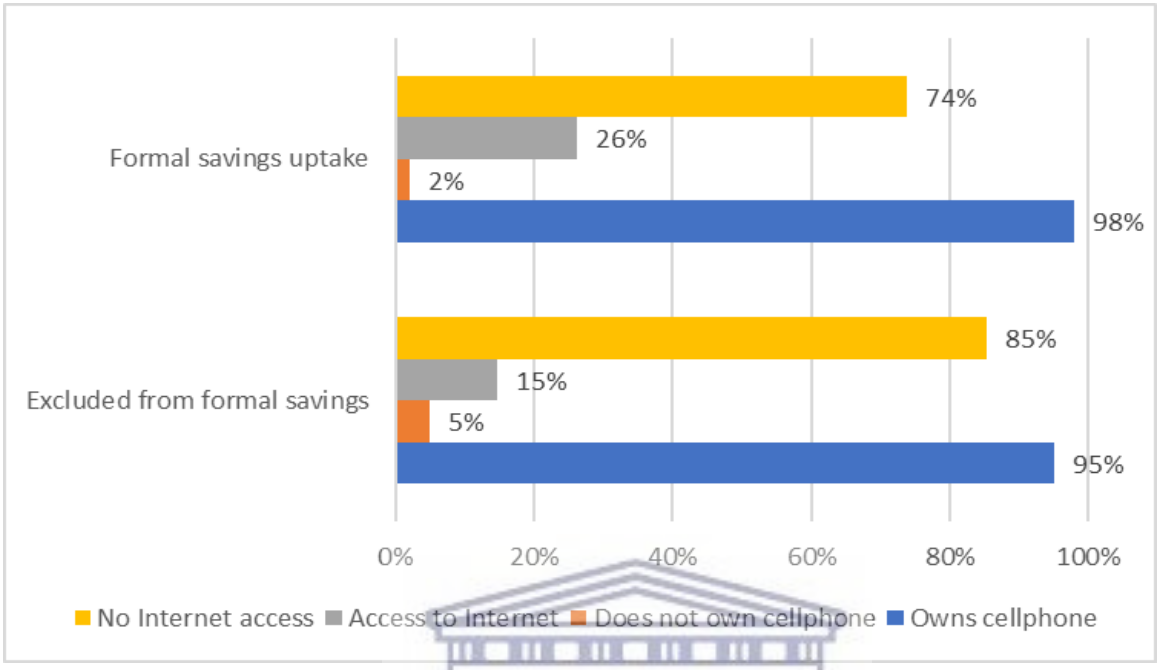
Figure 35: Reasons for saving for lower-income adults, in 2015



Source: Author's calculations using Finscope data

There are, however, lower-income adults who save. Of those that save, the most cited reasons for saving are for food (28.17%) and in case of an emergency (19.69%). It is concerning that very few lower-income adults are saving for retirement (1.45%). There is also a considerable proportion of lower-income adults who do not have a reason for saving (8.62%). Without a clear savings objective or goal, savings could easily derail as a result of immediate consumption wants or needs. This group of adults (those that do not have a reason to save) could substantially benefit from a nuanced financial literacy initiative that provides lower-income-centred financial education that speaks to the challenges that lower-income individuals have in terms of saving, and how savings could benefit a lower-income adult in the near future and in the long term. This group could also benefit from digital savings products that are linked to savings objectives and have some kind of commitment mechanism, such as fixed-term deposits.

Figure 36: Formal savings uptake by internet access and cell phone ownership for adults earning less than R3000 per month, in 2015



Source: Author's calculations using Finscope data

From a technology perspective, lower-income adults with access to the internet were more likely to take up formal savings products compared to those that did not have access to the internet. Similar conclusions can be reached on cell phone penetration. That is, adults who owned cell phones were more likely to take up formal savings products. This was a strong trend both in 2012 and in 2015. If digital savings products are more efficiently marketed, the consumer with internet access and a cell phone is more likely to take up such products. Moreover, such consumers already participate in the formal savings market which reduces the friction that might be experienced by adults who have not before made use of formal savings. This friction includes financial literacy friction, i.e. understanding the different types of savings accounts and how to evaluate them. Also, if the adults do not save formally, this may be due to lack of documentation. Some adults may then save informally and not open a formal bank account and are also less likely to have financial accounts.

Table 14: Probit regression estimating the probability of saving for adults earning less than R3,000 in 2013

Average marginal effects Number of obs = 1,027
Delta-method

	dy/dx	Std.Err.	z	P>z	[95%Conf.	Interval]
Financial literacy						
Somewhat financially literate	.4096288	.0728791	5.62	0.000	.2667883	.5524693
Financially literate	.0385774	.0577392	0.67	0.504	-.0745893	.1517442
Income categories						
R1 - R999	-.0108072	.0480017	-0.23	0.822	-.1048889	.0832745
R1,000 - R1,999	.0380504	.0574351	0.66	0.508	-.0745202	.1506211
R2,000 - R2,999	.132964	.0682077	1.95	0.051	-.0007206	.2666487
Unemployed	-.1247487	.0427696	-2.92	0.004	-.2085757	-.0409218
Grant recipient	.158906	.0415702	3.82	0.000	.07743	.2403821
Female	.0767963	.0349507	2.20	0.028	.0082941	.1452985
Age categories						
30-44	.0340528	.0346163	0.98	0.325	-.0337939	.1018994
45-59	.099314	.0461584	2.15	0.031	.0088453	.1897827
60 and above	.1101956	.1495632	0.74	0.461	-.1829429	.403334
Geographical area type						
Urban Formal	.1238436	.0473213	2.62	0.009	.0310956	.2165915
Tribal	.0563895	.0485891	1.16	0.246	-.0388435	.1516224
Urban Informal	.0639029	.0574769	1.11	0.266	-.0487499	.1765556
Owns a cell phone	-.0317062	.0722244	-0.44	0.661	-.1732633	.1098509
Access to internet	.1974286	.0610738	3.23	0.001	.0777262	.3171311

Note: dy/dx for factor levels is the discrete change from the base level.

Source: Author's own calculations using Finscope data

While the descriptive statistics have provided an understanding of the savings behaviour of lower-income adults, it is yet to be understood which factors are significant determinants of saving among lower-income adults, as well as how significant a role these factors play. The 2013 data from Finscope was used for this analysis as it included questions on financial literacy, which is an important determinant of savings behaviour. Having an income is a crucial factor in an individual's saving and conversely, not having an income acts as a barrier to saving. Lower-income adults who are unemployed are 12.47 percentage points less likely to save compared to employed lower-income adults. This again indicates the importance of having a holistic overview of the savings among lower-income adults. This also means that the solution to the problem that has been identified – that lower-income adults largely do not save – will require a socioeconomic response

from policymakers. The formalisation of the social grant system has helped. Lower-income adults who are social grant recipients are 15.89 percentage points more likely to save relative to their lower-income counterparts who are not registered social grant recipients. The SASSA social grant system has therefore enabled a subsector of the market to engage in savings which they would not have done in the absence of the system. Other socioeconomic factors include the geographical area type in which an individual resides. Lower-income adults residing in formal urban areas are 12.38 percentage points more likely to save compared to their rural counterparts. This may be linked to access points, i.e. a lack of ATMs and bank branches in rural areas limits the likelihood that rural adults will deposit money into savings accounts.

Gender and age are factors that play a role in the savings behaviour of lower-income adults. In 2013, lower-income women were 7.68 percentage points more likely to save compared to their male counterparts. Lower-income middle-aged adults, i.e. adults between the ages of 45 and 59, were 9.93 percentage points more likely to save compared to lower-income adults between the ages of 18 to 29, in 2013. A number of factors could be at play here. Firstly, younger adults who are studying are more likely to be unemployed and therefore less likely to have an income to save. In addition, school fees and mortgages, both of which are common incentives to save, are more likely to be expenses faced by older adults, such as lower-income middle-aged adults.

Education is a crucial factor in determining whether a lower-income adult will save or not. More specifically, financial literacy involves understanding the benefits of saving and is therefore a pathway to initiating a savings culture. The data indicates that, compared to financially illiterate adults, lower-income adults who were somewhat financially literate were 47.96 percentage points more likely to save than their lower-income counterparts who were financially illiterate

Internet access was a strong determinant of savings behaviour. In fact, in 2013, lower-income adults who had internet access were 19.74 percentage points more likely to save relative to those that did not have access to the internet. Overall, this points to the internet as a crucial source of information for individuals who would like to save and do not know how much interest they can accumulate over the period in which they would like to save their money. Furthermore, the internet can assist individuals to more easily assess their financial savings product and how it can help them reach a savings objective. For instance, there are websites with savings calculators that allow

an individual to calculate how much she needs to save per month in order to have a certain amount of money at a specific future date.

5.5 Access

Table 15: Formal financial access by distance to bank branch, in 2012

Bank branch distance	Over	Proportion	Std.Err.	[95%_Conf	Interval]
Included in formal banking	< 5 minutes	94%	2%	88%	97%
	5-14 minutes	86%	2%	82%	89%
	15-29 minutes	78%	2%	75%	82%
	30-59 minutes	73%	2%	69%	77%
	1 hour to 1 hour and 59 minutes	59%	3%	53%	65%
	2-5 hours	59%	6%	46%	71%
	More than 5 hours	65%	11%	42%	83%
Excluded from formal banking	< 5 minutes	6%	2%	3%	12%
	5-14 minutes	14%	2%	11%	18%
	15-29 minutes	22%	2%	19%	25%
	30-59 minutes	27%	2%	23%	31%
	1 hour to 1 hour and 59 minutes	41%	3%	36%	47%
	2-5 hours	41%	6%	29%	54%
	More than 5 hours	35%	11%	17%	58%

Source: Author's calculations using Finscope data

Table 16: Formal financial access by distance to ATM, in 2012

ATM distance	Over	Proportion	Std.Err.	[95%_Conf	Interval]
Included in formal banking	< 5 minutes	88%	2%	83%	92%
	5-14 minutes	84%	2%	81%	87%
	15-29 minutes	75%	2%	71%	79%
	30-59 minutes	71%	2%	67%	75%
	1 hour to 1 hour and 59 minutes	58%	3%	51%	64%
	2-5 hours	66%	6%	53%	77%
	More than 5 hours	63%	13%	36%	84%
Excluded from formal banking	< 5 minutes	12%	2%	8%	17%
	5-14 minutes	16%	2%	14%	20%
	15-29 minutes	25%	2%	21%	29%
	30-59 minutes	29%	2%	25%	33%
	1 hour to 1 hour and 59 minutes	42%	3%	36%	49%
	2-5 hours	34%	6%	23%	47%
	More than 5 hours	37%	13%	17%	64%

Source: Author's calculations using Finscope data

The banking agency model has been a critical driver of access in South Africa in the absence of digital financial services (DFS) uptake, but many people are financially excluded from formal banking as a result of a lack of access. Table 14 above indicates that in 2012, adults who resided further from bank branches were more likely to be excluded from formal banking. Similar findings are seen using ATM distance as a measure of access. Overall, this points to physical access as a persistent obstacle to financial inclusion in South Africa. In the cases where DFS uptake rates were high, distance to a bank branch or ATM would not be correlated with formal financial exclusion. However, since this has not taken place significantly, there is still a common thread found between geographical access and entry into the formal financial sector in 2012. To determine whether progress has been made in this aspect and whether the increased uptake of cell phones and improved internet penetration rate has weakened the link between geographical distance to formal financial services and the uptake of formal financial services, the data for 2015 was examined.

Table 17: Formal financial access by bank branch distance, in 2015

Bank branch distance	Over	Proportion	Std.Err.	[95%_Conf	Interval]
Included in formal banking	< 5 minutes	96%	3%	82%	99%
	5-14 minutes	94%	1%	91%	95%
	15-29 minutes	91%	1%	89%	93%
	30-59 minutes	90%	1%	87%	92%
	1 hour to 1 hour and 59 minutes	87%	3%	81%	91%
	2-5 hours	82%	11%	51%	95%
Excluded from formal banking	< 5 minutes	4%	3%	1%	18%
	5-14 minutes	7%	1%	5%	9%
	15-29 minutes	9%	1%	7%	11%
	30-59 minutes	11%	1%	8%	13%
	1 hour to 1 hour and 59 minutes	13%	3%	9%	19%
	2-5 hours	18%	11%	5%	49%

Source: Author's calculations using Finscope data

Table 18: Formal financial access by ATM distance, in 2015

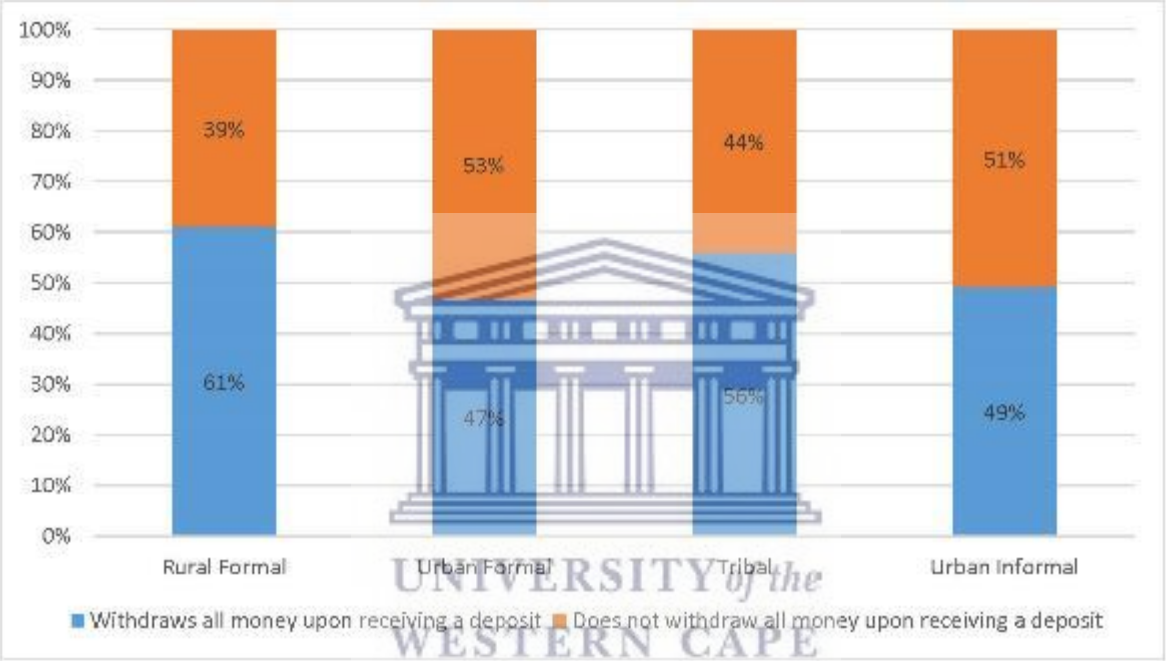
ATM distance	Over	Proportion	Std.Err.	[95%_Conf	Interval]
Included in formal banking	< 5 minutes	93%	2%	87%	97%
	5-14 minutes	93%	1%	91%	94%
	15-29 minutes	90%	1%	88%	92%
	30-59 minutes	86%	2%	82%	89%
	1 hour to 1 hour and 59 minutes	90%	2%	85%	94%
	2-5 hours	74%	15%	38%	93%
Excluded from formal banking	< 5 minutes	7%	2%	4%	13%
	5-14 minutes	7%	1%	6%	9%
	15-29 minutes	10%	1%	8%	12%
	30-59 minutes	14%	2%	11%	18%
	1 hour to 1 hour and 59 minutes	10%	2%	6%	15%
	2-5 hours	26%	15%	7%	62%

Source: Author's calculations using Finscope data

Geographical barriers to formal financial services have reduced and can be seen from a comparison of 2012 and 2015. Fewer adults who lived far from bank branches and ATMs were excluded from the formal financial sector. For example, 41% of adults who lived 1 hour to 1 hour and 59 minutes away from a bank branch were excluded from formal banking in 2012. This proportion declined to 13% in 2015. This is significant and indicates that digital financial services have definitely

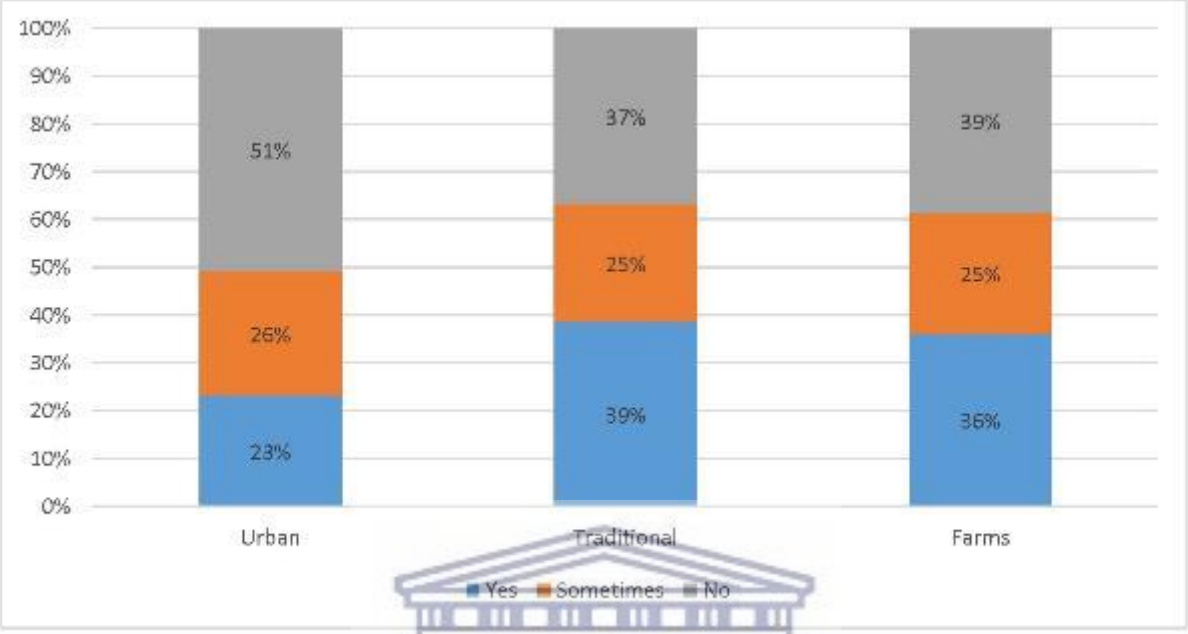
contributed to the uptake of formal financial services and have broken the geographical barriers to having a formal financial account. In terms of income, roughly 13% of adults who earned less than R6,000 and resided 1 hour to 1 hour and 59 minutes away from a bank branch were financially excluded in 2015. This is a dramatic decline from 41% in 2012.

