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Master Of Management in Finance and Investments (MMFI)

BUSA7388A – Research Report

User Adoption and Risk Concerns of Mobile Payment Gateway Systems

WITS BUSINESS SCHOOL (WBS)

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Abstract

Digital payments have increasingly preferred method for consumers to purchase a diverse array of products and services, offering convenience and has been significantly accelerated by the relentless progress in mobile capabilities. As our daily financial lives become more and more reliant on digital systems, there's been an unavoidable surge in complex cyberattacks and various cybercrimes, a reality South Africa is quite familiar with. While digital platforms offer many advantages, they also expose users to greater risks. This makes strong security measures and increased user awareness crucial to lessen the potential financial and personal harm from these widespread cyber threats.

This study explores the elements that drive users to embrace digital payment systems and how they react to risk concerns when using these platforms. To understand these dynamics, the research utilized two established theoretical models: the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT2). For this study, data was gathered using an online questionnaire distributed via Qualtrics XM. The study employed a convenience sampling method, collecting 294 responses in total, with 268 participants fully completing the survey. The collected data was then analysed using SPSS software and Microsoft Excel. Various statistical methods, including descriptive statistics and Quality Assurance models (specifically Construct Validity and Reliability), were applied to interpret the data and draw conclusions.

The study's findings reveal that several elements from the Unified Theory of Acceptance and Use of Technology (UTAUT) significantly impact how readily people adopt mobile payment gateway systems. These key factors include Ease of Use, Subjective Norms (the influence of others' opinions), and Perceived Trust in the system. Interestingly, the research also found that users hold a neutral perception regarding the risks associated with using these digital payment methods. Furthermore, the study highlighted that gender, age, and prior experience all play a role in influencing the dynamics of both the UTAUT and Technology Acceptance Model (TAM).

Declaration

I, **Nchochoba Nkemele**, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in fulfilment of the requirements for the degree of **Master of Management in the field of Finance and Investment** at the **University of the Witwatersrand, Johannesburg**. It has not been submitted before for any degree or examination in this or any other university

Name: **Nchochoba Nkemele** Signature: **NK Nkemele**

Signed at **Sebokeng, Vereeniging**

On the **26** day of **February** 2025

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Abbreviations

AI - Artificial Intelligence

B2B - Business to Business

B2C - Business to Consumers

CAGR - Compound Annual Growth Rate

C2C - Consumer to Consumer

DOI - Diffusion of Innovation

EFT - Electronic Funds Transfers

ICT - Information and Communication Technology

KMO - Kaiser-Meyer-Olkin

ML - Machine Learning

MPS - Mobile Payment Systems

POS - Point of Sales

POPIA - Protection of Personal Information Act

PSPs - Payment Service Provider

PaaS - Platform as a Service

SARB - South African Reserve Bank

SPSS - Statistical Package for the Social Sciences

TAM - Technology Acceptance Model

UTAUT - Unified Theory of Acceptance and Use of Technology

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1 Chapter 1: Introduction

1.1 Background

Traditional banking has been defined as banking that provides in-person transactional services as well as face-to-face support to both individuals and businesses (Chiorazzo et al., 2018). Traditional banking has evolved significantly over the past years, with a recent change introduced by digitisation. Digitisation abruptly affected all businesses, and they had to establish an online presence (Wong et al., 2008). However, with the increase in digitisation, a study conducted by Margaret and Ngoma (2013) has shown that the adoption of e-banking was very slow in Zimbabwe, as most of the people in the country were of a mature age while most young people had left the country in search of prosperous paths (Margaret & Ngoma, 2013). Most mature individuals still prefer going to physical bank branches to get assistance with financial queries. This might have been due to a general case of desiring in-contact financial services enquiries and not easily opening to new ways of digital banking (Margaret & Ngoma, 2013). In countries like India, the demonetisation vision of 2014 forced the population to adopt digital payments, which boosted the demand for mobile payment services (Srivastava, 2017).

The development of digitisation has led to the finance technology (FinTech) nexus, in which enterprises and consumers find comfort in transacting online (Johnson et al., 2018). This nexus has escalated due to the continuous advancement in the mobile internet, cloud computing and other technological features that enable mobile payments (Farahzadia et al., 2017). Digitisation has forcefully made businesses advance their models and change their processes to accommodate a new stream of digital consumers (Farahzadia et al., 2017). The changeover for banks to pursue e-banking was to ensure they cater for digital consumers. Moreover, e-banking platforms should be seen as complementary to traditional banking, and not a substitute (Wong et al., 2008). Digital transacting platforms are merely used to provide convenience to the consumer and increase the profit level of banks as they promote frequent transactional activities (Johnson et al., 2018). Moreover, the digital channel has allowed consumers to have input in online services offered by enterprises. This feedback channel enabled businesses to find areas for operational enhancement (Johnson et al., 2018).

Before the development of mobile payments, consumers had to perform transactions physically at outlets. However, There has been a large scale shift away from the original transaction method, due to the rise of mobile payments (Wong et al., 2008). The advancements in

innovation and technology have led to a drastic increase in financial institutions in the finance ecosystem, and most companies have sought to get licensed to facilitate online transactions (Huang et al., 2020). On the other hand, some companies have opted to build partnerships with existing banks to pursue digital financial ventures. This type of partnership requires restructuring companies' networks and technology to allow for the development of a value-sharing ecosystem. The developments in technological infrastructure have led companies to continuously change their systems to enhance their operations (Farahzadia et al., 2017). Moreover, the value-sharing ecosystem enables companies to learn and gain specialisation in financial management from the banks (Chiorazzo et al., 2018; Dlodlo, 2015).