Figure 37: The withdrawal of the entire sum of the deposit among women, by geographical area type, in 2012



Source: Author's calculations using Finscope data

Figure 38: The withdrawal of the entire sum of the deposit among men, by geographical area type, in 2015



Source: Author's own calculations using Finscope data

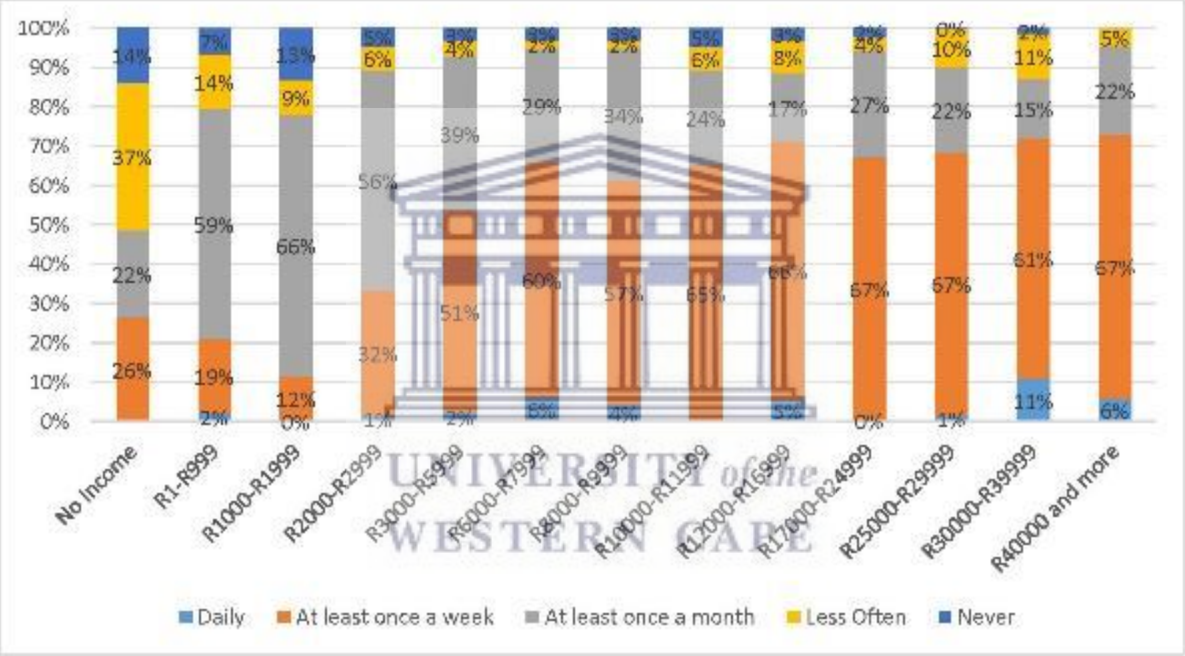
While access indicators such as the proximity of individuals to bank branches and ATMs are important measures of financial inclusion, they tend to miss peculiar behavioural aspects of financial inclusion. Whereas financial inclusion access rates in South Africa are satisfactory, the usage rates are poor. In 2012, approximately seven million banked South Africans withdrew all their money upon the money being deposited in their account. This diverges from the success seen in the access measures. Upon further investigation, the data indicates that this behaviour is more common among women in South Africa. In 2012, 38% of women withdrew all their money upon the money being deposited in their account. This behaviour was most common among women who resided in rural formal areas. While more men exhibited this behaviour in 2015, the general trend persisted wherein roughly 5.3 million banked South Africans withdrew all their money upon money being deposited in their account. An additional 6.1 million did the same "sometimes" [7]. This indicates that perhaps the usage trends are not aligned with the access trends due to a

[7] In 2015, the respondent was asked, "As soon as money is deposited into your account, do you take all of it out"? The respondent was given three options, namely Yes, No, and Sometimes. In 2012, only two options were given, either Yes or No.

misalignment of needs and product delivery. From a gender perspective, this behaviour was more common among men relative to women, in 2015. The figure above indicates that in 2015, roughly 39% of men who resided in traditional areas withdrew all their money upon the money being deposited in their account. Rural geographical areas have remained the main source of this type of behaviour, indicating that the needs there are yet to be adequately met by the formal financial services sector.

5.6 Usage

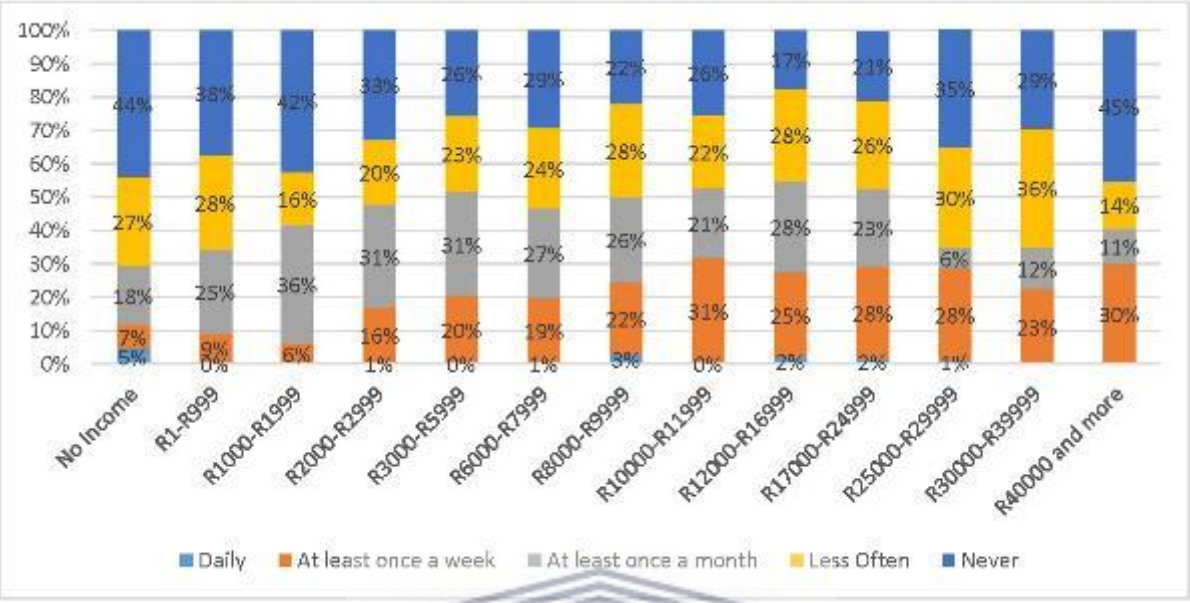
Figure 39: Frequency of getting cash from an ATM, by income categories, in 2015



Source: Author's calculations using Finscope data

From a usage standpoint, a clear trend can be seen in figure 35 between the frequency with which individuals withdraw cash from an ATM and their income categories. The figure indicates that lower-income individuals are more likely to infrequently withdraw cash from an ATM. This could be explained by the fact that they are also more likely to withdraw most of their income at once. As a result, they do not have much money in their account for further withdrawals.

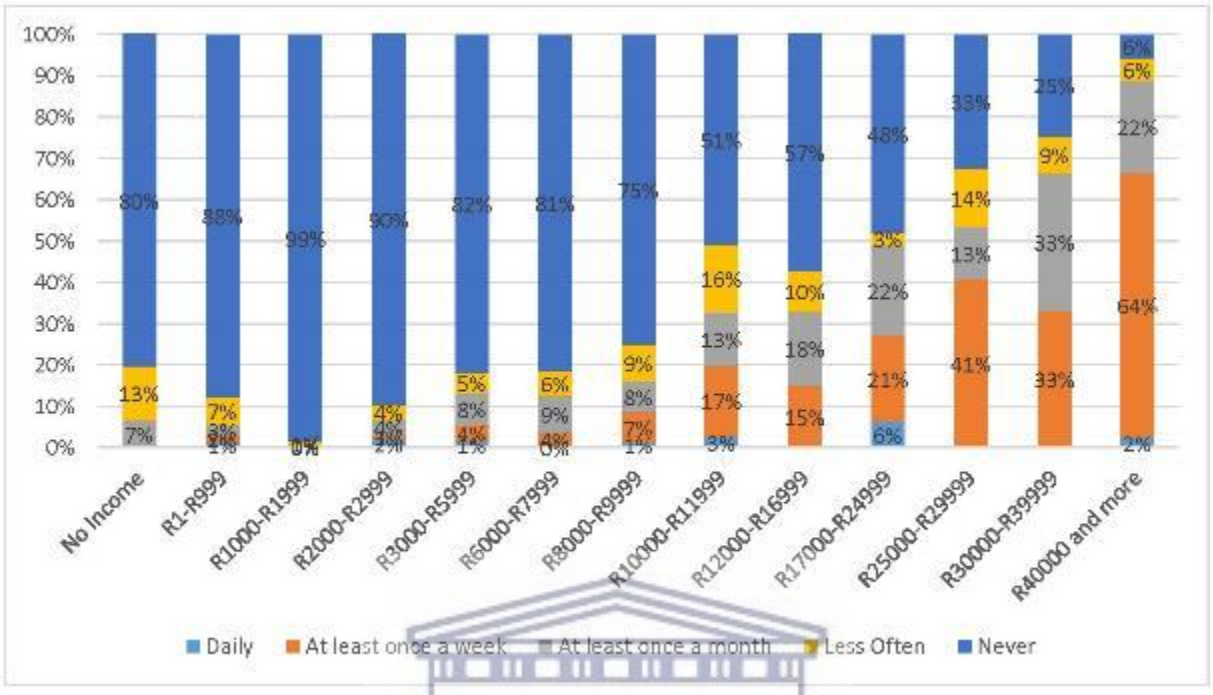
Figure 40: Frequency of getting cash from an ATM, by income categories, in 2015



Source: Author's calculations using Finscope data

Although the till is not as frequently used as the ATM to withdraw money the trends are similar, most likely reflecting lower-income individuals most often making single transactions and probably linked to the date when their weekly or monthly wages are paid. Overall, compared to the uptake and access rates, the usage rates do not reflect the depth of financial inclusion that South Africa needs.

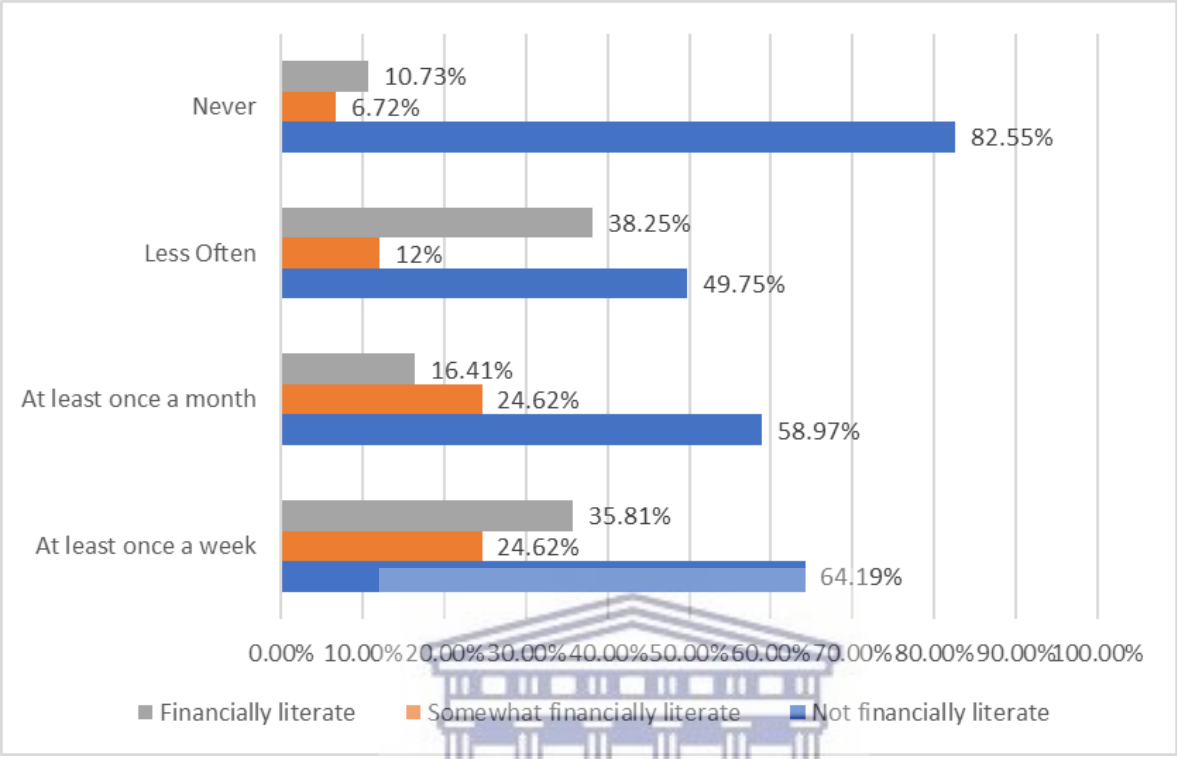
Figure 41: Frequency of internet banking use by income category, in 2015



Source: Author's calculations using Finscope data

Internet banking rates follow socioeconomic strata: the higher an individual's income, the more frequently he/ she makes use of internet banking. One of the barriers to internet banking for lower-income individuals and even middle-income individuals is the lack of affordable internet access. Data bundles are particularly out of reach for lower-income individuals which acts as a big deterrent to internet banking. It should also be noted that non-income factors play a role in determining the frequency with which an individual makes use of internet banking. This is seen in the wide confidence intervals which point out that substantial heterogeneities exist within income classes. This could be associated with geographical areas as certain areas have freer WiFi zones, which enables access and drives up the usage of internet banking. Other factors, such as the age and educational status, may also explain the differences in the frequency with which individuals make use of internet banking platforms.

Figure 42: Internet banking usage by financial literacy categories, in 2013

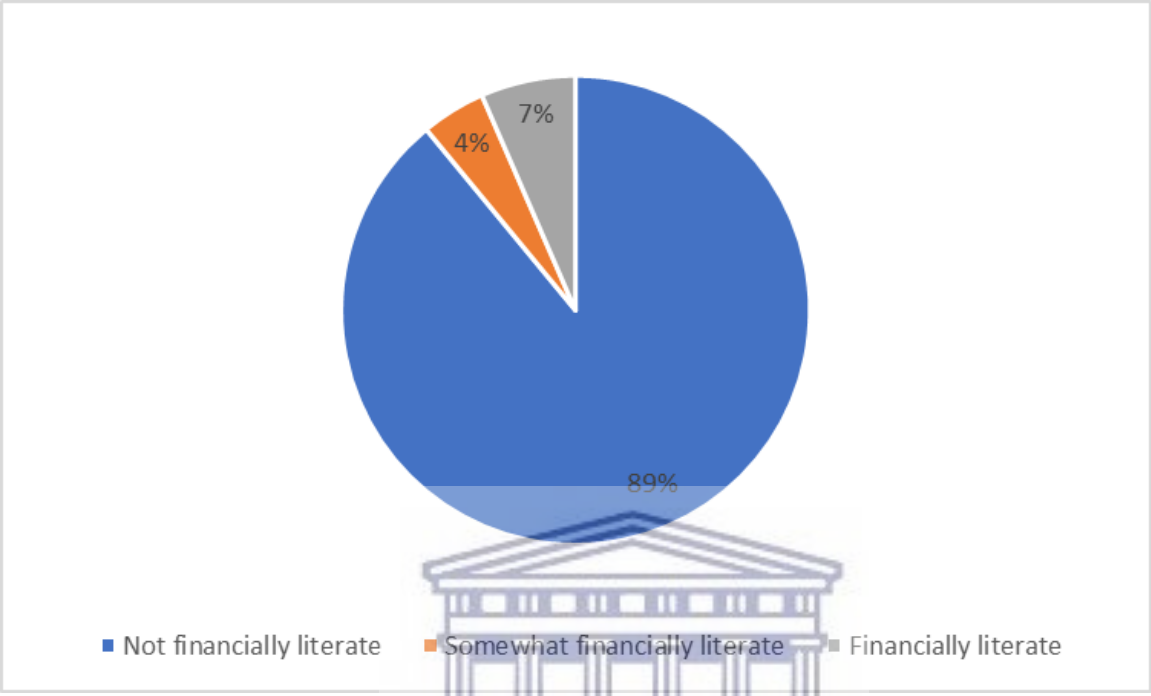


Source: Author's calculations using Finscope data

Financial literacy[8] is a strong indicator of the frequency at which an individual makes use of internet banking platforms. The figure above illustrates that individuals who are not financially literate or had poor financial literacy scores make less frequent use of internet banking compared to "somewhat financially literate" users and financially literate users.

[8] Financial literacy is scored out of 10. Individuals scoring 3 and below are regarded as financially illiterate. Individuals scoring between 4 and 6 are regarded as somewhat financially literate. Individuals scoring above 6 are regarded as financially literate.

Figure 43: Financial literacy for lower-income adults, in 2013



Source: Author's own calculations using Finscope data

Financial literacy has been identified as a crucial determinant in assessing financial inclusion. In particular, the study has already shown that lower-income adults with poor financial literacy are less likely to save relative to their more financially literate counterparts. Generally, financial illiteracy is a problem among lower-income adults, as indicated in figure 39 above. Roughly 89% of lower-income adults are financially illiterate and only 4% are financially literate, with 7% being somewhat financially literate. This indicates that financial literacy is a key entry point for policymakers to improve the quality of financial inclusion in South Africa. More emphasis needs to be placed on educating lower-income adults about the various financial products and how financial inclusion can assist their everyday lives.

5.7 Conclusion

This chapter provided an overview of financial inclusion in South Africa from a demand-side perspective. The findings provided evidence that digital financial services cannot currently be considered financially inclusive. The lower-income population has been digitally and

economically excluded from using digital financial services. Cell phone uptake rates are significant among the lower-income population, even among adults without an income. However, without affordable access to the internet, cell phones will not provide an effective entry point into the formal financial sector. Another key barrier for the lower-income population is financial illiteracy. This is a failure primarily of the policymakers and FSPs, as the type of financial inclusion that has taken place cannot be considered inclusive if lower-income adults are unable to understand the benefits of the available financial services and products. Until changes occur, usage rates among lower-income consumers will continue to fall far short of the uptake rates seen thus far in South Africa.

CHAPTER SIX: QUALITATIVE FINDINGS

6.1. Introduction

This chapter presents the qualitative findings of the study. The chapter aims to meet two research objectives: to describe the inclusivity of digital financial services (DFS) from a supply-side perspective and to investigate the impact that data generated from SMACT technologies has had on financial inclusion. The chapter begins firstly with a discussion on what constitutes an enabling environment, and how South Africa fares in terms of the ICT infrastructure and interoperability factors that have played a role in facilitating and, to some extent, stifling better-quality financial inclusion for the lower-income population. Secondly, the chapter discusses FSPs and how the enabling environment and their own internal factors, such as their organisational structures and skills base, can affect their ability to provide quality DFS and improve financial inclusion. Thirdly, we discuss the regulatory environment in South Africa and how it relates to the innovation of inclusive DFS. The following sections focus on aspects that are directly critical to the sustainable usage of DFS and sustainable financial inclusion. These sections consist of consumer protection, transparency, financial literacy, product fit, affordability, convenience and welfare. The concluding section discusses the use cases of DFS in South Africa and how they relate to financial inclusion for the lower-income population.

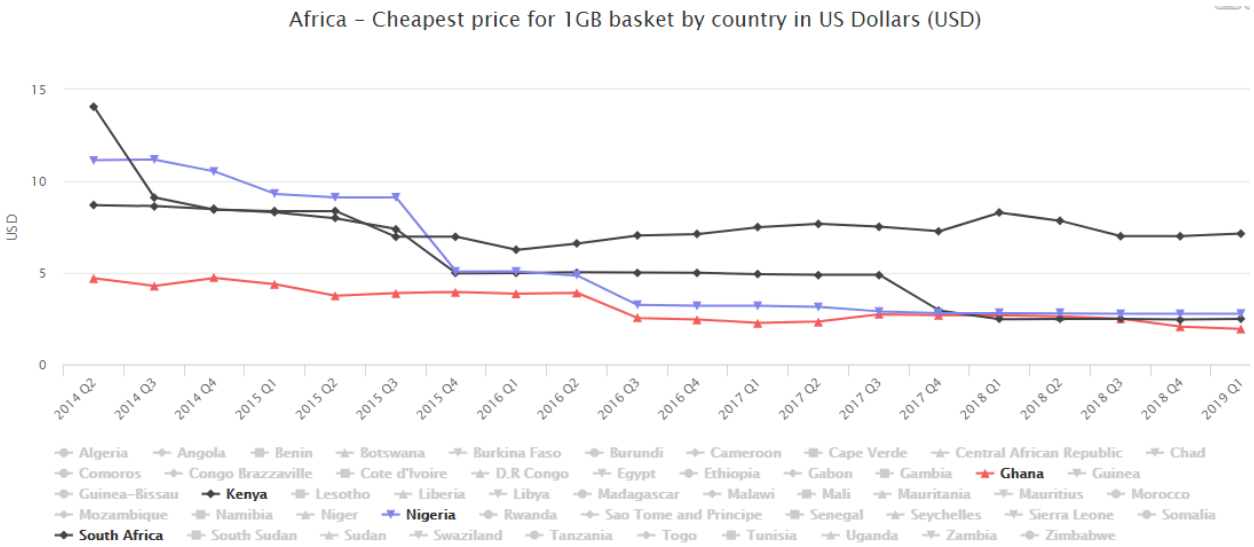
6.2 Enabling environment

An enabling environment is one which facilitates financial inclusion. The financial ecosystem relies on a number of factors to facilitate financial inclusion, including ICT infrastructure – specifically that used by FSPs within the particular geographical area in which they operate, and interoperability – which is largely driven by key stakeholders further down the value-chain such as retailers and SMMEs. These stakeholders' decision to either adopt or reject providing financial services will largely be based on the economic incentives perceived. Based on data gleaned from the key informants, the extent and degree to which the ecosystem has enabled or stifled financial inclusion are discussed.

6.2.1 ICT infrastructure

A crucial factor in enabling DFS is ICT infrastructure. One of the key informants suggested that, if people got free WiFi throughout a city or throughout an area, that will facilitate better digital banking opportunities. The ICT infrastructure has to be considered from two perspectives, firstly from the consumer's point of view (demand side) and secondly from the FSP's perspective (demand side). Understanding the consumer's point of view is important as it affects the demand for DFS. Despite high cell phone penetration rates and significantly high smartphone penetration rates compared with other African countries, South Africans still struggle to access the internet. One of the driving factors behind this is the cost of data bundles. This barrier is more pronounced at a lower income level, hence exacerbating the digital divide. Without accessibility, the lower-income population has low demand for DFS, hence it is not surprising that the marketing of DFS has largely been geared towards the middle-income population. One of the key informants who worked at a large South African FSP indicated that supply and demand are crucial factors in the bank's decision to develop a product and sell it to consumers, i.e. the bank does not supply products if there is an inadequate demand since this does not make financial and economic sense. Consequently, the lower-income population struggles to make use of internet banking and digital financial wallets due to affordability constraints that stem from a lack of digital inclusion. The South African Department of Communications issued the national Broadband Policy which aims to provide available, accessible and affordable broadband to all South Africans by 2020 (National Treasury, 2015, as cited in World Bank, 2014:51). There have been initiatives such as the City of Cape Town's city-wide Internet Access project which planned to provide 384 city-wide WiFi hotspots where anyone with a smartphone can have free access to WiFi (Vermeulen, 2018). It is, however, unclear how effective the initiative has been in enabling digital inclusion, reaching the most vulnerable, and impacting on financial inclusion.

Figure 44: Comparison of data prices across the major African countries



Source: https://researchictafrica.net/ria-african-mobile-pricing-index/

The figure above depicts the trends in the price of data for consumers in the four major African countries. The figure compares a 1gb data bundle in USD across the African countries. In the first quarter of 2019 the price of 1gb of data was, $7.14 in South Africa, compared to $2.77 in Nigeria, $2.49 in Kenya and $1.94 in Ghana. What can be concluded from the data points above, is that whilst the costs of data have declined significantly across African countries, South Africa still has one of the highest costs of data to consumers.

6.2.2 Interoperability

Interoperability, the ability of computer systems to exchange and use information, is one of the most well acknowledged and crucial requirements of an enabling environment. With ICT infrastructure in place, the interoperability problem would remain the stumbling block that prevents financial inclusion. In South Africa, certain industries are more digitised than others, as is the formal sector when compared to the informal sector. One of the reasons for the low uptake of digital financial services among lower-income communities is the lack of interoperability. For lower-income populations, local stores may not offer debit card/ credit card/ mobile banking facilities, which encourages a cash-based informal economy. Lower-income consumers are unable to use non-cash options to buy products in their communities or buy passage on a minibus taxi. The question of interoperability must be interrogated to understand why certain parts of the market

avoid non-cash options despite the benefit in terms of mitigating the risk of robbery that prevails in cash-based environments. A key talking point for interoperability is finding ways in which FinTech companies can meet the needs that are not being supplied by the banking agency model which has yet to make partnerships outside of large retailers such as Pick n Pay and Shoprite. Unfortunately, interoperability tends to be the Achilles heel of regulators. A researcher that was interviewed noted, for example, difficulties in the transport industry where resistance has been experienced by government and regulators to getting the informal taxi industry to go digital. Such resistance limits the possibilities of a digital financial system prevailing that is fully interoperable. According to two key informants, the failure of both Vodacom and MTN in providing mobile money was linked to the lack of a back-end mobile money network. It is quite clear going forward, that the digitisation of merchants may be one of the few ways to connect the lower-income market to large FSPs.

Unfortunately, because digital financial services are not meeting the needs of lower-income consumers, that market remains cash-based. Due to a lack of interoperability, lower-income consumers are unable to rely on a single non-cash channel for payments and tend to make use of debit cards, cash and sometimes even cell phone banking. This destroys the possibilities for economies of scale. One of the key informants explained that the implementation of ISO standard 20022 would allow all the channels of payments to collapse, i.e. all types of transactions and producers would make of the same channel and one back-end process. In other words, there would be no need of a cell phone or a mobile processing engine, a card processing engine, EFT processing engine, etc. Such a disruptive innovation has the potential to achieve immense scale and could end up reducing the costs of banking appreciably.

6.3 Financial service providers and FinTech

The entire economy would benefit from improved interoperability and ICT infrastructure. From the FSP's perspective, the high initial costs of investing in ICT infrastructure can act as a deterrent or barrier. However, FSPs in South Africa have invested heavily in ICT and WiFi facilities on site, including investing in fibre optic cables to enable faster internet connectivity for their clients.

Data storage is a major area of ICT infrastructure investment. In early 2017, FNB had 383 branches that had access to WiFi facilities which were used by more than 200,000 customers (Mybroadband,

2017). With the explosion of data, the capacity of ICT infrastructure to warehouse data is a critical need. One of the key informants noted that data warehouses grew so large that they are now referred to as data lakes. The information pool in these data lakes is much bigger and so are the concomitant costs involved in establishing and maintaining them. Financial institutions that understand what value they can derive from such technology and the relative advantage of adopting new methods of storing big data are more likely to invest and adopt in the technology. On the other hand, if, for example, blockchain technology is seen as a threat to banking rather than a platform for quicker, faster and more secure transactions, banks will become resistant towards the technology rather than proactively looking for ways of using the technology.

Without adequate ICT infrastructure in place for not only banks but banking clients, the adoption of SMACT technology will be slow. Without accessible and affordable internet access, mass-market consumers are unable to interact with internet banking. As a result, banks may decide to only conservatively invest in their online banking interface. One key informant who currently works at an FSP referred to the supply versus demand problem. In contrast to Say's law, demand does not follow supply in the banking industry, supply follows demand. Banks develop new products and services based on consumer needs. Without a need, banks do not artificially attempt to create demand. In fact, the FSP representative was at pains to repeat that the bank's starting point was always the data.

Overall, the ICT infrastructure in South Africa has provided an enabling and conducive environment to FSPs. However, on the demand side, particularly for lower-income consumers, data costs still have to fall appreciably to promote their inclusion in the digital economy. Further ICT investments at the provincial government level may facilitate access. More importantly, telecommunications companies have a role to play as WiFi hotspots have been considered potentially risky for customers who plan on using them to engage in internet banking. The solution therefore partly lies with the telecommunications companies developing their capacity to provide affordable yet reliable internet access to the lower-income consumer.

6.3.1 Organisational structures

Organisational structure is a key factor in the adopting of innovations. One of the key informants felt that the actual structure of organisations can make it very difficult to adopt new technologies because they work in different departments that sometimes work in silos or pillars of power that

are not always pulling towards the same objectives. When they have to work together, they might feel that they are diluting their power and will try to conduct their affairs separately. Such an environment prevents the seamless flow of information throughout an organisation. Certain departments in a bank may be more digitised than others. In developing digital financial products, the environment in which these products are developed has to be conducive to such innovation. For example, the department that collects KYC information may work with paper and collect physical documents such as proof of address documents and certified copies of passports. On the other hand, if the product development department is largely digitised, the transfer of KYC information may require a physical transfer of documents from one department to another which may be cumbersome and pose a risk of documents being misplaced.

One key informant alleged that many organisations outsource 'their thinking' to consultants especially in the ICT space, where most of the innovations and large-scale ICT projects are outsourced to ICT companies. Banks do this because it enables them to stick to their core business and not have to employ and train technical staff to upgrade the back-office systems. Most of the key informants agreed that although outsourcing saved costs for banks, one consequence of outsourcing innovation was that the banks remained institutions characterised as slow technology adopters.

A key informant reported that a number of employees struggled with change or resisted it whenever it involved disruptive innovation, e.g. a new app being implemented, because implementing the new technology enforced change on the organisation. The key informant shared a personal experience:

> I remember where I was working at a large company 15 to 20 years ago. And they said to us, most people in their lives will only experience one system change, in their career. And as soon as you try and introduce a second one, they opt out of because it is so traumatic on them. Because they cannot handle the change. And that I think is probably the biggest thing. You have to have a willingness to embrace the change. And most people don't like that change even if it means that they are going to work 10 hours a day. And you tell them that if you automate this it, it will only take 4 hours a day, which frees up time for them…they don't want to do it. I think it is human nature. People don't want to change.

You might not fully understand how the technology is going to benefit you and that there is a business case for it.

6.3.2 Skills

Financial inclusion is becoming more and more digitised and the only way to reach the excluded is through understanding the different types of SMACT technologies and the data that is now available as a result of these technologies. The entire financial ecosystem has had to digitise and the skills sets required in the Fourth Industrial Revolution have changed. South Africa has followed global peers such as Sweden and Germany and has introduced FinTech courses to begin tackling digital disruption in the financial sector. In 2018, the University of Cape Town introduced a FinTech course to equip students to fill new IT infrastructure and digital solutions positions that are opening up in banks. There have been large investments, particularly in banks' treasury systems and MIS systems, the core banking infrastructure, to make sure that they are collecting data and that the data is available to ultimately inform later decisions.

The skills set available to FinTech companies and large FSPs determine what they can innovate and how inclusive the innovations they develop will be. Big data and analytics have caused a renewed interest in statisticians some of whom have been deployed as data scientists. The vast current requirement for data scientists and statisticians in the banking and finance industries will only increase as the financial ecosystem continues to digitise and banks leverage their skilled human capital to gain a competitive edge over their competitors. Thus, massive investments have been made in data science skills training in South Africa with one key informant estimating that in Cape Town alone currently, R50 million has allocated by the private sector specifically to train data scientists. There is a growing need for mathematics and technology-related employees as can be seen in the banking sector skills plan (BANKSETA, 2017). This trend coincides with increasing regulatory requirements, including in relation to market conduct. For instance, the Financial Advisory and Intermediary Services Act, Act 37 of 2002 (known as FAIS) is market conduct regulation for how financial services are sold. According to one of the key informants, the Act makes it increasingly challenging for banks to sell by using humans and increases the possibility of selling it digitally. A new debate has emerged on the role of humans in the financial sector amid advanced machine learning and automation technology that threaten to replace jobs while reducing costs for banks. In response to low usage levels among lower-income populations, as well as to

develop products that best suit the needs of this unique market, both skilled humans as well as new automation technology should be employed to reduce transaction costs for lower-income clients and develop affordable and appropriate financial products and services.

6.4 Regulatory environment

Based on the discussions with key informants, it emerges that new innovations that leverage FinTech pose risks to stability and market conduct risk. In terms of stability risk, regulators need to ensure that the technology does not introduce risk into the financial sector that can lead to instability of some sort, such as firms entering and closing down or losing money, or risk not being appropriately transferred or transferred to inappropriate recipients. In addition, new technological innovations risk creating opportunities for money laundering and funding of terrorism, e.g. cryptocurrencies. Though the Financial Intelligence Centre Act (FICA, 2001, Act 38) the government requires the financial sector to execute the function of policing money laundering and financing of terrorism. New technologies known as Regtech can be useful to better equip regulators to perform their oversight function. Market conduct risk relates to individuals within the financial sector. This risk needs to be managed so that people are not 'scammed' out of their money and that they understand the contracts that they enter into. With the newly established Financial Sector Conduct Authority (FSCA) market conduct authority, which places an emphasis on consumer protection, this risk will be closely monitored by regulators.

Regulators are therefore being equipped to understand the FinTech disruption of the banking sector, how it has changed the entire financial ecosystem and consequently how it can effect the financial inclusion goals of society. In light of this, the regulatory environment in South Africa has recently made a drastic shift towards focusing on the consumer. South Africa is well-known for its sound financial system, owing to its twin-peaks model and strict implementation of monetary policy. Although financial stability is a crucial goal, it should not be at the peril of the consumer and innovation. One key informant felt the main regulatory concern for FSPs is not stringent regulations but regulatory uncertainty. FSPs are used to making decisions based on knowns. When there isn't certainty, they will struggle to make decisions.