Payment Service Providers (PSPs) are companies that offer payment capabilities to businesses without them necessarily being banks (Bartelt & Hommel, 2021). PSPs ensure that transactions are moved from one point to another and work with banks. Some of their transaction activities are done by the banks as confirmed by the law. For instance, the Central Bank Act on digital payments of Iran allows the banks to delegate tasks to PSPs through a contract restricting what the PSPs can and cannot do (Khalilzadeh et al., 2020). The banks that PSPs work with are referred to as acquiring banks and they settle the transactions of consumers into respective accounts based on the request received from the PSPs. For this to occur, the PSP and the bank systems must be connected so that payment information or requests can be passed (Bartelt & Hommel, 2021; Khalilzadeh et al., 2020). PSPs facilitate online payments on cloud-based systems using payment gateways and pay-as-a-service (PaaS) (Khalilzadeh et al., 2020).

The digital payment strategy is in line with the aim of the global economy to try to reduce cash in the system, thus it supports consumers and businesses to make financial transactions online. Banks partner with businesses to enable the expansion of their resources and being able to integrate banking abilities into their services (Johnson et al., 2018), therefore leveraging on the partnership (Chen et al., 2017). Mobile payment (m-payment) services have been viewed to be secure, convenient, and fast for both consumers and merchants (Chen et al., 2017). With merchants, it provides them with increased transaction activity on their platforms at a lower cost and increases consumer loyalty (Feldhaus & Mathauer, 2018; Johnson et al., 2018). As much as mobile payment (m-payment) services have great benefits, it has been denoted by Johnson et al. (2018) that the adoption of online payment services is very low in Asia, Europe, and the United States of America (USA), and that the adoption of m-payments is not necessarily correlated to the purchase of smartphones. For instance, 25% of adults could potentially purchase smartphones but may not see the interest in understanding the applications

on the phone. It is believed that the penetration of Apple Pay, Android Pay, and other M-payment services could increase the adoption of payment services globally (Johnson et al., 2018).

The discussion so far has been on the transition to digital payment platforms and the benefit of mobile payment services. Some barriers that cause consumers to adapt to online payment services at a lower rate include concerns about the security of payment platforms with consumer information (Johnson et al., 2018). Despite digital businesses stating that online platforms are very secure, there have been numerous cases of cyberattacks that have been reported (Khalilzadeh et al., 2020). Cyberattacks and cybercrimes have been defined as stealing personal information and using it to make fraudulent activities such as applying for credit and loans using someone's details. The increase in cyberattacks over time has shown that the advances in technology to create a complex infrastructure network, also result in more complex ways cyberattacks can occur. For instance, the companies in the US that have experienced cyber breaches include Target Corp. and JP Morgen Chase, whereby a breach led to 130 million credit and debit card information being stolen by cybercriminals and exposed personal information and social security details of consumers, respectively (Johnson et al., 2018). These events in the market have disquieted consumers from utilising mobile payment services. It then puts a lot of pressure on businesses to strengthen the security of their internet infrastructures ensuring that their online services are completely secure to rebuild their trust with consumers (Vimal et al., 2021; Johnson et al., 2018).

Cyberattacks and cybercrimes are phenomena that South Africa is not foreign to and have impacted various businesses and consumers in digital spaces. South Africa has been reported as the third country to be victimised by cybercrimes costing enterprises a total of R2.2 billion annually (Dolley, 2021). It shows that cybercriminals are observing the vulnerability in the South African internet infrastructure, and this causes the country to become an agent of ransomware (Dolley, 2021). For instance, Transnet suffered a cyberattack, which forced them to pay a ransom to protect their data (Dolley, 2021). Most importantly, this has indicated that the government must work on cybersecurity regulation and act to ensure that it is in full operation to prevent South Africa from being a victim of cyberattacks (Kempen, 2017).

The technology breaches have caused severe limitations to consumers adopting mobile payment services. A study was conducted by Johnson et al. (2018) using the diffusion of innovation (DOI), simply looking at factors that impact the adoption of the technology by the

public. The study reported that the adoption was impacted by the security and the perceived risk linked to internet transactions as consumers fear losing money and show low tolerance to risk (Johnson et al., 2018). This has been the biggest hindrance in consumers exploring mobile payments as they are concerned about their personal information being violated on websites or mobile applications (Khalilzadeh et al., 2020; Johnson et al., 2018). Moreover, Johnson et al. (2018) also discovered that the ease of use is a limitation in consumers exploring mobile payments. Consumers that struggle with using mobile applications tend to give up quickly due to the pain points that they will experience with mobile payment services and prefer to learn from early adopters of the technology. Therefore, mobile payment services must be easy to use for consumers to readily adopt payment applications. In addition, payment applications should have a strong infrastructure to ensure that the information of consumers online is protected (Johnson et al., 2018; Vimal et al., 2021).

The newly modified and advanced payment infrastructure has allowed money to move across countries and ensure that payments are processed in real-time (Gómez et al., 2018). Moreover, the modernised infrastructure has enabled the cost of processing transactions to decrease and improve its accessibility anywhere at any time (Gonzalez, 2021). The infrastructure plays a key role by making sure that if a payment is initiated then the right message is sent to the system to process the request (Gonzalez, 2021). The Internet of Things (IoT) enables this instance, whereby objects speak to systems to process a request that is initiated by a consumer (Gonzalez, 2021). In addition, the systems can communicate to process requests. IoT has made it easy for information to be passed in one form and received in a different form between systems or objects while keeping the messaging information intact. The technological concept has reshaped the future of services across industries and was enforced by the rise of the fourth industrial revolution (4IR) (Farahzadia et al., 2017).

The Internet of Things (IoT) has empowered cloud technology or cloud computing whereby payment information is located efficiently and easily accessible (Gonzalez, 2021). It has significantly increased the ability of withholding and processing real-time payment data. Information is now easily exchanged between platforms at a shorter settlement time to manage consumer expectations and enhance the consumer experience (Huang et al., 2020). The interconnectedness of systems and objects requires a stable cross-system automation that is driven by machine learning. Machine learning (ML) is an intelligence that enables software applications to become good at predicting outcomes without being told to respond in a

particular way (Gonzalez, 2021). The systems will respond in a way that is informed by historical data to judge the output of a new response (Gonzalez, 2021).