The regulations that FinTech start-ups have to adhere to are extensive. None of the regulations is FinTech start-up-specific and there is very little flexibility when it comes to regulation. There is

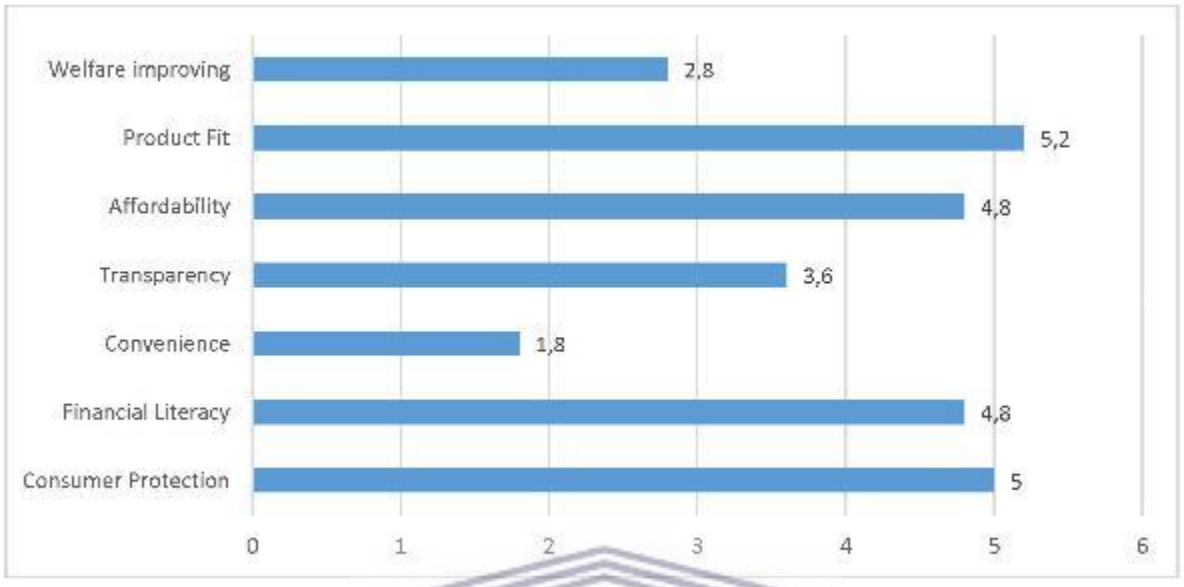
therefore a sense that FinTech start-ups are overregulated due to overlapping regulations. From a consumer's perspective, regulation is important, particularly in the provision of financial services. A key informant suggested that poor and vulnerable consumers can be regulated out of the financial market due to requirements that they do not meet. There is a clear call for more nuanced regulatory approaches.

All the key informants felt that legislation and regulations needed to become more business-friendly and updated with the new technologies that exist. For instance, banks, which would like to use blockchain technology for smart contracts and digital consent, have regulatory uncertainty around blockchain technology. It is not surprising therefore that blockchain use cases are largely non-existent in the South African, especially among incumbent banks. One key informant felt that the normal knee-jerk reaction of regulators when they don't have a full understanding of a topic was to over-regulate to protect consumers. Regulators needed to find a balance between protecting consumers and not stifling innovation or the speed with which businesses could launch to market, such as through the tardy issuance of licences.

The key informants had different perspectives on regulation in South Africa but greater consensus that the government had a huge role to play in creating an environment in which FinTech start-ups could develop. One of the strategies highlighted is the development of a regulatory sandbox in which government could learn about the various challenges that FinTech companies experience and assist start-ups from the product development stages. This would also allow regulators to develop more nuanced approaches to dealing with business models that overlap industries and legal jurisdictions of oversight bodies. This could potentially stimulate innovation that leads to financial service provision that is welfare-improving, affordable, convenient, meets consumer needs and improves the quality of financial inclusion overall.

The figure below describes dimensions that were included in the study that could be used to assess the quality of financial inclusion across countries. The key informants were asked to rank the indicators by importance. The closer to one, the higher the indicator was ranked. Overall the convenience and welfare improving factors were the highest ranked. Each dimension is discussed in detail below

Figure 45: Quality of financial inclusion dimensions by importance



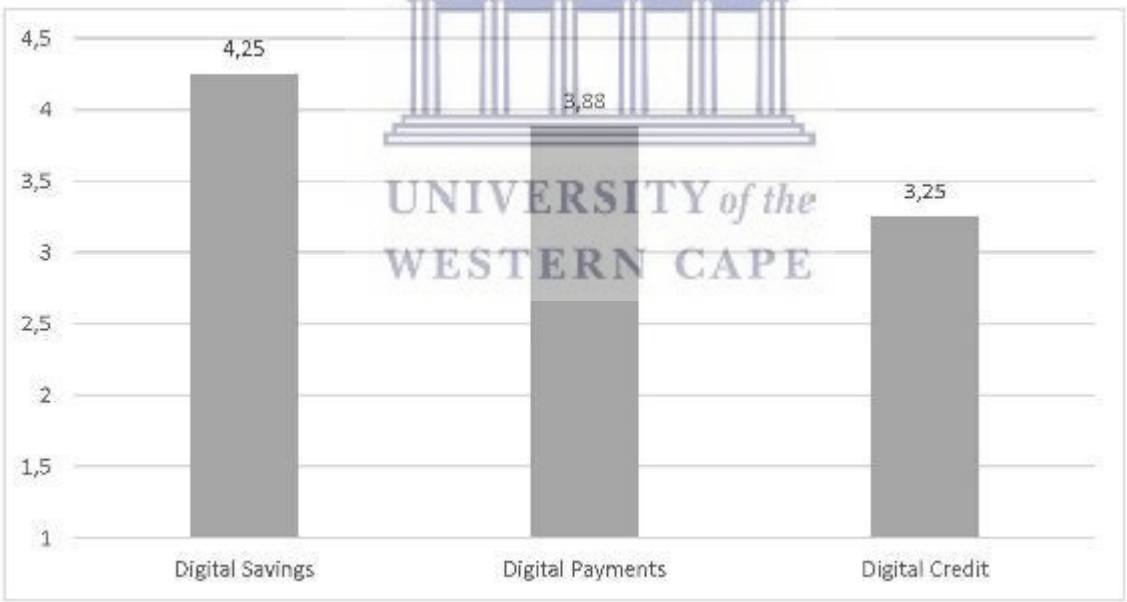
Source: Author's own calculations

6.5 Consumer protection

Consumer protection is a key aspect of ensuring the quality of financial inclusion. Inclusivity depends upon consumer trust. Without trust, consumers are likely to make use of informal financial services. Hence, one of the key drivers of not only uptake but of sustained usage is that of consumer protection. This responsibility is borne by several stakeholders, from FSPs to regulators to retailers who act as point-of-sale interaction points. Despite cross-cutting laws such as the Consumer Protection Act, financial sector laws such as FAIS make specific mention of how products are to be sold in the financial sector and what type of information must be disclosed to protect the consumer from product mis-selling. One of the key informants who works in regulation stated that the framework was very robust and protected consumers' digital and non-digital savings deposits. Digital savings was rated as safer for the lower-income consumer in South Africa than digital payments and digital credit. The safety of the funds from a consumer protection perspective is largely not an issue, whatever the type of bank. Despite the key informants holding dissimilar views on credit, it could be concluded that the National Credit Act is a strong framework that ensures that credit is only provided by registered credit providers. However, the dispute ratios were cited to be around 15 to 20% for early debit platforms. This brings into question how protected

consumers are in the credit arena. In terms of digital payments, the key informants felt that consumer protection powers were effectively and successfully exercised. The figure below shows that the key informants perceived that the consumers were well protected by legislation and that digital credit, savings and payments products were more secure financial products for lower-income consumers to use. Two major factors that play a role in determining safety are cybersecurity and financial literacy. For lower-income consumers, financial illiteracy represents a larger problem related to their lower education levels. The simplicity of digital financial products is important as it reduces the chances of disputes arising between clients and providers. Regarding cyber security, more awareness is needed regarding the dangers of consumers not protecting their personal information. Moreover, financial literacy should include digital literacy that provides consumers with knowledge of ways to mitigate the risk of cybercrime.

Figure 46: Consumer protection: In the South African context, are these digital platforms generally safe for lower-income consumers to use?[9]



Source: Author's calculations using own primary data

[9] Ranked from: 1=Strong No, 2=No, 3=Unsure, 4=Yes, 5=Strong Yes

6.5.1 Product mis-selling

According to two key informants who were involved in regulation at the time of the study, one of the key discussion points that came out of the Intergovernmental FinTech Working Group (IFWG) workshop held between 19 and 20 April 2018, was that digital financial products and services tend to be more geared towards the middle-income consumer and enhancing their banking experience, as opposed to adequately meeting the needs of lower-income consumers. As a result, a lot of product mis-selling may be taking place. A similar conclusion was reached by another key informant working in a regulatory body. Product mis-selling takes place when products are initially developed for middle-income consumers and then marketed to all consumers regardless of their socioeconomic standing. Despite differences in tastes, preferences and needs, lower-income consumers are still prone to be sold products designed to fit the needs of middle-income consumers. A key informant who used to work in the banking sector noted most products are modelled for wealthy clients, such as private banking products. Product development teams at banks try and replicate that process in the lower-income market, modelling lower-income products in the exact same way. As a direct result, the lower-income consumers do not understand the products nor that the products are marketed to them. The products do not meet their needs because they have not been matched to specific circumstances or the specific behaviour that the lower-income consumers exhibit.

One of the key informants gave the example of the grants space which they said was occupied by 16 to 20 million South Africans. The SASSA grant system enabled millions to be included in the formal financial sector, but very little financial depth was reached with those that became included. One of the key informants argued that this may have been an example of a mis-sold financial product as the consumers did not really need the services. Hence, once they became banked, the peculiar behaviour of withdrawing all the money upon payment become widespread. This negated any sort of real financial inclusion that took place. SASSA epitomises the disconnect that exists between uptake and usage in the South African financial sector, particularly among lower-income consumers. One of the key factors driving this disconnect is intentional and unintentional product mis-selling by FSPs.

The regulatory environment has a role to play in ensuring that consumer needs and financial products that are developed and marketed are better aligned. The area of competition is a critical

entry point for policymakers to ensure that new entrants are serving the lower-income segment. One of the key informants working at a regulatory body shared that FinTech companies in South Africa are yet to serve the lower-income market adequately. Rather than transforming the financial sector, much of the competition for market share is taking place in the middle and upper-income market, where more revenue per customer can be expected. If this continues, the lower-income market will not benefit from the Fourth Industrial Revolution shifting the financial sector.

6.5.2 KYC, AML and financial inclusion

Stemming from the traditional banking secrecy, proof of address has become a globally used tool for mitigating the risk of fraud, money laundering and the financing of terrorism. This has been further reinforced by FICA, 2001 (Act 38). Whatever its intentions, FICA has been criticised by members of the banking sector. For example, Hawkins (2012:6), who conducted nine key informant interviews in South Africa, reports that seven out of the nine key informants felt FICA was acting as a barrier to low-cost banking.

Proof of address as a tool was critiqued by all the key informants in the current study as an ineffective way of mitigating the above risks. All the key informants cited new technological methods such as biometrics that can improve the ability of banks to carry out their KYC checks, as well as reduce the cost of conducting KYC checks. One of the questions they were asked, was 'what type of risk are banks actually able to mitigate by having proof of address?' The appropriateness of this may be called into question in the African context, where not all physical addresses are recorded in government records or are easily verifiable. Furthermore, millions of lower-income consumers live in informal settlements, backyard shacks and rural communal areas where they do not receive municipal bills, have title deeds to their homes or have a separate mailing address. Hornby, Kingwill, Royston and Cousins (2017) estimate that in 2011, "around 30 million people, nearly 60% of all South Africans, lived on land or in dwellings held outside of the cadastral system". Without the required paperwork, those that are disadvantaged are unable to open a bank account or a store account at a clothing retailer. Access to formal financial services such as a debit card and credit card becomes impossible and these populations are forced to make use of cash and other informal financial services. This places these consumers at an increased risk from FSPs such as microlenders and informal lenders that might target vulnerable lower-income consumers.

Another risk this poses is that it creates more inequality as lower-income consumers will not receive the welfare gains of making use of financial services.

6.6 Transparency

From a transparency perspective, most of the key informants agreed that the financial sector regulations were well thought out and were sound in their specification of how banks should conduct their business in order to protect the interests of clients. In terms of interest rates and banking fees, each bank is required to list any fees or costs to consumers. Consumers are well protected by the Consumer Protection Act. Issues that may exist which perhaps lead to disputes and complaints that go the Ombudsman for Banking Services are usually related to clients not understanding the terms and conditions involved. Financial illiteracy could also play a contributing role to any disputes that may exist between providers and clients that are related to transparency.

6.6.1. Information asymmetries

In terms of information asymmetries, most of the key informants agreed that information asymmetries exist in the financial sector between financial service providers and clients, with one of the key informants giving the example of credit lending. One key informant who worked in regulation asked some key questions that point to some of the limitations of the data held by FSPs:

> Even though an FSP may be able to look at the consumers' social media data, how do they know that there is no moral hazard? How do they know that the consumer is not going to smash their window and tell them that they got hijacked yesterday? Those behavioural aspects don't go away. Even though added data helps, but the client's behaviour may not always be correlated to the data-derived insights that the FSP has. From a consumer perspective, the question that remains to be answered is how does a client know they are getting the best value for money?

Platforms have been developed for meeting this information asymmetry issue. For example, the South African FinTech company, My Treasury, enables consumers to compare prices of financial products and the interest rate returns that they can get on varying financial products, based on their needs. Information asymmetries prevent rational and effective decision-making. Some of the bad financial decisions that consumers make, such as withdrawing all their income upon payment or incurring high banking fees from withdrawals, are to some degree due to a lack of information.

Some South African banks do make efforts to inform consumers of ways that they can save money that they are currently losing due to a lack of information that led to them making bad financial decisions.

Although it is unclear to what extent robo-advisers have penetrated the South African financial sector, one of the key informants felt that robo-advisers offered a unique opportunity for tackling information asymmetries by providing clients with real-time, data-driven advice to improve their decision-making.

6.7 Financial literacy

Financial literacy is part of consumer protection and market conduct. According to one of the key informants, although financial literacy is the responsibility of all stakeholders, the primary lead for this should be taken by the newly formed FSCA, followed by National Treasury. Financial literacy is regarded as a priority area by the South African Reserve Bank and is discussed in the Reserve Bank's Vision 2025 document, although the SARB is mostly occupied here with locating financial inclusion within the national payment system (SARB, 2018:20). The document does, however, specifically envisage among its listed strategies launching more 'consumer education initiatives'. The Reserve Bank's rationale for educating the consumer is to increase awareness as well as trust in the electronic payment system (SARB., 2018:21).

Some of the key informants felt that many South Africans were not financially capable. This was not only perceived as a huge problem among the lower-income population, but the population in general. The initiatives that were put in place were regarded as ineffective by two key informants who both argued that a different approach was required. One of them felt that a roadmap/ dynamic approach was required in financial literacy presentations. That is, a thorough explanation of what financial products are suitable for clients at different stages of their lives and what to do when one's income increases, and the entry-level bank account is no longer suitable. The latter issue is pertinent to financial products such as the Mzansi account. The financial literacy pitch should not only consider a client's current income but potential and future income as well. In terms of the roadmap approach, it was mentioned that a farm owner might not look like the traditional client for derivative products but could benefit from learning about hedging risks rather. The key

informant argued that this approach was better than simply providing the farm owner with a savings/ credit product.

One key informant argued that financial literacy campaigns were often inappropriate and are misguided. It was suggested that the root problem was not that consumers were financially illiterate but that the problem was what was being offered was not what people needed. Standard Bank spent a lot of time assisting customers at ATMs and being more practical in tackling challenges that new customers might face in understanding financial products. From a costing perspective, this approach is expensive, and it was hard to justify helping primarily lower-income consumers in disadvantaged areas. It was considered more cost-effective to provide financial services in more affluent areas where consumers tend to be more financially literate. It can, however, lead to shorter queues and fewer customer complaints which will ultimately benefit the FSP.

The market conduct regulator (key informant) felt a lot of financial education work needed to be done. However, there needed to be support from the co-set of regulators. FSPs are trying to promote financial education through making use of their data. This is especially important in the savings space. The different types of savings accounts are digitally accessible. A key informant that worked at an FSP noted that the FSP was able to intelligently drive lower-income customers from digital wallets that are primarily used to send money towards beneficial savings products (tax-free, interest-free and interest-bearing savings accounts). All of these efforts can lead to increased savings among lower-income customers and consequently increased welfare.

6.8 Product fit

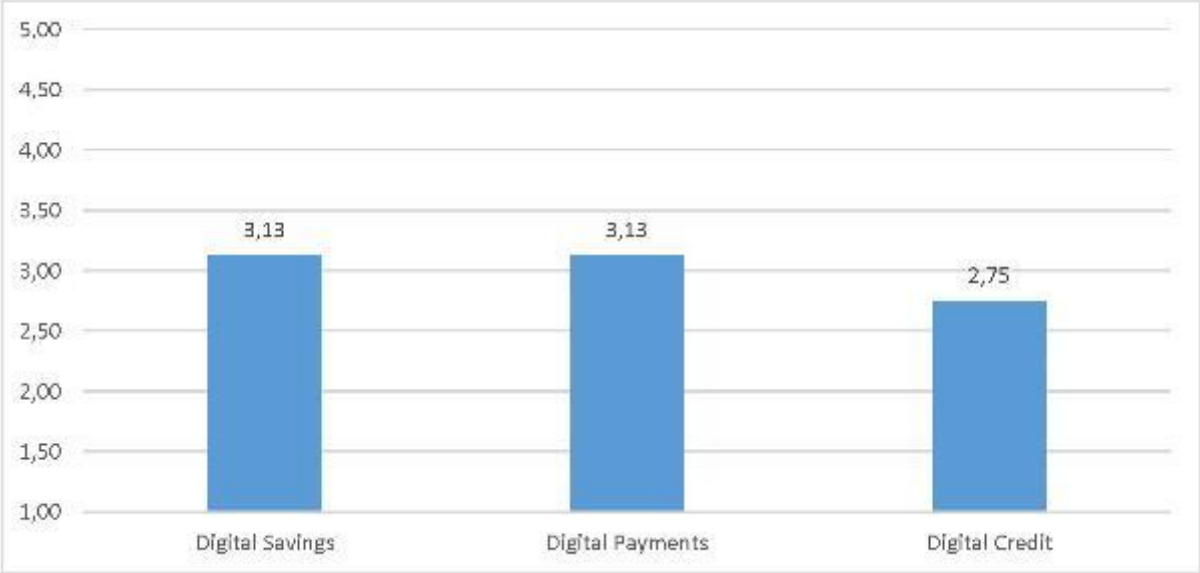
Product fit considers whether the DFS meet the needs of lower-income consumers. The key informant discussions indicated that DFS are largely targeted at middle-income consumers. Digital savings and payments were slightly able to meet the needs of lower-income clients. There was however a general misalignment between digital products and the needs of lower-income consumers. This is seen in the graph below which shows that most of the key informants were largely unsure about whether the needs of lower-income clients were being met by digital financial products. The internet plays a role in facilitating the interaction of lower-income consumers with DFS. Unfortunately, barriers to internet access mean that lower-income consumers tend to be excluded from DFS. As a result, they do not demand these services and consequently, FSPs do not

provide these services in a targeted manner that is inclusive of lower-income consumers. This disconnect is indicated in the poor scores given for digital payments, savings and credit[10].

In order to meet the unique demands of lower-income consumers, telecommunications companies and other large business could potentially make use of their big data to reach this market which largely remained underserved by banks. One of the key informants noted that forcing non-banks to partner with banks was a huge problem. Reason being that products like M-Pesa and MTN mobile money which had lower-income consumers at the heart of their designs failed as a result of legislative rigidity. The key informant argued that the solution was to amend legislation to be more accommodating of new market players, as seen in other jurisdictions. For instance, as one key informant explained, regulators in the United Kingdom played an active role in facilitating other market players to serve markets where incumbent banks had failed to meet the market demand. The dilemma, however, is that regulators need to balance competition with financial stability and understand the risk of failure and the implications that could have for the economy.

Figure 47: Product fit: Do the following products meet the needs of lower-income consumers in South Africa?[11][12]

[10] It is important to note that these scores were dependent on what DFS came to mind when the individual tried to match the consumers' need to the DFS.
[11] It is important to note that these scores were dependent on what DFS came to mind when the individual tried to match the consumers' need to the DFS.
[12] Ranked from 1=Never, 2=Seldom, 3=Unsure, 4=Sometimes, 5=Often



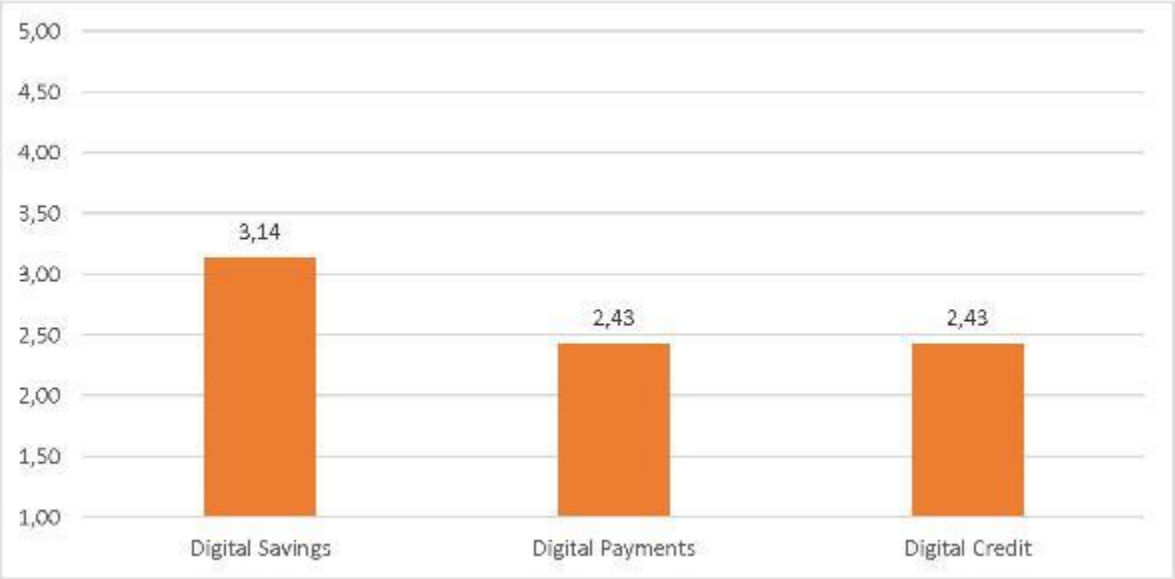
Source: Author's calculations using own primary data

6.9 Affordability

The affordability of financial services is an important factor for sustained financial inclusion. Without having products that are affordable to clients, high attrition rates will likely occur where consumers' bank accounts will either be closed or remain inactive. Lower-income consumers are particularly sensitive to affordability as a determinant of sustained usage. One of the key informants, who was currently part of regulation, argued that prices should be regulated in the financial sector, as the informant perceived margins to be at levels that were too high and detrimental to the consumer.

Figure 48: Affordability: Are the following digital financial products generally affordable for lower-income consumers in South Africa?[13]

[13] Ranked from: 1=Strong No, 2=No, 3=Unsure, 4=Yes, 5=Strong Yes



Source: Author's own calculations

One key informant stated, "what usually kills it for the poor is all of these admin charges". This is a key area for policymakers to ensure that sustained financial inclusion takes place. The reason why DFS are important is that they cut the cost of banking in terms of accessibility. Consumers save in terms of travelling and in terms of time. The key informant scores suggest that DFS are generally not affordable for lower-income consumers. The cost of digital payments needs to be addressed. It is, however, clear that there are differences across the digital payment products available in the South African payments sphere. Some are more sensitive to the needs of lower-income individuals. This is important, especially with respect to remittances which have a significant economic impact in rural areas in South Africa. Expensive digital payment products therefore negatively affect the economic livelihood of the most vulnerable in South Africa.

The table below lists the costs of digital financial services in South Africa. Keeping in mind that lower-income consumers tend to transact with lower-value amounts, the costs listed below are discouraging. For instance, if a lower-income consumer needed to send R100 through a DFS in South Africa, roughly 10% of that amount would be taken by the bank. Capitec, which is not listed below, does not have a mobile money service that enables users to send money to clients of other banks. From a functionality perspective, this is not inclusive for lower-income consumers who have family members banked at other banks.

Table 19: Costs of digital financial services in South Africa

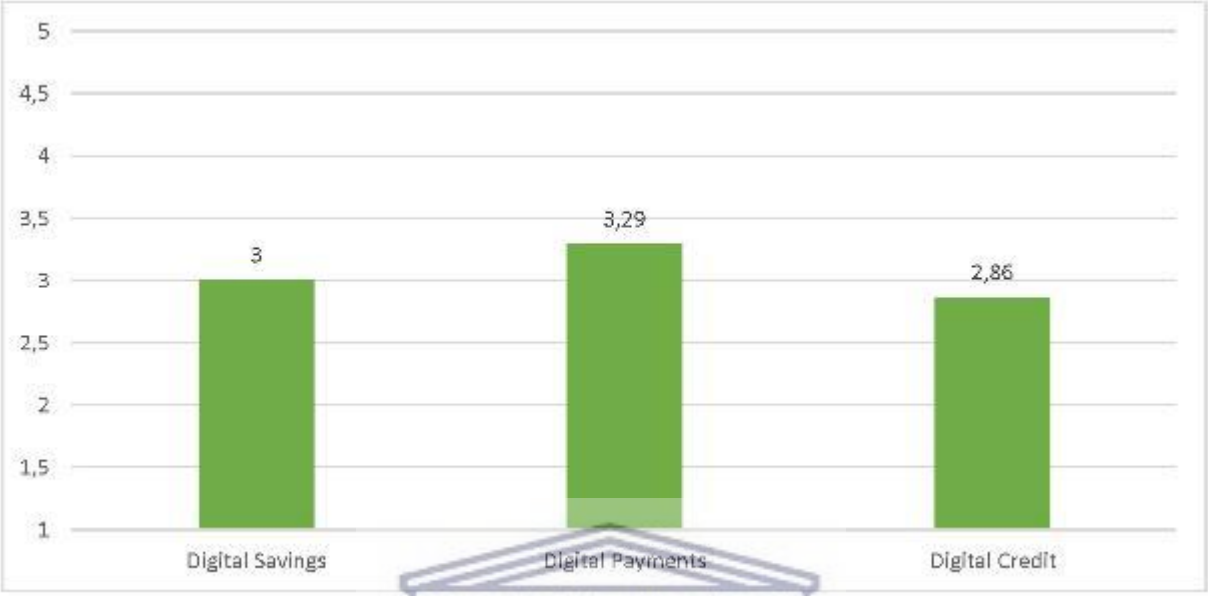
Fees for the sender	ABSA CashSend	FNB eWallet	Nedbank Send iMali	Standard Instant Money
Daily limit	R3000	Send up to R3000 per day using online banking or the app and R1500 using cell phone or ATM	R2500	R5000
Fee to send money	R8.50 on entry-level transact account. Exact fee depends on the bank account held.	R10.95 flat fee for up to R3000 per send	R8.50 for amounts up to R1000. R14 for amounts of more than R1000	R9.95
What channels can be used to send money	App, online banking, cell phone banking or ATM	App, online banking, cell phone banking or ATM	App, online banking, cell phone banking	App, online banking, cell phone banking or participating retailers
Data zero-rated on the app only	Yes	Yes	Yes	Yes
Fees for the recipient	ABSA CashSend	FNB eWallet	Nedbank Send iMali	Standard Instant Money
Cash withdrawal at bank's own ATM	Free	1 free withdrawal per Send Money transaction - thereafter R8	Free	Free
Cash withdrawal at shop	N/A	Free at selected Spar outlets	N/A	Free
Shop purchase fee	N/A	Free	N/A	N/A
Pre-paid purchase	N/A	R1.75	N/A	N/A
Balance enquiry	N/A	Free	N/A	Free
Validity of PIN used to make withdrawal	30 days	4 hours. Receiver can request another PIN anytime	7 days	30 days

Source: https://www.sowetanlive.co.za/business/money/2018-03-01-know-what-you-pay-when-you-send-cash-via-a-phone/

6.10 Convenience

The convenience of financial services is a crucial aspect and is strongly linked to the access aspect of financial inclusion. As reflected in the figure below, the question posed to the key informants considered forms of DFS that might be assumed to make the consumer's life easier.

Figure 49: Convenience: Are the following digital financial products making the everyday lives of lower-income consumers easier?[14]



Source: Author's own calculations

There were mixed views on this question as a lot had to be considered. Different products operate at different levels of functionality. This would lead some key informants to make judgments based on the subset of digital financial products that came to mind. It could be inferred that in some cases and at some level, there is access to DFS. This type of access should, however, not be conflated with the product being appropriate or what people need. One key informant felt that DFS potentially made the consumer's life easier in several ways. People could receive a salary or a grant as a result of having an account and digital access. This held many benefits for the consumer such as reducing the inconvenience of receiving income which could not be monitored or verified. This would assist a client wanting to qualify for a loan as it would provide proof of income. A digital bank account could be a starting point for increasing the usage of other digital financial services. A DFS also reduced the cash carrying risk and reducing the need to visit a physical bank branch, a great convenience benefit for people living far from ATMs and banks. Despite these benefits, digitalisation has not occurred on all fronts in South Africa. One key informant gave the example of Brazil, where clients can remotely do their KYC and can remotely open a digital

[14] Ranked from: 1=Strong No, 2=No, 3=Unsure, 4=Yes, 5=Strong Yes

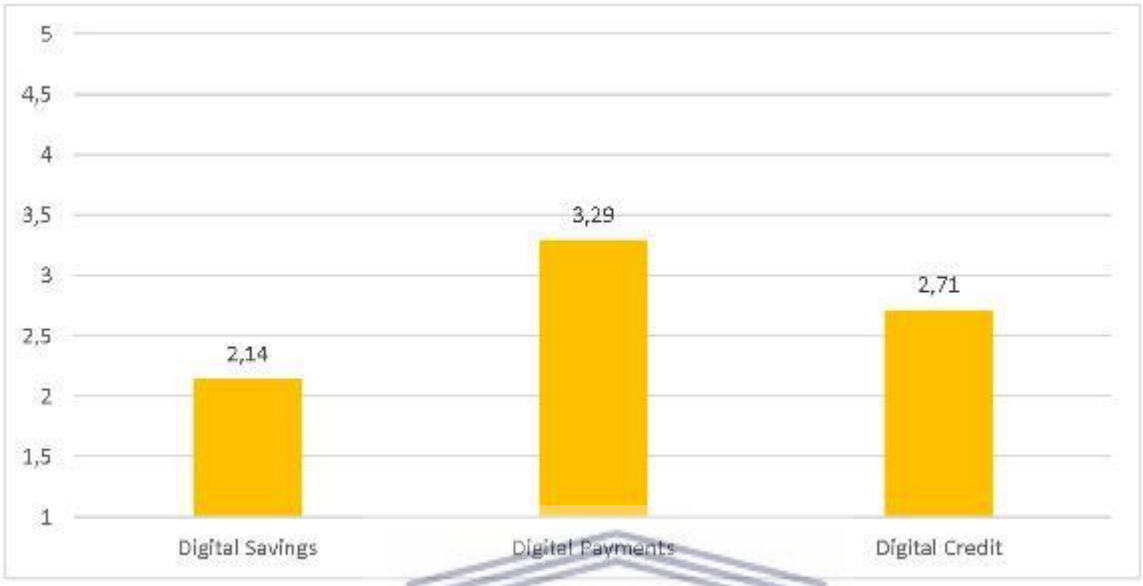
account that constituted an additional ID. This is yet to occur in South Africa, where KYC information such as proof of address must be provided in person. Moreover, opening a digital account of some sort requires one to at least visit an ATM. One of the key informants felt that if such barriers are removed, savings rates would increase and the amount of formal small value credit taken up would also increase, particularly among those currently disproportionately excluded, e.g. farm workers and people living in rural areas.

Currently, the acceptance of deposits is done in deposit-taking institutions. These include banks and automated deposit systems for lower-value accounts. Not being close enough to a bank or ATM is an access issue that can be a significant inconvenience. This is a crucial determinant of usage patterns. The banking agency model was meant to address the issue of proximity to points of interaction. Hawkins (2012:6) considers FICA to be one of the barriers to the banking agency model. Similar to the perceptions of the key informants in this study, one of the key informants in the Hawkins study highlighted the weaknesses of using residential addresses and identity documents as entry requirements for consumers to be formally banked in the South African context (Hawkins, 2012:6). There are however market gaps for improving convenience. Not many payment agents exist across the country, particularly in residential areas. Most shops deal with customers in cash, so the scourge of cash persists in South Africa. One of the key informants pointed out that one supermarket group loses a person a month through being shot in robberies targeting the cash. Yet there isn't a sufficient, robust, targeted means of digital payments. The use of nearfield communication on mobile money going through the tills, or QR codes on the same platform, hasn't yet occurred significantly. Like most FinTech firms, Snapscan is experiencing uptake at an upper market level and has yet to address the day-to-day cash-related inconveniences that lower-income consumers experience. In terms of the gap for DFS in the credit space, one key informant felt that the National Credit Act is quite robust and makes it challenging to provide credit products, particularly lower-income credit products. Moreover, the cost of all the mandated checks is exorbitant if one wants to provide microcredit. Owing to the restrictive laws, digital credit has yet to become as efficient and effective as in places like Kenya. Consequently, too much credit is provided based on bad information which has driven up over-indebtedness, especially in-store credit. The combination of over-indebtedness and stringent credit regulations makes South Africa an environment that is not conducive to innovative solutions to how digital credit can make the lives of lower-income consumers more convenient.

6.11 Welfare

Financial inclusion is not an end but a means to an end, that end being improved welfare. For financial uptake to translate to welfare, the financial product needs to be accessible. After accessibility, usage is the crucial determinant of whether the welfare of an individual will improve. For a long time, this has been the notion presented in much of the literature. One key aspect that is seldom cited and never explored is that of the quality of financial inclusion. Quality factors are the drivers of usage and explain why customers stop using certain financial products. They also provide entry points for policymakers to improve the welfare of individuals. One such example is that of improving product fit. If products don't fit the needs of consumers, consumers are less likely to continue using the product.

Figure 50: Welfare: How significant an impact have the following digital financial products had on the welfare of the lower-income population in South Africa?[15]



Source: Author's own calculation

The results in the graph above indicate that the economic impact of DFS on lower-income consumers has been poor. In terms of welfare, some informants even felt that digital credit had a negative impact on the well-being of lower-income consumers and in fact should not be targeted at that group. Digital payments have been slightly more successful than the other DFS in terms of the ability to facilitate the transmission of domestic remittances to poor households. FinTech has definitely played a role in terms of enabling this type of financial and economic inclusion. Both traditional and non-traditional data have been used by FSPs to understand the lower-income consumer and this has led to somewhat inclusive digital payments channels. The economic impact of digital payments could be greater if not for financial illiteracy, a lack of trust and affordability barriers that are associated with digital payments.