Despite technology enabling accuracy in the exchange of information, sometimes some glitches occur in the system and require enterprises to have support centres to which consumers can always send their queries. Most enterprises have traditional call centres and expect consumers to call in whenever they need assistance with an issue. However, due to the development of mobile payment services, companies experienced a significant increase in the queries that they receive daily. This influx in queries has pressured companies to explore other channels that will allow consumers to send through their queries and be assisted (Kumar Saran & Chandrakala, 2016). Machine learning (ML) has given businesses new ways of exploring and monitoring the behaviour of consumers who use their platforms and using this information to improve their current products and develop complementary products (Huang et al., 2020). Machine learning has also been used widely in supporting operational aspects of businesses (Diethe et al., 2019).

Uber uses a machine learning tool called the Michelangelo; this machine learning tool is integrated into the consumer relationship management (CRM) system whereby it deciphers messages from consumers that are received in the form of queries (Diethe et al., 2019). Consumers can send their queries via email or through an in-app chat capability on the mobile application. The queries will be ticketed and sent to the backend of the system for 'deciphering' using relevant words to ensure that the machine understands what the issue is (Figure 1) (Hermann & Balso, 2017). Once the words have been deciphered by the machine, then the machine will propose three solutions to that query and get sent to an agent. Thereafter, the support agent will select the correct solution in response to the consumer's query and action accordingly (Figure 1) (Hermann & Balso, 2017). This process works very efficiently and has alleviated pressure on the support team of the enterprise from manually dealing with queries from consumers.

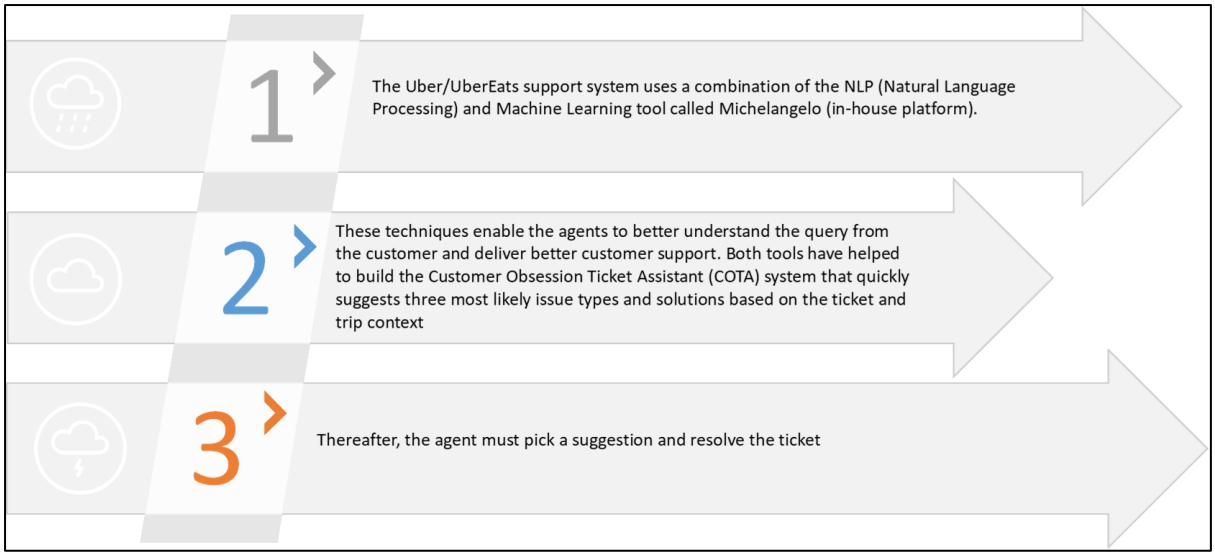

Figure 1. The Uber re-engineering process for dealing with queries.

The enhancement of the digital ecosystem for consumers and businesses has caused fraudsters to find new strategies to keep stealing consumers' and business information (Gómez et al., 2018). Machine learning has been used by financial institutions and card associations such as VISA and Mastercard to also strengthen their cybersecurity. Machine learning can detect consumer behaviour and report any activities that are fraudulent or not (Gómez et al., 2018). Machine learning in this instance tracks the spending behaviour of a consumer and it is mindful of anomalies in the spending patterns. The study by Cordray et al. (2014) reported that sometimes the analysis can result in false positives and impact consumer usage of the mobile payment application due to dissatisfaction experienced (Vimal et al., 2021). The latter can be optimised by using other Artificial Neural Networks (ANN) proposed by Gomez et al. (2018) to delimit the false positive and false negative detections.

1.2 **Problem Statement**

The advancement of technology has led to new developments in how people and systems interact in this age. The evolution of technology has enabled the new age consumers and businesses to use their mobiles to perform transactions (Wong et al., 2008). The payments environment has moved from it being a key function of the banks to telecommunications (telecoms) and other enterprises also having a part in payments (Chiorazzo et al., 2018; Wong et al., 2008). It is noticed that mobile payments provide convenience to consumers and businesses (Huang et al., 2020). In the South African context, the South African Reserve Bank (SARB) is the regulator of the national payment systems (NPS) and must ensure that all the

payment systems are safe and convenient for both consumers and businesses. South African consumers and enterprises have more than 18 payment systems from which they can choose. The choice can be based on the elements described by the diffusion of innovation (DOI) study, such as usability of the system, safety as well as transaction costs (Wong et al., 2008; Johnson et al., 2018). Consumers and enterprises can select systems that have low transaction costs to high transaction costs depending on the type of services that they require (Feldhaus & Mathauer, 2018; Wong et al., 2008). Mobile payments have grown in popularity, but they also come with increased risks. Cybercriminals often target mobile transactions, leading to financial and data losses (Chen, 2021). This is due to insufficient security measures and consumers' concerns about their privacy and the protection of their personal information (Chen, 2021).