With the goal of sustainable financial inclusion in mind, policymakers can intervene in settings and rails that already exist such as the stokvel system. Despite the poor savings culture in South Africa, stokvels are quite effective, according to one of the key informants. Hence, there is somewhat of an inherent savings culture, if not at a formal savings account level. The key

[15] Ranked from: 1=Highly Insignificant, 2=Insignificant, 3=Unsure, 4=Significant, 5=Highly Significant

informant noted that previously, the stokvel's centralised money was not previously kept in an account, which sometimes led to the money being stolen or people being targets of robberies. The insignificant digitisation of the stokvel system prevents stokvels from thriving as they should. The potential impact on welfare if stokvels are digitised is significant as it will encourage more entrants into the formal stokvel market and increase the interest gains from the entire pool of money. The welfare implications of this could be significant in terms of providing increased savings for lower-income families to use for education and health purposes.

Another welfare improving mechanism for savings is that of commitment-related digital savings products. One key informant argued that consumers could derive value from savings products if there is some sort of barrier preventing them from withdrawing their money. This was such an important factor that the key informant related a real-life story of a woman who walked 30 km whenever she wanted to deposit money. She could have banked closer, but she decided to bank 30 km away as a mechanism to keep her from withdrawing cash frequently. An example of a financial product with such appropriate barriers is that of a fixed-term account which protects consumers from the adverse pressure that they might have from their community or family to withdraw their money. It is clear that a more behavioural approach to digital savings could have a significant impact on savings culture as well as on welfare.

Credit could also improve the welfare of lower-income consumers. Mixed views were had on credit and its welfare implications, especially for lower-income consumers. Some felt that digital credit products were not benefitting the lower-income group and leading to over-indebtedness. The high entry costs into formal credit created a problem for many lower-income consumers. South Africa's strict credit regime meant FinTech companies would struggle to enter this market. New entrants could become formal providers, in which case they needed a significant amount of capital in order to be approved as a formal credit provider. The other options are that of microlenders, which are providing credit to clients due to their inability to enter the formal credit provider space. This has had negative welfare implications for lower-income South Africans who have fallen prey to quick loans that were coupled with ballooning interest rates. In order for DFS in the credit space to improve the welfare of lower-income consumers, one key informant felt that regulators needed to reopen space for digital peer-to-peer lending where lenders can get a return and consumers can understand the risk of these peer-to-peer lending models.

Another more helpful approach is to improve access to alternative credit scoring mechanisms. This could allow for more robust credit scores that do not exclude lower-income individuals based on the fact that they do not have traditional income streams. Although this has not been widely performed in South Africa, the Jumo digital lending platform, that provides loans to various individuals in different African countries based on non-traditional data, is a success story of how DFS in the credit space can be used to improve the welfare of the lower-income population. Two key informants identified the movement from traditional data to alternative data as a key enabler of better credit scoring. These alternative credit models include sensor data and data from mobile applications. Through this, they have been able to start offering financial services to consumers that were previously considered unbankable but in fact just did not have a traditional cash flow or behave as traditional clients. The low visibility and high perceived risk of such clients are slowly being reduced through alternative credit scoring models.

From a payment perspective in the South African context, domestic remittances are well known to alleviate poverty and improve welfare. One of the ways the process can further benefit the recipient is through the seamless transfer of funds through digital channels. One key informant noted that South Africa's payments space still needs to get to the point at which there would be almost zero costs and no friction in payments. This will be difficult considering that the banking model is fee-based and largely does not accommodate micro-transactions.

6.12 Use case

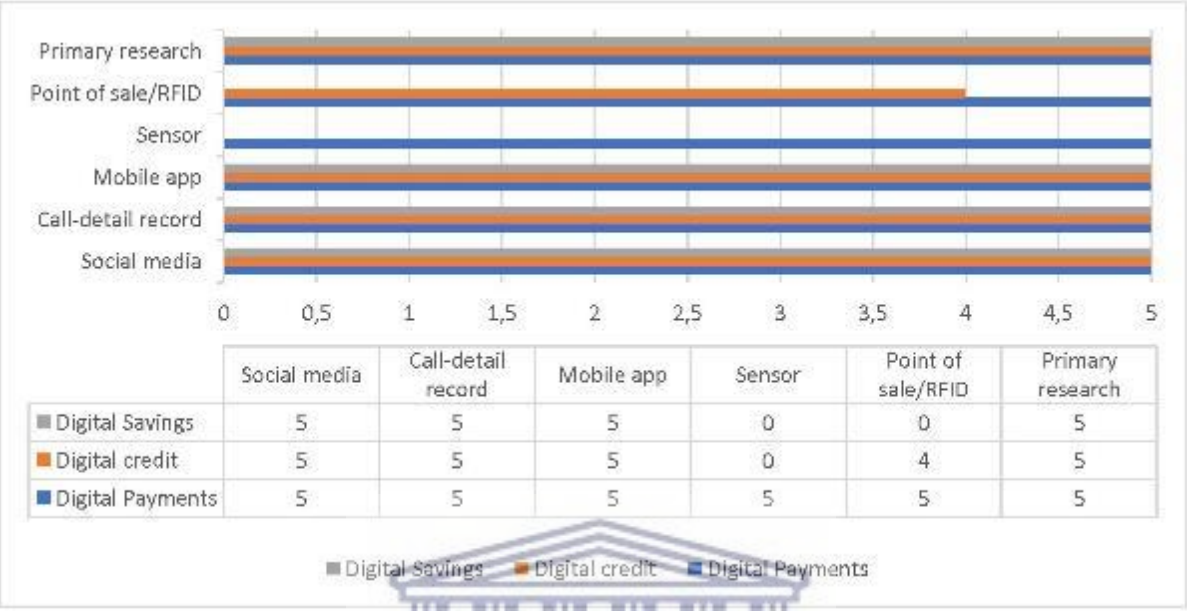
This section answers the research objective to determine, through a large FSP, what impact data generated from financial technologies has had on financial inclusion, specifically the quality of financial inclusion. This will be done by looking at the use cases in South Africa and how data was used to develop DFS that financially includes the lower-income population.

Large FSP

i. Data

From interviews with key informants from the FSP, it became clear the FSP makes extensive use of all forms of data, structured and unstructured. The data was primarily used for enhancing their digital payments platform. Below the different types of data used by the FSP are discussed.

Figure 51: Perception of welfare impact of the data used by the FSP on lower-income consumers[16]



	Social media	Call-detail record	Mobile app	Sensor	Point of sale/RFID	Primary research
Digital Savings	5	5	5	0	0	5
Digital credit	5	5	5	0	4	5
Digital Payments	5	5	5	5	5	5

Source: Author's calculations using key informant insights

Social Media data

The bank representative noted that the bank usually gets complaints through social media that are related to financial literacy. The bank makes use of this data in its decision-making processes. For instance, this type of data is used to understand whether social media is an access mechanism, for example, for lower Living Standards Measure (LSM) customers to use for financial literacy purposes. The bank also makes extensive use of social media to understand which problems customers have with regards to its digital platforms, e.g. what complaints are being received regarding the bank app?

Call-detail record data

In terms of query and reporting, call centre data is used in this regard. What is most important is using this data responsibly. The call centres work laterally rather than in silos. Every interaction is voice recorded to avoid miscommunication. Despite all calls being recorded, the FSP did not prioritise this type of data and therefore when the data was collected and analysed, no feedback or

[16] Ranked from: 1=Highly Insignificant, 2=Insignificant, 3=Unsure, 4=Significant, 5=Highly Significant

review processes were in place to ascertain the value extracted from this data and whether the FSP was making the best use of CDR data.

Mobile app data

Data is collected from anyone using the bank's mobile app or USSD commands on their phones for digital payments. This data is collected and used for data mining insights. Usually, trends on consumer usage are assessed, i.e. what they are paying for or if there were specific payments to one entity (e.g. to the landlord). This will translate into pop-up messages on the screen, perhaps the next time that a customer logs in. For example, the bank may send a message stating that, based on the customer's payment trends, an imminent payment is due on a particular date. The bank will then prompt the customer intelligently and ask before the time of payment whether he would like to schedule the payment for that day.

Sensor data

The FSP has developed a cloud-based payments platform with one of its partners. The product allows an individual to make payments with merchants by simply tapping their device at the point-of-sale. This act transfers funds from the individual's mobile wallet to that of the merchant. This is securely done through the contactless payment's device.

Point-of-sale data

From a point-of-sale perspective, the FSP representative noted that the retail area was becoming a key market of interest. Similar to Samsung pay or Apple pay, the bank's app allows clients to tap and pay using their phone. This, in turn, generates data that informs the FSP on client usage trends which later allows the FSP to enhance the customer's experience and solve any issues. The FSP is able also to identify the type of phone software that is used, e.g. Apple or Android.

Analytics

The FSP made extensive use of all types of analytics. Voice analytics was the only exception, where the respondent noted that due to a lack of a proper review of the insights generated from voice analytics, this method was not as impactful as the other analytical methods. Data mining is used for digital credit, the banks look at the data and consider whether a customer qualifies for a loan based on data mining insights. In terms of digital payments, the channel that customers are using is analysed through data mining. This is done very intelligently for home loans and insurance. This data is used to talk logically and intelligently to consumers.

Applications and Insights

The FSP used the data collected to improve their mobile money wallet and provide a way to include those that were previously excluded. What the FSP realised was that they had a lot of information on remittance senders who banked with them. They also realised that quite a number of people who received remittances from those senders did not have a bank account. Remittances are a crucial supplementary income or even in some cases the only form of income to a poor household. Ensuring that this income flows seamlessly to those that need it to live day to day is essential for the survival and the upliftment of poor households. Through the second iteration of their mobile money wallet, the FSP removed the need for the remittance receiver to have a bank account. As a result, previously unbanked populations have now begun interacting with financial services. This has become an entry point into the formal financial sector for the previously financially excluded and those that participated in informal finance. The app also enables the receiver to buy airtime and make prepaid payments for water/ electricity without incurring any monthly fees.

Convenience

In terms of convenience, the key informant said, "we could define convenience as, oh, we got 50 ATMs in KZN and it is accessible to all customers…but that is just a blanket statement". He further added, "We have to actually dig into the data and find out what is being used". As an example, the key informant explained how they were applying their insights with the geolocation module. The bank is able to drive withdrawals from an ATM to a retail store. Having multiple retailers involved in that network is important to facilitate more convenient banking for the customer. Another example made regarded prepaid products like electricity. Many South Africans need to make prepaid payments every month for electricity. It becomes rather convenient for customers to avoid waiting in long queues or travelling to a point of sale to make the payment. By allowing customers to purchase prepaid electricity anywhere via their mobile device and any other channels that are available, the bank is able to facilitate better quality financial inclusion through providing DFS that make the lives of consumers easier.

Financial literacy

The bank also makes use of its insights for financial literacy. The bank tries to understand the devices that are used for a specific LSM, e.g. cell phone or local radio. For instance, if it is the cell phone, the bank's response relies on sending SMS and MMS financial literacy help and cues. If a customer has the bank's mobile app, the bank sends information to the customer that is more

geared towards their specific type of profile. Over and above using technology as a medium to promote financial literacy, the bank has found that having a community presence and undertaking campaign days are crucial, especially among lower LSM groups.

How the FSP views consumer protection

The FSP representative constantly mentioned that the bank places a huge emphasis on using data responsibly and that the bank adheres to fundamental principles of treating customers fairly. In fact, the FSP goes through their governance framework in the development cycle to ensure that they are building products that don't break any laws. This was not done across the whole financial sector. This representative pointed out that the lending space is one such area where some FSPs do not act ethically. For instance, a client who qualifies for a loan but would be worse off if she took the loan should not immediately be given the loan requested. The FSP could provide more assistance through understanding why the customer needs to borrow the money and perhaps responsibly influencing the conversation in a way that ultimately benefits the customer.

There are clear guidelines that FSPs have to be aware off when handling data, such as the prescripts of the POPI Act. This informs how banks collect information and how it is stored. The Payment Card Industry Data Security Standard (PCI DSS) is also important for banks from an interbanking point of view, e.g. the acceptance of Bank A's card at Bank B's ATM. MasterCard and Technoserve-branded cards also come with their own governance protocols. FSPs in South Africa undergo an annual certification with MasterCard or Technoserve to verify that they are in alignment with regulatory requirements in terms of card acceptance, as well as managing card-specific information in the FSPs' data systems.

ii. Economic impact

From a welfare perspective, the changes the FSP made in modifying their mobile money wallet significantly improved the welfare of remittance receivers, who tend to be lower-income populations. In terms of functionality, the USSD dial string is also applicable to the wallet. This allows lower-income populations who might not have a smartphone, or perhaps do have a smartphone but cannot use the internet due to a lack of data (not benefitting from South Africa's ICT infrastructure, to actually make use of the mobile wallet). This could potentially have a significant impact on the livelihood of lower-income populations because of its inclusivity at the product development level. Through not incurring monthly fees, lower-income mobile wallet users

are able to break the affordability barrier and, through the USSD dial string, the ICT infrastructure barrier is broken.

6.13 Conclusion

This chapter consisted of the qualitative findings from the key informant interviews. The findings indicate that, while South Africa has a well-designed regulatory framework that protects consumers and ensures financial stability, the framework does little to ensure that the financial sector is inclusive of those currently economically and digitally excluded. Therefore, while South Africa may be performing well on transparency and consumer protection indicators, the system is not performing well in terms of affordability, product fit, financial literacy, convenience and, ultimately, developing sustainable financial inclusion that leads to improvements in consumer welfare. The challenges that regulators and FSPs face, however, are not easy to tackle as they are not solely a financial inclusion problem. High unemployment rates and severe economic inequalities mean that factors such as affordability affect people unevenly. High bank charges are more of a barrier to usage and uptake for the lower-income consumer. Financial literacy, while it should be improved for all, has several nuances. For instance, while the concept of 'compound interest' may be easy to comprehend for high-income adults who reside in urban areas, an individual who does not speak English as a mother tongue and does not reside in an urban area may not be familiar with the term 'compound interest's, but may understand the concept. Digital financial services can automate processes and can be programmed to use languages that are appropriate to the targeted demographic. There is a clear opportunity to usher in previously excluded individuals, as well as enhance the current experience of banked individuals who may be underutilising banking services due to affordability, convenience or financial illiteracy problems.

CHAPTER SEVEN: CONCLUSION

7.1 Introduction

This thesis investigated the economic impact of FinTech in South Africa with a particular focus on financial inclusion. The study made use of primary data from key informant interviews as well as secondary data from Finscope. The supply-side findings from the key informant interviews were assessed and synthesised along with the demand-side findings from the Finscope data, as briefly summed up below. After briefly highlighting the key contributions of this study, the chapter concludes with the most pertinent recommendations for policy and the areas of future research that were identified in the study.

7.2 Discussion and findings

The Fourth Industrial Revolution has impacted on every industry, with the financial sector experiencing significant digital disruption, particularly due to the impact of SMACT technology. From a consumer or demand-side perspective, social media and mobile technologies (cell phones in particular) have led to a greater degree of consumer empowerment at all levels of income. With more information at their fingertips, consumers have been exposed to a wide range of products being offered to them on these media. Consumers are making use of data-driven SMACT devices e.g. cell phones, tablets and computers. Producers and government are improving technology, widening the range of its applications and transforming the capacity and range of its enabling infrastructure These advances, coupled with the integration and multiple interfaces encouraged by the growing implementation of the Internet of Things, have enabled banks to generate and collect structured and unstructured data on an unprecedented scale and depth that is enabling banks to develop disruptive new products and enhance existing ones. Consequently, this has led to greater financial product uptake, access, usage and quality. The study finds that the overall financial ecosystem, albeit with several important caveats, has become more financially inclusive for lower-income consumers thanks to FinTech.

The study made use of demand-side data from Finscope and supply-side data from key informant interviews. The key informant interviews included regulators, research consultants, academics and an FSP representative. The insights from the interviews indicated that South Africa has high

financial inclusion uptake rates. This confirms findings from the Finscope data that indicate that roughly 80% of adults in South Africa are financially included through formal banks. In fact, there were significant improvements in financial inclusion rates across all income classes over the period 2012 to 2015. Despite the fact that financial inclusion rates are so high, the opportunity for further inclusion that could be driven by DFS has been limited due to a lack of interoperability, inflexible regulations and high data costs. Those that have been left behind are those that have been most economically excluded, i.e. those that do not have a source of income. This group's economic exclusion puts them at an increased risk of also being financially excluded. Internet access had some positive effect on the resilience of this group to being financially excluded, despite being economically excluded. While cell phone ownership is foundational in having access to internet banking or cell phone banking, owning a cell phone does not necessarily mean that the individual has internet access. The key informants underscored the importance of ICT infrastructure and access to WiFi as a key enabler of DFS uptake. However, Internet access among lower-income groups was found to be limited by the high cost and unaffordability of data bundles. Consequently, lower-income consumers lack significant access and remain on the periphery of the Fourth Industrial Revolution. Their situation is not homogeneous, however, as lower-income consumers who reside in urban areas – where the ICT infrastructure is more prevalent and where some free internet access is possible through workplaces, bank branches and public hotspots – were found to be more likely to be formally banked compared with lower-income consumers who reside in rural areas and urban informal areas, where ICT infrastructure is generally poor.

The use case that formed part of the study indicated that the FSP was aware that major gaps existed in addressing the barriers that lower-income consumers face in accessing financial services. It was also clear that, although FSPs find it commercially more viable to target their products at middle and higher-income consumers, pressures from competitors, government and regulators are compelling FSPs to accommodate the underserved and unbanked segments of the economy. It was equally clear that the solutions lie in a combination of technology, intelligent use of data and consumer education.

The key areas of concern that were confirmed and emphasised in the key informant interviews were digital barriers, geographical access barriers and the unaffordability of DFS, specifically digital payments. The FSP in the use case was able to address all these barriers and launch a

product that could meet the need of lower-income consumers to remit money to dependent households in other areas. If scale is reached, the FSP could have a significant economic impact on the livelihood of lower-income households and improve the well-being of the sender and receiver through cutting transaction costs, improving convenience and removing any digital barriers that may exist as a result of the consumer not having a smartphone or internet access.

One of the more successful lower-income customers in terms of financial inclusion are social grant recipients. The introduction of the SASSA MasterCard in 2012 enabled many social grant recipients who did not have access to a bank account to a card that can store value. This was, however, critiqued by the key informants. While the SASSA card enabled millions of marginalised individuals to be included in the formal financial sector, very little financial depth was reached. In fact, the SASSA card only enabled grant recipients to make payments with the card or withdraw cash from the card. This did not lead to any meaningful financial inclusion in which the recipients were introduced to a wide array of financial products that could improve their welfare. The large FSP in the use case undertook a consumer financial literacy exercise that involved presentations to consumers on their product suite and the use of data on the consumer to understand their product needs. This was not and still is not happening with those that only rely on the SASSA card as their means of banking. Consumers in this segment may not see the need to open up a bank account because they already have something similar. As a financial product, this product is completely misaligned with the needs of social grant recipients. Moreover, it oversimplifies their needs. This can be seen in the fact that the vast majority of social grant recipients withdraw all their money upon receiving their payment. This even takes away the 'security' that the card should provide as possessing the cash exposes the social grant recipients to the risk of robbery. Looked at from this perspective, the SASSA card may have actually stifled further financial inclusion and ultimately had a negative impact on the quality of financial inclusion in South Africa.

Access measures have indicated that, while uptake rates may be high, adults who fall out of the bank agency model struggle the most to access formal financial services and therefore are more likely to either be financially excluded or to make use of informal financial services. The South African spatial and historical inequalities play a significant role in the ability of the banking agency model to effectively reach and service lower-income and poor households. Areas with poor infrastructure are less likely to have bank branches or ATMs in close proximity. There are also

clear disparities in ICT infrastructure between such areas and more affluent areas. Poorer areas also are more likely to be cash-based which poses a crime risk to individuals who transact in those areas. As a result, the biggest obstacles to formal financial inclusion in terms of uptake and access lies in these areas. All stakeholders need to find a way to make access possible in these communities. The goal of improving welfare and financial inclusion should be to reduce the cash base of less affluent neighbourhoods. This will reduce the risk of crime by reducing the opportunity, which ultimately will improve the security and welfare of individuals residing in those areas.

The usage trends indicate that financial services do not adequately meet the needs of lower-income individuals. Most financial products tend to be geared towards and designed for the middle and upper-income consumer in South Africa. This is even more so when it comes to digital financial services. The affordability barrier is responsible for the low internet banking usage rates among lower-income consumers. Furthermore, information asymmetry and consumer financial illiteracy can have severe implications for the economic, digital and financial inclusion of lower-income consumers. Information asymmetries mean that consumers may not be able to accurately assess whether they are getting the best value for money. This can lead to overspending and unmet consumer needs. Lower-income consumers who do not have access to the internet are further affected by information asymmetries as they are unable to make use of online comparison tools such as My Treasury. Financial illiteracy also plays a significant role in explaining the poor usage rates among lower-income consumers. Understanding fundamental concepts such as compound interest, simple interest, the benefits of saving and insurance, as well as how to independently use an ATM are essential. Consumers who fail to understand or possess such foundational literacy will struggle to interact with the array of financial services that banks offer and underutilise their bank account functions, simply because they are unaware. For deeper financial inclusion to occur among lower-income consumers, financial illiteracy and information asymmetries need to be mitigated.

It is clear from the study that South Africa is not adequately leveraging Fourth Industrial Revolution technology to ultimately develop sustainable financial inclusion that leads to improvements in consumer welfare. The solution is also not only a digital one but consists of a combination of economic, digital and financial inclusion efforts to holistically improve the welfare of lower-income consumers.

The evidence in the data, interviews and literature used in the study shows supports the notion that FinTech has had a hugely disruptive impact on every aspect of the banking industry and alongside it, legislative and regulatory progress has ensured that South Africa is performing well on the transparency and consumer protection indicators. However, because the financial ecosystem is not performing well in terms of affordability, product fit, financial literacy and convenience, it cannot be said that the technological progress of FinTech has been matched by equal progress with financial inclusion, particularly of lower-income consumers, the unemployed and marginalised citizens.

7.3 Key contributions

The study makes a key contribution to the body of literature on financial inclusion as the current literature on the topic has made little effort to holistically investigate the impact of FinTech on financial inclusion. This study not only provides unique insights from Finscope regarding some of the financial behaviours of lower-income consumers, but it identifies a key gap in the market for FSPs and FinTech start-ups. Almost all lower-income consumers and even consumers without an income possess cell phones. This indicates that mobile banking is perhaps the best way to formally financially include those who are currently excluded or making use of informal channels. The study also reveals that affordability is a major constraint for the lower-income population adopting digital financial services, especially digital payments which is more advanced and well-suited to the needs of lower-income consumers. Making digital payments cost less or free will immensely facilitate the transfer of domestic remittances to poor households. This would, in turn, have a positive economic impact on rural areas and poor urban people.

Another key contribution was that the study confirmed that ICT infrastructure is not yet enabling financial inclusion in South Africa, particularly for lower-income people. Data costs are one of the biggest barriers to internet access for lower-income consumers who also tend to be out of reach of free WiFi connections, especially in rural areas. A key lesson came from the use case where the FSP enabled the USSD command in its digital financial product to not exclude those that were digitally excluded. All FSPs and FinTech providers should ensure that their products are similarly inclusive of the lower-income population.

One major contribution of the study is its emphasis on the quality of financial inclusion in the South African context. The study provides dimensions that could be used to assess the quality of financial inclusion across countries. In order to have quality financial inclusion in South Africa, financial products need to make the lives of consumers easier as well as improve their welfare over time. This means that FSPs and FinTech companies should be providing financial products that are affordable and meet the needs of consumers while also ensuring that the company gains in terms of its value proposition. Without a balance between the two, providers will focus on the most profitable and least difficult markets to serve (middle to high-income consumers), as has happened to a large extent in South Africa. For lower-income consumers that have consumed products that were designed for middle to high-income consumers, the usage rates have not matched the take-up rates as the costs of continued use has been unaffordable. This shows that the quality of financial inclusion in South Africa is lacking. While the groundwork has been laid through strong consumer protection and transparency and sophisticated financial services that provide more convenience are being developed, the day-to-day economic experience of the lower-income consumer is still largely cash-based.

The thesis found that lower-income consumers who do have some form of income are more likely to take up formal financial services compared to those that do not have any form of income. The analysis of the Finscope data shows that as income increases, the need for formal financial services increases. Another key finding is that there is a key gap for financial data inclusion among young lower-income adults. That is, FSPs can more easily collect and analyse data from adults between the ages of 18 and 29 years. This is since young lower-income adults are more likely to make use of internet banking than their older counterparts. Even though middle-aged adults are more likely to make use of formal financial services, a key opportunity lies waiting for FSPs to usher younger adults into the formal financial sector before the financial behaviours and tastes change. That is, as the younger adults enter into later stages of life where home loans and vehicle loans are strong drivers of their remaining formally banked, FSPs that already have data on them will more easily be able sell them different financial service offerings that may have not been as applicable to them between the ages of 18 to 29 years.

7.4 Policy recommendations

- Increase the ICT infrastructure in rural as well as urban informal areas. Digital inclusion is an entry requirement for digital literacy, digital financial services and sustainable financial inclusion. As the world becomes more digital and various processes become digitised, and branchless banking becomes more of a phenomenon, sustainable financial inclusion will become increasingly dependent on well-designed ICT systems and the extent to which those ICT systems reach all consumers, particularly the lower-income market. Digital financial services provide government and regulators with an opportunity for financial data inclusion which will mean they can tackle anti-money laundering, counterterrorism and anti-corruption goals more effectively through enhanced data access.
- Regulate and reduce the costs of data to ensure affordable internet access for all. This can be done in several ways. One method that is already being employed is that of providing free wi-fi facilities at public libraries and government buildings. It is however not adequate to meet the internet access needs of consumers. Consumers that live too far from libraries are struggling to access the internet. Therefore, a complementary approach to increasing public wifi facilities is increasing competition in the telecommunication sector. This is essential to reducing the prices of data that consumers incur whilst accessing the internet on their personal mobile phones. This is a long-term solution to the internet affordability problems in South Africa.
- Reform regulation to promote competition and disruption in the banking industry. The financial sector in South Africa has been stable since there have been very few new entrants. Ironically, the caveat to the stability achieved has been that it has disadvantaged lower-income consumers who have not had their needs adequately met by the big five banks and even new FinTech companies that primarily challenge established FSPs for the middle-income market.
- Re-assess the usefulness of using proof of address as a KYC requirement. This has largely been inappropriate in the context of South Africa as a developing country and can be replaced by biometrics.

- A shared single KYC utility should be developed to collect KYC information and distribute it to relevant stakeholders. This may make it easier to standardise biometrics as a means of identification.
- Financial literacy and financial consumer education should become more integrated into the public education system. Financial education should also be provided in a more nuanced to target the specific financial literacy needs of lower-income consumers.
- Policymakers and researchers should develop quality measures that could be used in different contexts to better understand how inclusive a financial system actually is. These should be linked to the legislative and regulatory environment and particularly to industry standards and strategic milestones such as embodied in the Financial Sector Charter.

7.5 Areas of future research

Firstly, while the study was able to analyse the payments, savings and credit sub-sectors, the areas of insurance and investments were not assessed and thus could be included in a larger study that studies all the financial product sub-sectors. Secondly, this study was only able to provide preliminary evidence that some of the indicators suggested could assist to drive up usage and improve financial inclusion. Studies could improve on this thesis by considering what granular measures could be used to assess consumer protection, convenience, affordability etc. Thirdly, due to time limitations, the study was also not able to really grapple with dynamics in the social grants space. This is a big part of the conversation on financial inclusion in South Africa. It would be of great use to policymakers and other actors in the financial services space to understand whether there is a difference in the financial behaviour of social grant recipients relative to individuals with similar income levels but do not receive social grants. Fourthly, one of the findings of the study was that males took up formal financial services at a higher rate than females between 2012 and 2015. It would be interesting to get qualitative insights into financial uptake decisions among women as well as getting a better understanding of the barriers that prevent women from taking up formal financial services. Lastly, randomised control trials are powerful tools of analysis. There is room to assess how different payment channels affect consumers' spending and saving habits. This could provide a new understanding of savings and consumption behaviours under different payment streams.

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Appendices

Appendix A: Information Sheet for Interview

University of the Western Cape
Private Bag X17 Bellville 7535 South Africa
Tel: 27 714182317 Email:3259032@myuwc.ac.za

Information Sheet for Interview

Research Title: The Economic Impact of FinTech in the South African Banking Industry: A Case of Digital Disruption

What is this study about?

The research is being conducted by Kinyanjui Mungai, an Economics PhD student at the University of The Western Cape. The interview I am conducting is meant to collect information on FinTech in the banking industry in South Africa. The Fourth Industrial Revolution has brought forth a number of technological advancements. The SMACT (Social Media, Mobile, Big data and Analytics, Cloud, and Internet of Things) technologies have gained prominence rapidly and have changed banking globally. I have noticed that the FinTech companies have leveraged these technologies to challenge incumbent banks. The response of the incumbent banks has varied. This study investigates all these dynamics in the South African banking industry in order to provide new insights into the banking industry of today.

What about confidentiality?

Your name and organisation will be kept confidential. The researcher will only state the general occupation of the respondent, e.g. FinTech CEO, or Academic. This is purely for the reader to see that the insight of the experts may differ based on their occupation. The responses collected will only be used for academic purposes.

Why should I participate?

The researcher has identified you as someone who is particularly knowledgeable on the research topic and your unique insight will add to the body of literature on this topic. This is a particularly under-investigated topic in South Africa and your insights may be the initial building blocks spurring on further research that will challenge policymakers to develop a regulatory framework that encourages competition, innovation and financial inclusion.

Appendix B: Consent Form for Interview

University of the Western Cape
Private Bag X17 Bellville 7535 South Africa
Tel: 27 714182317 Email:3259032@myuwc.ac.za

Consent form for Interview

Research Title: The Economic Impact of FinTech in the South African Banking Industry: A Case of Digital Disruption

- I have read and understood the information as provided to me in the following information sheet relating to the above-named research
- I agree to participate in this research project and I consent to publication of the findings of the research on the understanding research project and I consent to publication of the findings of the research on the understanding that the confidentiality of subjects will be preserved completely.
- I also understand that I can withdraw from the participation in this research project and that if I do so, then any information I have provided will also be withdrawn.
- I voluntarily agree to participate in this scientific research.

Name:…….

Signed:……

Date:…….....

Appendix C: SECTION A

UNIVERSITY OF THE WESTERN CAPE

Economic and Management Sciences
(EMS) Private Bag X17, Bellville 7535, South Africa **Tel:** +27714182317

E-mail: 3259032@myuwc.ac.za

The research title: The Economic Impact of FinTech in the South African Banking Industry: A Case of Digital Disruption

Date: ..../..../..... **Location: .....**

Respondent's General Occupation: Respondent's Expertise:

All questions are strictly confidential. Please be as truthful as possible.

Questions on Macroeconomic impact to Key informants <u>Semi-structured Interview Questions</u>

Note: The past 10 years is our time period of reference (from 2006/2007 until now) Note: SMACT=Social Media, Big data and Analytics, Cloud, Internet of Things

1.1. From a systemic perspective, how have the Fourth Industrial Revolution technologies (SMACT) influenced the banking ecosystem in the past 10 years?

Make reference to the ecosystem factors:

1. *employment, and employability…. how these aspects have changed in general in South Africa as a result of increased use of the technologies noted above, also speak on the banking industry....*
2. *labour productivity,*

3. *ICT innovation,*

4. *international trade and international transfers,*

5. *the contribution of the banking sector to the economy.*

1.2. Which industries to your knowledge have experienced the greatest penetration rates/ disruption from these technologies (SMACT)? *Why do you think this has happened in these specific industries?*

1.3. Which factors/ mechanisms, e.g. ICT infrastructure, have been crucial to the penetration or the impediment of these technologies into the economy? *Can you make reference to government, industry level factors, consumer acceptance?*

1.4. Which SMACT technologies have significantly affected employment and employability in the banking industry? Score and discuss. *E.g. advertisements moving from newspapers/ magazines to social media/ mechanisation affecting the employment trends in the banking industry/ new type of skills needed in the banking industry.*

SMACT technology	Scale of 1 to 7 (Worst to Best)
Social Media	
Big Data and Analytics	
Cloud	
Internet of Things	

1.5. Which SMACT technologies have significantly affected labour productivity in the banking industry? Score and discuss. *Have certain activities been streamlined as a result of improvements in technology?*

SMACT technology	Scale of 1 to 7 (Worst to Best)
Social Media	
Big Data and Analytics	

Cloud	
Internet of Things	

1.6. Which SMACT technologies have significantly affected the contribution of the banking industry to economic growth? Score and discuss.

SMACT technology	Scale of 1 to 7 (Worst to Best)
Social Media	
Big Data and Analytics	
Cloud	
Internet of Things	

1.7. Which SMACT technologies have significantly affected international trade/ transfers of funds (remittances)? Score and discuss.

SMACT technology	Scale of 1 to 7 (Worst to Best)
Social Media	
Big Data and Analytics	
Cloud	
Internet of Things	

1.8. Which SMACT technologies have significantly affected ICT innovation and innovation in general? Score and discuss.

SMACT technology	Scale of 1 to 7 (Worst to Best)
Social Media	
Big Data and Analytics	
Cloud	
Internet of Things	

1.9. Which SMACT technologies have significantly impacted on financial inclusion? Score and discuss.

SMACT technology	Scale of 1 to 7 (Worst to Best)
Social Media	
Big Data and Analytics	
Cloud	
Internet of Things	

1.10. What is the broad role of government in the Fourth Industrial Revolution as well as their role specifically in the banking industry? *E.g. UK (Theresa May) investing more in cybersecurity as opposed on the ground police force…to adapt to the shifting nature of criminal activity.*

1.11. How can the banking ecosystem be improved so that the economy is more productive and the poor are directly benefitting from new innovations?

UNIVERSITY OF THE WESTERN CAPE

Economic and Management Sciences
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The research title: The Economic Impact of FinTech in the South African Banking Industry: A Case of Digital Disruption

Date: ..../..../..... **Location: .....**

Respondent's General Occupation: Respondent's Expertise:

All questions are strictly confidential. Please be as truthful as possible.

Population of Interest-Please refers to lower-income groups, specifically those who were previously or currently excluded from formal banking institutions.