1.3 **Research Question**

With the advancement of technology and payment services, certain factors influence whether people use digital payment systems and what risks they consider. The study aims is to address the following questions:

- What factors influence users to adopt digital payment gateway systems?
- How do users respond to risk concerns on the usage of digital payment gateway systems?

1.4 **Research Objectives**

Based on the research question, the study assessed the following objectives:

- Identify the influences the adoption of digital payments, viewed through the TAM and UTAUT models.
- Investigate digital payments adoption, specifically integrating constructs of perceived risk.

1.5 **Significance of the Research**

Given the global and South African growth in mobile payments, this research is valuable for anyone interested in finance. Mobile payments are particularly important in developing countries, offering convenient person-to-person transactions for the unbanked population. Research has identified key factors influencing mobile payment adoption, including ease of use, perceived usefulness, trust, social influence, performance expectations, and facilitating

conditions (Venkatesh et al., 2003; Napitupulu, et al., 2017). Mobile payment systems offer low costs, accessibility, and efficiency, making them attractive to emerging markets. However, despite these benefits, adoption remains low due to concerns about risks. This study aims to understand how these risks impact users' intentions to use mobile payments.

1.6 **Chapter Summary**

The modernisation of technology has significantly changed how payments are conducted in this age. Digitisation of payments has created a new ecosystem of online consumers and increased competition amongst the companies that facilitate payments. Various companies besides financial banks have penetrated the market and facilitated payments for customers at lower costs. Some of these companies partner with the banks to use their licenses while some of them apply for their own licenses to actively compete in the payment environment. The migration of payments to online facilities has also attracted fraudsters to find new ways to hack customers' accounts in pursuit of stealing their information and this forces companies to strengthen their online infrastructure. Investigating users' attitudes towards mobile payment gateways, including their reasons for using them and their perceptions of risk, will help us understand the effects of digital transformation on end users.

1.7 **Research Outline**

Chapter 1 provides a background on the evolution of payments and technology use, and outlines the problem statement, research questions, and the study's significance. Chapter 2 reviews existing literature on payment services and regulatory concepts. Chapter 3 details the methodology used to achieve the study's objectives. Chapter 4 presents and interprets the findings. Chapter 5 discusses the key results, and Chapter 6 concludes the study, summarising its implications and offering recommendations.

2 Chapter 2: Literature Review

2.1 Introduction

Operational teams of financial institutions perform activities that customers never get to realise in the backend such as managing and processing transactions and will have to ensure that the information of the clients is always protected. The automation that was brought by the modernisation of technology has enhanced the operations of businesses and influenced the influx in e-commerce platforms. This has put massive pressure on payment administrators to recruit resources with technical expertise to build secure payment infrastructures to ensure that they can provide their services and goods online. This then inquires an interest to discover the user adoption on the usage of mobile payment system and concerns thereof that users have on the payment systems.

2.2 Banking Operations

Retail banking procedures are the same as business banking procedures and practise in the sense that business banking still provides services such as start-up loans, processing transactions and collecting deposits, to mention a few (Wong et al., 2008). However, business banking can be more sophisticated than retail banking as companies would need more support from the bank such as requiring the bank to perform a treasury function on behalf of the company (Cordray R, 2014; Kitsios et al., 2021). Banks and other financial institutions perform activities that customers never get to realise in the backend. Some of these activities include closing the fulfilment of loans, processing payments as well as resolving disputes for customers (Syed, 2021). The back office of the financial institutions is responsible for the mentioned activities and must ensure that appropriate procedures are followed to complete a customer's transaction (Syed, 2021). Moreover, the operations team will have to ensure that the information of the clients is always protected.

Financial institutions have different operational processes and procedures based on the customers that they serve (González-Carrasco et al., 2019). They build their customer base by providing specific services or products to a particular group of individuals (Deninzon et al., 2019). Sage (2017) reported that with the increase in competition in the finance industry, companies must develop their speciality products and services and understand what their customers require. Companies aim to retain their existing customer base and ensure that they

keep up with up-to-date developments to ensure continuous servicing of their customers' needs (Syed, 2021). Some of the elements that the companies focus on to better their service delivery are providing a great customer experience, offering incentives, and implementing loyalty programmes to retain and grow their customers (Thomas-Bryant, 2017).

The automation that was brought about by the modernisation of technology has enhanced the operations of businesses (González-Carrasco et al., 2019). McKinsey (2019) reported that the manual effort in compiling and processing payments has decreased, and these activities are now done by machines. The machines run analytics for the operations team and advise on the product options that should be given to a client, making the whole experience customer-centred. McKinsey (2019) also reported that recent banks are becoming tech companies whereby state-of-the-art technology is used to better the operations of financial institutions (Deninzon et al., 2019). Moreover, the banks use analytics to build more accurate measures to monitor payment behaviour and cell phone usage of the customer (Kitsios et al., 2021). This then explores another option to track customer behaviour and concerns, and not only rely on the call-centre data. Operational consultants can also manage key performance indicators (KPIs) regularly and use these to continuously evaluate the customer success strategy based on analytics (Deninzon et al., 2019; Thomas-Bryant, 2017).

2.3 **Telecommunications and Internet Architecture**

The advances in mobile phones have caused individuals to stop using fixed lines for communication. Individuals in developing countries started using mobile phones due to the ability to obtain information at lower transaction costs. Without mobile phones, individuals had to travel to get information, and mobile phones brought the convenience of accessing information at any time (Waverman et al., 2001). Waverman, Meschi and Fuss (2001) reported that there is causality between advances in mobile networks and the GDP of a country as advances in mobile networks influence individuals to purchase devices and in turn, increase the GDP of a country. Moreover, the increase in devices led to an increase in the social value of a country (Chen et al., 2017).

Telecommunications (Telecoms) have invested in digital disruptions to be able to produce new internet networks for their customers and enable their partners to enhance their operations by providing them with the latest digital systems to pursue new streams of profit such as Cloud and Software as a Service (SaaS) (Farahzadia et al., 2017; Sadoughi et al., 2020). The increase in digital businesses makes it overly critical for companies to know who their competitors are

and the threats in the market (van Schewick, 2010). With the increase in the digital business, customers have become the centre of every business strategy and businesses aim to retain their customers at all costs to ensure profitability in the end (Bartelt & Hommel, 2021). In addition, with this business strategy, companies experience the pressure to develop systems and new products that will keep their clientele interested in the companies' offerings.

The internet is not owned by anyone or any organisation, however, it is a decentralised system that spans a wide network of networks. Certain protocols are in place to ensure that the networks communicate within these protocols, namely, the Transmission Control Protocol (TCP) and Internet protocol (IP) (Shacklett et al., 2021). The standards of the protocols are set and run by organisations such as the World Wide Web Consortium (W3C), which sits within the Massachusetts Institute of Technology (MIT) computer laboratory faculty (Shacklett et al., 2021). More than half of the world's population uses the internet to access information and services. The internet has benefited businesses and individuals by ensuring that information travels quickly and that they can communicate with people from various places in the world (Khalilzadeh et al., 2020).

The consortium and other private organisations regulate the protocols at a global level while local networks are regulated by the private companies and the government. These agencies will then provide networks to individuals and other businesses, and they are referred to as Internet Service Providers (ISP). The ISPs will then require the individuals to pay for the internet that they provide, and in their modelling strategy, they will ensure that the business remains profitable (Shacklett et al., 2021; van Schewick, 2010). Porter (2003) reported that internet companies should strive to make economic value by determining a good pricing point and reducing costs to sustain the profitability of an organisation. Considering that several companies are internet service providers (ISPs), and the competition is extremely high, companies must aim to establish a good pricing point against their competitors and provide quality internet networks to their clients (Porter, 2003; Shacklett et al., 2021).

Sending information through the internet is complex, the information is broken down into small packets sent to local networks and shared with the appropriate destination. Various network devices handle and direct data packets to their intended destinations. These devices include hubs, routers, gateways, and repeaters (van Schewick, 2010). Hubs are used to link computers to one another while gateways are used to translate a form of a network into a different kind (Shacklett et al., 2021). Normally, the signal of passing information deteriorates with the

distance that it travels, and gateways experience this more often. To solve this, the repeaters are used to reduce the deterioration of the signal occurring. Gralla (1998) mentioned that the routers are also used to send information between different networks and manage the traffic of the internet on the local area networks (LANs).

TCP/IP are communication protocols that are used to manage the end-to-end process of sending information, from messaging, packing the information, reassembling, and routing the message to the receiver (Shacklett et al., 2021). TCP assembles the information sent via the internet after it has been packeted while the IP ensures that the information/communication is sent to the correct destination. Moreover, TCP/IP allows for remote login into systems or server hosts, and they are used to establish a lot of applications across industries, such as mobile applications, internet logins as well as the delivery of emails (Gralla, 1998; van Schewick, 2010). It is also important that internet infrastructures are secure considering new forms of abuse in digital spaces whereby cybercriminals steal information of businesses/consumers and illegally sell them on the dark web to make a profit (Khalilzadeh et al., 2020). Network Address Translations (NATs) are used with the IP to improve security on the servers and companies' networks (Shacklett et al., 2021). Therefore, the networks and their hardware ensure that information is sent to the appropriate destination and remains uncorrupted (Gralla, 1998).

2.4 **Mobile Payment Systems and E-commerce**

Payment systems have evolved significantly in the past years, the evolution was caused by the modernisation of technology (Fransman, 2004). Advancements in technology have enabled the world to move from paper-based payment systems to e-payment systems (Odior & Banuso, 2012). Information and communication technology (ICT) has changed the operations of the business and caused an increase in the emergence of businesses in payment services. Besides banks, technological and FinTech companies have ventured to facilitate payments (de Luna et al., 2019). Technological developments on the internet have given a lot of companies the impression that the digital payment system operates above the set rules and regulations as this type of payment service is performed on cloud-based systems (Kitsios et al., 2021). In addition, deregulation has been noticed where some e-payment platforms are charging high fees, and de Luna et al. (2019) mentioned that the limited research on the pricing of these systems must draw policymakers to this issue.

The rise in e-commerce has forced payment administrators to obtain technical expertise or hire IT specialists to build secure payment infrastructure to ensure that they can provide their

services and goods online (de Luna et al., 2019). The technical specialists would have to know about internet architecture and construct the right protocols to ensure that the right servers are being accessed as well as send information to the right hardware in the network infrastructure (Shacklett et al., 2021). This is critical for business operations to ensure that the security of the platform is intact so that the consumer and merchant information is not breached and most importantly that the payment infrastructure can perform the activities it was invented for (van Schewick, 2010; Waverman et al., 2001). The activities could include, sending payment requests, recording transactions on the cloud, and enabling remote login to the platform by merchants and consumers. The abovementioned activities require an exchange of data between networks to ensure that the appropriate signalling is received by the system and the ability of the system to also respond to the signal (Shacklett et al., 2021). Anomalies in this event would trigger an error at the end of the pathway. It would require the technical team to investigate the reason for the occurrence and urgently fix it with the intent of maintaining a good user experience (Barry & Crowley, 2012; van Schewick, 2010).