1. To what extent has the current set of **digital savings products** improved the welfare of **lower-income** consumers who were previously excluded? Explain. (ALL)

2. Please rate on a scale of 1 to 5 how significant the impact is. (if you feel the impact is negative please explain why you say so)

Highly insignificant (1)	Insignificant (2)	Unsure (3)	Significant (4)	Highly Significant (5)

3. To what extent has the current set of **digital credit products** and improved the welfare of lower-income consumers who were previously excluded? Explain. (ALL)

4. Please rate on a scale of 1 to 5 how significant the impact is. (if you feel the impact is negative please explain why you say so)

Highly insignificant (1)	Insignificant (2)	Unsure (3)	Significant (4)	Highly Significant (5)

5. To what extent have the current set of **digital payment channels** improved the welfare of lower-income consumers who were previously excluded? Explain. (ALL)

6. Please rate on a scale of 1 to 5 how significant the impact is. (if you feel the impact is negative please explain why you say so)

Highly insignificant (1)	Insignificant (2)	Unsure (3)	Significant (4)	Highly Significant (5)

7. How exactly do **digital savings products** affect welfare for lower-income groups? From a regulatory perspective, how can the link between better digital savings products and consumer welfare be improved? (mostly for regulators) So, what can be done by regulators to allow innovation that increases consumer saving incentives and consequently increase consumer welfare?

8. How exactly do **digital credit products** affect welfare for lower-income groups? From a regulatory perspective, how can the link between better credit products and consumer welfare be improved? (mostly for regulators)

9. How exactly do **digital payment channels** affect welfare for lower-income groups? From a regulatory perspective, how can the link between better digital payment channels and consumer welfare be improved? (mostly for regulators)

Convenience

Definition: Financial product makes one's life easier

10. Is the current set of digital payment channels and digital savings and digital credit products convenient for **lower-income groups**? i.e. Are they making consumers lives easier? Please rate on a scale of 1 to 5.

Products	Strong No (1)	No (2)	Unsure (3)	Yes (4)	Strong Yes (5)
Digital Savings					
Digital Credit					
Digital payments					

11. Please justify your responses above.

12. What gaps are there for **digital savings products** to make lower-income consumers lives easier?

13. What gaps are there for **digital credit products** to make lower-income consumers lives easier?

14. What gaps are there for **digital payment services** to make lower-income consumers lives easier?

Affordability

15. Are digital savings, digital credit and digital payments products affordable for lower-income consumers? Please rate on a scale of 1 to 5. Please explain.

Products	Strong No (1)	No (2)	Unsure (3)	Yes (4)	Strong Yes (5)
Digital Savings					
Digital Credit					
Digital Payments					

Transparency

16. What type of information asymmetries/ or transparency problems exists between clients and providers in the financial services space? (ALL)

17. From a regulatory perspective, what can be done to facilitate more **symmetric** information in the financial ecosystem, particularly for lower-income clients.

Financial literacy

18. How has financial illiteracy on **digital savings products** contributed to lower usage/ inactive accounts among lower-income groups (if you believe this is the case)?

19. What should be done by regulators to improve financial literacy on digital savings products?

20. How has financial illiteracy on **digital credit products** contributed to lower usage of credit among lower-income groups (if you believe this is the case)?

21. What should be done by regulators to improve financial literacy on digital credit products?

22. How has financial illiteracy on **digital payment channels** contributed to lower usage/ inactive of transaction accounts among lower-income groups (if you believe this is the case)?

23. What should be done by regulators to improve financial literacy on digital payment products?

Product Fit

24. Do digital payments channels meet the daily transaction needs of consumers of lower-income consumers? Please explain. Please rate on a scale of 1 to 5.

Never (1)	Seldom (2)	Unsure (3)	Sometimes (4)	Often (5)

25. Due to the fact that the informal sector is quite large, consumers tend to use cash/ card and sometimes mobile banking every day. Are there costs to consumers using multiple payment channels (cash/ card/ mobile)? I.e. Is this a problem?

26. A lot of lower-income individuals tend to withdraw large portions of their income as soon as they are paid[17]. Do **digital savings account** options meet the flexibility needs of lower-income consumers? Please explain. Please rate on a scale of 1 to 5.

Never (1)	Seldom (2)	Unsure (3)	Sometimes (4)	Often (5)

27. Lower-income consumers tend to borrow small amounts from friends and family when emergencies arise. Do **digital credit** options meet the consumer flexibility needs of lower-income consumers? Please rate on a scale of 1 to 5.

Never (1)	Seldom (2)	Unsure (3)	Sometimes (4)	Often (5)

28. Please justify your answer above.

[17] The most attractive feature of saving under a mattress is accessibility.

Consumer Protection

29. Are digital payments channels, digital savings, and digital credit products **safe** for consumers? Please rate on a scale of 1 to 5. (ALL)

Products	Strong No (1)	No (2)	Unsure (3)	Yes (4)	Strong Yes (5)
Savings					
Credit					
Digital payments					

30. Please justify your answers above.

31. Do you think that product mis-selling takes place in the digital financial product space?

32. Do the current set of regulations adequately protect lower-income consumers? Why or why not? (Reg)

33. How has KYC and AML laws interacted with the financial inclusion of lower-income groups? (ALL) E.g. proof of address

34. What type of influence do you think FinTech companies have on improving the usage aspect for lower-income groups? (Reg)

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The research title: The Economic Impact of FinTech in the South African Banking Industry: A Case of Digital Disruption

Date: ..../..../..... **Location: .....**

Respondent's General Occupation: Respondent's Expertise:

All questions are strictly confidential. Please be as truthful as possible.

Population of Interest-Please refer to lower-income groups, specifically those who were previously or currently excluded from formal banking institutions.

Scope: South Africa

Digital savings products - e.g. mobile wallets with savings features that allow individuals to save and earn interest on their savings.

Digital credit products - e.g. peer to peer online credit markets or mobile wallets with borrowing functionality

Digital payments - e.g. mobile wallets that allow individuals to send money or pay for products electronically or pay for products through using QR code functionality. Can even be an app that is linked to one's bank account and allows for cashless payments.

1. To what extent has the current set of **digital savings products** in SA improved the welfare of **lower-income** consumers who were previously excluded? Explain. (ALL)

2. Please rate on a scale of 1 to 5 how significant the impact is (if you feel the impact is negative please explain why you say so).

Highly insignificant (1)	Insignificant (2)	Unsure (3)	Significant (4)	Highly Significant (5)

3. To what extent has the current set of **digital credit products** in SA and improved the welfare of lower-income consumers who were previously excluded? Explain. (ALL)

4. Please rate on a scale of 1 to 5 how significant the impact is (if you feel the impact is negative please explain why you say so).

Highly insignificant (1)	Insignificant (2)	Unsure (3)	Significant (4)	Highly Significant (5)

5. To what extent has the current set of **digital payment channels** in SA improved the welfare of lower-income consumers who were previously excluded? Explain. (ALL)

6. Please rate on a scale of 1 to 5 how significant the impact is (if you feel the impact is negative please explain why you say so).

Highly insignificant (1)	Insignificant (2)	Unsure (3)	Significant (4)	Highly Significant (5)

7. What type of data is being used by **your organisation** to improve the **welfare of lower-income groups** through improved digital payments, digital savings and digital credit products? Please tick in the table provided below. Briefly explain.

8. What is the impact* of this data on consumer welfare on a scale of 1 to 5?

**Impact 1. Highly Insignificant 2. Insignificant 3. Unsure 4. Significant 5. Highly Significant*

	Yes (please tick if applicable)			Impact (Score)		
Type of Data	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Social Media data						
Call Detail Record data						
Mobile app data						
Sensor data						
RFID scans/ Point-of-Sale data						
Other (please specify)						

9. What type of analytics capabilities are used in this regard (improving lower-income consumers' welfare through better digital payments, savings and credit products)? (Please tick). Briefly explain.

10. What is the impact* of these analytics on consumer welfare on a scale of 1 to 5?

**Impact 1. Highly Insignificant 2. Insignificant 3. Unsure 4. Significant 5. Highly Significant*

	Yes (please tick if applicable)			Impact (Score)		
Type of Analytics	Savings	Credit	Digital Payments	Savings	Credit	Digital Payments
Analytics type						
Data Mining						
Data Visualisation						
Query and Reporting						
Predictive Modelling						
Voice analytics						
Other (please specify)						

Convenience

Definition: Financial product makes one's life easier

11. Is the current set of digital payment channels and digital savings and digital credit products convenient for **lower-income groups**? I.e. Are they making consumers lives easier? Please rate on a scale of 1 to 5. Please explain.

Products	Strong No (1)	No (2)	Unsure (3)	Yes (4)	Strong Yes (5)
Digital Savings					
Digital Credit					
Digital Payments					

12. What type of data is being used by **your organisation** to improve the **convenience** aspect of **digital payments**, **digital credit** and **digital savings products** for lower-income groups? Please tick in the table below. Briefly justify your response.

13. What has been the impact of each data source on making these financial products more convenient? Briefly explain.

**Impact 1. Highly Insignificant 2. Insignificant 3. Unsure 4. Significant 5. Highly Significant*

	Yes (please tick if applicable)			Impact (Score)		
Type of Data	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Social Media data						
Call Detail Record data						
Mobile App data						
Sensor data						
RFID scans/ Point-of-sale data						
Other (please specify)						

14. What types of analytical capabilities are being used to improve the **convenience aspect** of **digital payments**, **digital credit** and **digital savings products** for lower-income groups? Please tick in the table below. Briefly explain.

15. What has been the impact* of each type of analytics on making these financial products more convenient? Please rate on a scale of 1 to 5. Briefly explain.

**Impact 1. Highly Insignificant 2. Insignificant 3. Unsure 4. Significant 5. Highly Significant*

	Yes (Please tick if applicable)			Impact (Score)		
Type of Analytics	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Data Mining						
Data Visualisation						
Query and Reporting						
Predictive Modelling						
Voice Analytics						
Other (please specify)						

Transparency

16. What types of information asymmetries or transparency problems exist between clients and financial service providers in the financial services space? (ALL)
17. What type of data is being used to reduce **information asymmetries**? Please tick in the table below. Briefly explain.
18. How significant has the impact of this data been so far in attempting to reduce these asymmetries? Please rate on a scale of 1 to 5. Briefly explain.

**Impact 1. Highly Insignificant 2. Insignificant 3. Unsure 4. Significant 5. Highly Significant*

	Yes (please tick if applicable)			Impact (Score)		
Type of Data	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Social Media data						
Call Detail Record data						
Mobile App data						
Sensor data						
RFID scans/ Point-of-sale data						
Other (please specify)						

19. What types of analytical capabilities are being used to reduce information asymmetries? Please tick in the table below.

20. How significant has the impact been so far in attempting to reduce these asymmetries? Please rate on a scale of 1 to 5. Please explain.

**Impact 1. Highly Insignificant 2. Insignificant 3. Unsure 4. Significant 5. Highly Significant*

	Yes (Please tick if applicable)			Impact (Score)		
Type of Analytics	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Data Mining						
Data Visualisation						
Query and Reporting						
Predictive Modelling						
Voice Analytics						
Other (please specify)						

Financial literacy

21. How has financial illiteracy on **savings products** contributed to lower savings among lower-income groups (if you believe this is the case)?
22. How could digital savings break this barrier (use examples if you can think of any)?
23. How has financial illiteracy on **credit products** contributed to lower borrowing rates among lower-income groups (if you believe this is the case)?
24. How can digital credit break this barrier (use examples if you can think of any)?
25. How has financial illiteracy on **non-cash payment channels** contributed to the cash-based economy persisting among lower-income groups (if you believe this is the case)?
26. How could **digital payment products** break this barrier (use examples if you can think of any)?
27. What type of data is being used by **your organisation** to assess the financial literacy of lower-income clients? I.e. How do you know that clients can use the financial product and all its functionalities? Please tick in the table below.

28. How significant has the impact been so far in attempting to reduce financial illiteracy? Please rate on a scale of 1 to 5. Please explain.

**Impact 1. Highly Insignificant 2. Insignificant 3. Unsure 4. Significant 5. Highly Significant*

	Yes (please tick if applicable)			Impact (Score)		
Type of Data	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Social Media data						
Call Detail Record data						
Mobile App data						
Sensor data						
RFID scans/ Point-of-Sale data						
Other (please specify)						

29. What type of analytics is being used to assess the financial literacy of lower-income clients, i.e. How do you know that a client is capable of using the financial product and all its functionalities?

30. How significant has the impact been so far in attempting to reduce financial illiteracy? Please rate on a scale of 1 to 5. Please explain.

**Impact 1. Highly Insignificant 2. Insignificant 3. Unsure 4. Significant 5. Highly Significant*

	Yes (Please tick if applicable)			Impact (Score)		
Type of Analytics	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Data Mining						
Data Visualisation						
Query and Reporting						
Predictive Modelling						
Voice Analytics						
Other (please specify)						

Value creation (only speak on the ones your organisation has)

31. How do **digital payments products** create value for your FSPs?

32. How do **digital savings products** create value for your FSPs?

33. How do **digital credit products** create value for your FSPs?

Product Fit

34. Does the current set of **digital payment channels** in SA meet the daily transaction needs of lower-income consumers? Please rate on a scale of 1 to 5. Please explain.

Never (1)	Seldom (2)	Unsure (3)	Sometimes (4)	Often (5)

35. Do **digital savings account** options in SA meet the consumer flexibility needs of lower-income consumers? Please rate on a scale of 1 to 5. Please explain.

Never (1)	Seldom (2)	Unsure (3)	Sometimes (4)	Often (5)

36. Do **digital credit** options in SA meet the consumer flexibility needs of lower-income consumers? Please rate on a scale of 1 to 5. Please explain.

Never (1)	Seldom (2)	Unsure (3)	Sometimes (4)	Often (5)

37. What types of data are being used by **your organisation** to improve the product fit of digital payments channels and digital savings and digital credit products for lower-income consumers? Briefly explain.

38. What has been the impact so far on improving the product fit of these financial products to lower-income consumers? Please rate on a scale of 1 to 5. Briefly explain.

	Yes (please tick if applicable)			Impact (Score)		
Type of Data	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Social Media data						
Call Detail Record data						
Mobile App data						
Sensor data						
RFID scans/ Point-of-Sale data						
Other (please specify)						

39. What type of analytics is being used **by your organisation** to improve the product fit of digital payments channels and savings and credit products for lower-income consumers?

40. What has been the impact so far on improving the product fit of these financial products to lower-income consumers? Please rate on a scale of 1 to 5. Briefly explain.

**Impact 1. Highly Insignificant 2. Insignificant 3. Unsure 4. Significant 5. Highly Significant*

	Yes (Please tick if applicable)			Impact (Score)		
Type of Analytics	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Data Mining						
Data Visualisation						
Query and Reporting						
Predictive Modelling						
Voice Analytics						
Other (please specify)						

Consumer Protection

41. Are digital payments channels, digital savings, and digital credit products **safe** for consumers? Please rate on a scale of 1 to 5. Please explain.

Products	Strong No (1)	No (2)	Unsure (3)	Yes (4)	Strong Yes (5)
Savings					
Credit					
Digital Payments					

42. What types of data are being used to improve consumer protection of lower-income groups in the area of digital payments, digital savings and digital credit? Please tick in the table below. Briefly explain.

43. To what extent has this data led to improvements in consumer protection for digital payments, digital savings and digital credit? Please rate on a scale of 1 to 5. Please explain.

	Yes (please tick if applicable)			Impact (Score)		
Type of Data	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Social Media data						
Call Detail Record data						
Mobile App data						
Sensor data						
RFID scans/ Point-of-Sale data						
Other (please specify)						

44. What types of analytics capabilities are being used to improve consumer protection for lower-income groups in the area of digital payments, savings and credit? Please tick in the table below. Briefly explain.

45. To what extent have these analytics led to improvements in consumer protection for digital payments, digital savings and digital credit? Please rate on a scale of 1 to 5. Please explain.

**Impact 1. Highly Insignificant 2. Insignificant 3. Unsure 4. Significant 5. Highly Significant*

	Yes (Please tick if applicable)			Impact (Score)		
Type of Analytics	Digital Savings	Digital Credit	Digital Payments	Digital Savings	Digital Credit	Digital Payments
Data Mining						
Data Visualisation						
Query and Reporting						
Predictive Modelling						
Voice Analytics						
Other (please specify)						

Section B: Survey monkey surveys

1. Do the following products meet the needs of lower income consumers in South Africa?

	Never	Seldom	Unsure	Sometimes	Often
Digital Credit	○	○	○	○	○
Digital Payments	○	○	○	○	○
Digital Savings	○	○	○	○	○

2. Are the following digital financial products generally affordable for lower income consumers in South Africa?

	Strong No	No	Unsure	Yes	Strong Yes
Digital Savings	○	○	○	○	○
Digital Credit	○	○	○	○	○
Digital Payments	○	○	○	○	○

3. Are the following digital financial products making the every day lives of lower income consumers easier?

	Strong No	No	Unsure	Yes	Strong Yes
Digital Savings	○	○	○	○	○
Digital Credit	○	○	○	○	○
Digital Payments	○	○	○	○	○

4. How significant of an impact have the following digital financial products had on the welfare of the lower income population in South Africa?

	Highly insignificant	Insignificant	Unsure	Significant	Highly Significant
Digital savings	○	○	○	○	○
Digital credit	○	○	○	○	○
Digital payments	○	○	○	○	○

5. In the South African context, are these digital platforms generally safe for lower income consumers to use?

	Strong No	No	Unsure	Yes	Strong Yes
Digital Savings	○	○	○	○	○
Digital Credit	○	○	○	○	○
Digital payments	○	○	○	○	○

6. Rank the following aspects in terms of how important they are for South Africa to have sustainable financial inclusion

- ⠿ ▲▼ Consumer protection
- ⠿ ▲▼ Financial Literacy
- ⠿ ▲▼ Convenience e.g. saves the customer time
- ⠿ ▲▼ Transparency
- ⠿ ▲▼ Affordability
- ⠿ ▲▼ Product Fit i.e. meets the consumers needs
- ⠿ ▲▼ Welfare improving products e.g. leads to more asset accumulation etc.