E-commerce is normally cheaper in terms of transaction costs as it bypasses intermediate systems, and institutions need to ensure that the e-platforms are governed and always regulated to keep them lawful in this process (Diethe et al., 2019; Domingue et al., 2011). Molla and Licker (2005) explained that e-commerce businesses in developing countries differ from the ones in developed countries. Most businesses in developed countries have access to affordable internet infrastructure, which makes it easy for businesses to pursue e-commerce platform ventures (Molla & Licker, 2005). On the contrary, businesses in developing countries lack to facilitate e-commerce because it is expensive to use the infrastructure and maintain it, especially when the business is small. Moreover, the view of communities towards e-commerce raises concerns for businesses about whether the market will respond well to this new payment venture or channel (Frempong & Atubra, 2001). In addition, most businesses were reluctant to pursue e-commerce ventures in developing countries due to the lack of responsiveness in the market to digital platforms (Margaret & Ngoma, 2013). This concern also lures the DOI study of the e-commerce platforms on whether they are easy to use, efficient and convenient enough to drive e-commerce adoption in the market (Margaret & Ngoma, 2013).

The outbreak of Covid-19 has impacted the world whereby countries went on lockdown for a prolonged period. This meant that businesses had to shut down their operations and individuals had to avoid personal contact, during this time both businesses and individuals were impacted (P. Patel & Bhatt, 2020). Since the operations of business were put on halt, it meant that people

had to be laid off, which in turn increased the unemployment rate. Moreover, businesses now had to rethink new ways to continue with their operations and most of them had to pursue the digital channel (Craven et al., 2022). Businesses had to assess and improve their digital and social media presence to ensure that they attract the right market on the internet as everyone spent a lot of time online (Goldberg, 2022; Craven et al., 2022). So, they can continue to sell their services and goods and make a profit, and this was seen across the world, both in developing and developed countries. Certain businesses could not implement e-commerce facilities due to the lack of experience in the space and the infrastructure being expensive to implement and maintain, so they had to completely shut down their operations or explore cheaper avenues (Sleem, 2005).

The increase in competition in digital spaces caused companies to lower their e-commerce fees to attract merchants and individuals. In addition, the high competitiveness in the market enabled companies to pursue partnerships to have leverage in the market. This gave businesses that could not develop their e-commerce platforms to partner with financial services to pursue e-commerce services (Feldhaus & Mathauer, 2018). This was a time whereby, there was a rise in partnerships between businesses promoting business-to-business (B2B), business-to-consumer (B2C) and consumer-to-consumer (C2C) selling, and the businesses would sell what they want online with no limit and have the potential of their products reach different regions of the world (K. Patel, 2017). Moreover, these partnerships allowed businesses to facilitate their operations at a lower cost and gain valuable customer data from the systems (Kitsios et al., 2021). The data could be used to make future decisions around the product and services and ensure that enterprises still cater for the needs of the customer (Feldhaus & Mathauer, 2018).

2.5 **Regulation and Risk Management**

The ongoing changes in technology and globalisation in the world have caused a rise in risk over time. Risk is associated with ways that economic activity and the safety of individuals are negatively impacted by a situation (Srivastava, 2017). For instance, Covid-19 caused a pandemic and impacted the employment of individuals and in this scenario, Covid-19 is seen as a risk in the environment and parties needed to come together to mitigate it. For any risk to be mitigated or moderated, the government and other stakeholders should provide regulations that ascribe intervening steps to inhibit or slow the progression of risks in the economy (Syed, 2021). Srivastava (2017) reported that in India, the government and private sector prefer to

partner on developmental projects that occur in the country as they can share the risk of the project among them. The current risks in financial institutions have to do with the advancements in payment systems enabled by technology which has increased the activity of fraudsters online to always try to corrupt business systems and steal valuable data to make a profit from it on the dark web (Srivastava, 2017). This is a noticeably big concern for businesses and individuals that operate in digital spaces and is seen as a limiting factor in persuading individuals to use online platforms (Johnson et al., 2018). Since consumers have a low tolerance for risk, there must be risk management systems in place to ensure that personal and business details are always protected (Johnson et al., 2018).

2.6 User Adoption and Risk Concerns of Adoption

India had a demonetisation vision in 2014, whereby the intent was to ensure that all transactions happen electronically and are cashless (Srivastava, 2017). For India to achieve this goal, it had to establish a Unified Payment Interface with the Central bank and allow payment providers to link their payment infrastructure to the Central Bank system (Srivastava, 2017). Google Pay and WhatsApp have been linked through this system to facilitate digital payments in the country and have made a profit (Srivastava, 2017). Moreover, China also used Alipay and WeChat to facilitate electronic payments and are currently the largest players in the country, each having a market share of 40% and 54%, respectively (Arauz, 2021).

User behaviour has been explored by research to capture the current technological adoption of mobile payments (Chen, 2021). A few models have been used to describe the phenomenon of individuals to technological advancement, changes as well as innovations. Technological Acceptance Model (TAM) and The Unified Theory of Acceptance and Use of Technology (UTAUT) models are two prominent theoretical frameworks used to understand the adoption of modern technologies by individuals (Napitupulu, et al., 2017). They offer Useful information about what makes people think and act the way they do with modern technologies. The TAM, developed by Fred Davis, is grounded in the theory of reasoned action (TRA). TRA puts forward the fact that individuals' intentions to perform a behaviour are influenced by their attitudes toward the behaviour and their subjective norms (Napitupulu, et al., 2017). In the context of technology adoption, TAM suggests that users' intentions to use a technology are shaped by their perceived usefulness and perceived ease of use. Perceived usefulness refers to the belief that the technology will improve performance or enhance job satisfaction

(Napitupulu, et al., 2017). Perceived ease of use, on the other hand, is the belief that the technology is easy to use and requires minimal effort.

Another factor modelled on the TAM to study information technology (IT) includes the perceptions of the benefits the users obtain from using such technologies (Chen, 2021). The perception of the benefits of mobile payment systems influences the user to explore technological advancements. TAM also analyses why other consumers would reject the use of a particular technology and/or innovation. This could be influenced by other factors such as perceived risk, perceived security and perceived trust and privacy which can hinder consumers from adopting a technology if it is deemed inadequate (Maqableh, et al., 2016). One reason for the low adoption of e-payments is a lack of public trust. Frequent malfunctions, potential fraud, and limited availability of e-payment machines can lead people to question the usefulness of this modern technology (Chen, 2021).

2.7 **Conclusion**

In this chapter, detailed literature has been reviewed spanning various aspects of the research topic. The overview of the banking operations is followed by an overview of the technological infrastructure and advancement it has enabled for payment systems. Furthermore, discussed the user adoption of mobile payment systems and factors that have posed lower the adoption of technological uses such as risk and security concerns.

3 Chapter 3: Research Methodology

3.1 Introduction

The section explains the methodology that was adopted in this research. It details the research quantitative design, the research sample, the method of analysis as well as the ethical considerations, particularly with plagiarism and the accurate attribution of sources.

3.2 Research Design

There are various methods of conducting research and it includes two main categories, those being quantitative and qualitative research methods. Quantitative research methods involve using numbers to measure data and researchers would typically use statistical analysis to find a connection and meaning in the data (in relation to variables being measured). The qualitative method is used in collecting and analysing information to understand the concepts of a topic and apply logic to the literature that has been put forward (Seers, 2012). Moreover, qualitative is used to understand how people experience and interact with the world (Seers, 2012). The quantitative method was chosen for this research, which used a structured, electronically distributed questionnaire measuring the adoption and risk concerns of mobile payment gateway.

3.3 Population and Sample

Samples must be chosen based on quality, feasibility, criticality, compatibility, and comparability to adequately answer the research question. The systematic sampling technique is also known as a probability sampling method where a researcher sets a desired sample size for a study and decides who in the target population will be sampled. This technique is simple to use, has minimal risk of the data being contaminated and reduces bias (Edgar and Manz, 2017). This research utilised the systematic sampling technique to obtain insights on the user payment gateway adoption where a questionnaire was administered online. Systematic sampling is a probability sampling method where a researcher chooses a target from a reliable sampling frame to ensure that the population of the study is evenly sampled (Edgar and Manz, 2017). For this study, the population of interest was users of mobile payment systems.

3.4 **Data collection**

To address the research objectives outlined in chapter 1, this study employed an online digital survey. The questionnaire was designed to address gaps identified in the literature review (chapter 2). The survey link was distributed via email and social media platforms, including WhatsApp, Facebook, LinkedIn, and Instagram. These platforms were chosen due to their widespread use in South Africa (Statista, 2022c), maximizing accessibility to potential participants.

3.4.1 Electronic Questionnaire

The study was implored a two-part survey questionnaire to be developed by the researcher. The first part was a demographic questionnaire which focused on ethnicity, age, gender, province of origin and highest education. The second part focused on the use of the payment systems gateways, user- experience and risk/security concerns the users may have. Therefore, the second part of the survey explored questions that relate to the following constructs, those being, Ease of Use (PEU), Subjective Norms (SN), Trust (PT), and Perceive Risk (PR).

Ease of Use (PEU)

1. Mobile payment gateway makes it easier to perform transactions.
2. Payment Gateway enables us to do transactions quicker.
3. Mobile payment gateway is easy to use.
4. It is easy to learn how to use a mobile payment gateway.

Subjective Norms (SN)

1. The people important to me think I should use the mobile payment systems.
2. It is expected of me to utilise the mobile payment systems.
3. I feel under social pressure to use mobile payment systems.

Trust (PT)

1. I believe that my transactions on mobile payment systems are likely to be safe.
2. Mobile payment systems are likely to be reliable.
3. Many things may not go wrong with my transactions with mobile payment.
4. I am confident that my transactions with mobile payment systems will be transparent.

Perceived Risk (PR)

1. Do you think the security of mobile payment systems is good enough?
2. I feel confident that my personal data is secure on mobile payment systems.
3. I have experienced security issues (Fraudulent transactions, Loss of funds, data breaches) on the mobile payment systems.
   Is Authentication of the mobile payment system sufficient?

3.4.2 Measurement Scale

A 5-point Likert scale was used to ensure that the questions were addressing the constructs that were being tested. 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree.

3.4.3 Advantages and Disadvantages of Online Questionnaire

The reason for adopting an online questionnaire is that it can reach more people quickly and offer a more flexible and interactive way to gather data. They also eliminate potential biases caused by the researcher's physical presence (Wright, 2005). However, a major drawback of online questionnaires is their often low response rates.

3.5 Data Analysis

The responses from the questionnaire were mined for information to identify the main themes with a correlation to the main research questions and sub-themes that could potentially come out of the questionnaire. Thereafter, statistical methods were used to further examine the information about user payment system gateway adoption. This was done using the following.

3.5.1 Descriptive Statistics

Descriptive statistics provided a demographic overview of the participants, including their ethnicity, age, and gender. This information was presented in the form of pie charts.

3.5.2 Quality Assurance Measurement Models

3.5.2.1 Construct Reliability

The study used Cronbach's alpha to test the reliability of the scales in the research questionnaire. The measurement model offers values between 0 – 1 that determine how closely

related a set of items are as a group (Gliem & Gliem, 2003). The scale is reliable when the value of Cronbach coefficient alpha is higher than 0.7 (Gliem & Gliem, 2003). However, coefficient values between 0.5 and 0.6 are still acceptable. SPSS was used to extract, process, and present the data and results related to the research constructs. SPSS is chosen because of its capabilities in handling these tasks effectively.

3.5.2.2 Construct Validity

An exploratory factor analysis (EFA) was used to verify the validity of the research concept. This method assesses the validity of the research instrument by examining the relationships between measurement items and their corresponding factors (Price, 2023). For a successful EFA, each factor should have a stronger loading than its cross-loadings with other constructs and should be more than 0.6 (Price, 2023).

Before extracting scores from the collected data, several tests should be conducted to ensure its suitability for factor analysis. One of these tests is the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. KMO ranges from 0 to 1, and a value of 0.50 or higher is considered significant (Napitupulu, et al., 2017).

3.6 Ethical Considerations

The requirement for ethical conduct is fundamental to all research practices. One of the fundamental ethical principles guiding researchers is the recognition of potential participants' right to make informed decisions about their participation. Moreover, appropriate precautions were taken to shield participants from harm and to ensure they were treated without discrimination. Finally, the researcher undertakes to use the research for its intended purpose and not exploit the participants. This research ensures that all ethics requirements are considered and that the researcher followed the University of the Witwatersrand's ethics policy. This research placed a strong emphasis on academic honesty, meticulously avoiding plagiarism and providing accurate source citations

3.7 Conclusion

This chapter has outlined the quantitative research methodology that was used in this study, which focused on the quantitative questionnaire that provided insights into the user adoption of the mobile payment gateways. The section also covered the motives for the selected research

approach which would be a precedent of the justification for the data collection and analysis that is discussed in the following chapter.

4 Chapter 4: Presentation of Results

4.1 Introduction

This chapter aims to present the findings of the data collected in investigating the adoption of payment applications in South Africa. The chapter begins with the representation of the participant's demographics, followed by the quantitative analysis of the results using the SPSS software. The survey was distributed using Qualtrics XM, 294 responses were collected, with 268 who fully responded to the questionnaire. The data were analysed using SPSS software and Excel Microsoft and are presented as flows:

4.2 Demographics of Participants

As part of the survey, the participants were asked to provide their demographic information, which included their ethnicity, age, gender, highest level of education attained, and the province in which they reside.

4.2.1 Ethnicity of Participants

An analysis of the survey participants, as illustrated in Figure 2, reveals that the African population constituted the largest demographic group, comprising 97.1% of the Participants. Coloured accounted for 1.8%, while Indian and White represented 0.7% and 0.4%, respectively (Figure 2).

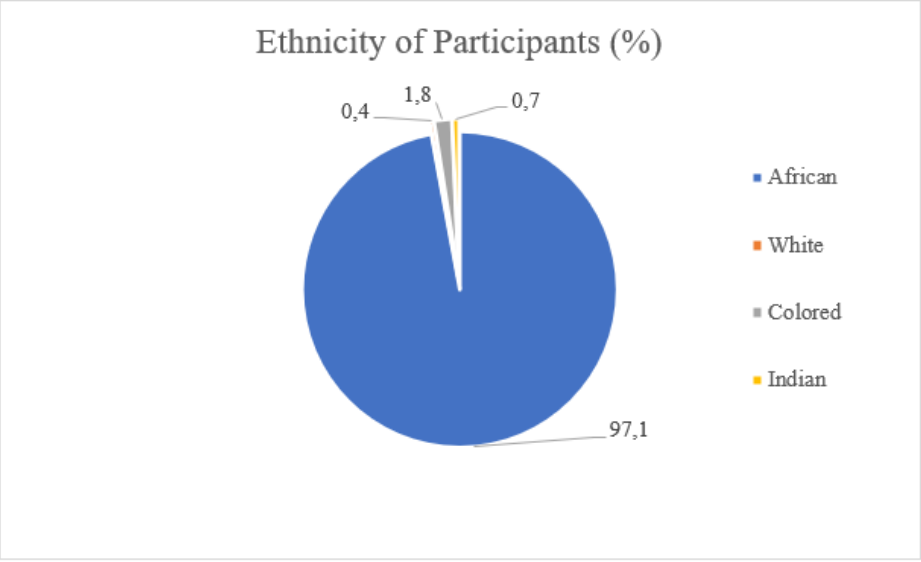

Figure 2 Ethnicity of Participants

4.2.2 Gender of Participants

The survey results show that most of the female representation is at 57.7%, followed by males at 39.8%. A small fraction of 0.4%, was identified as non-binary. Additionally, 2.2% of the participants preferred not to disclose their gender identity (Figure 3).

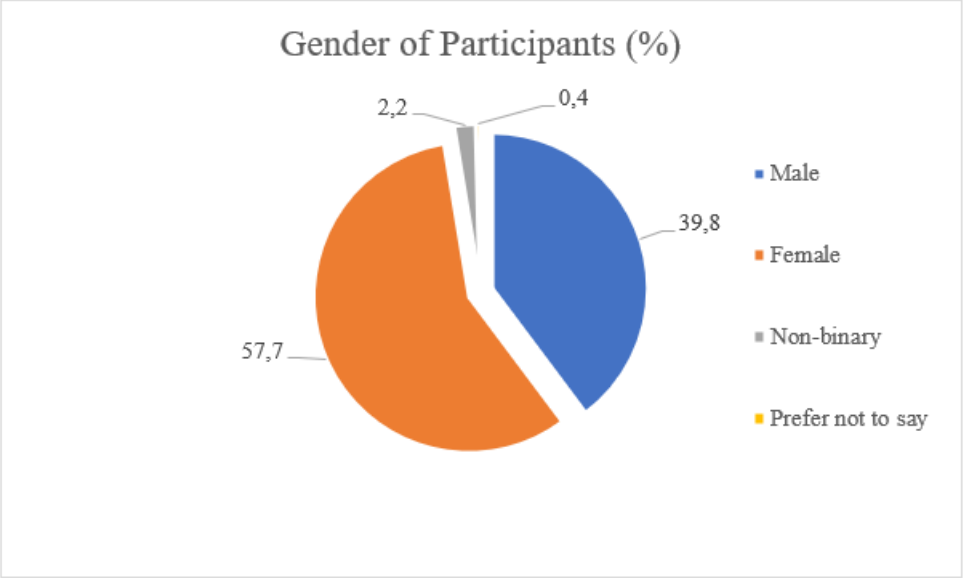

Figure 3 Gender of Participants

4.2.3 Age of Participants

The age distribution of the participants demonstrated a significant concentration in the 20-39 age group, accounting for 82.5% of the total. The >40 age group followed with 13.9% participation, while the <20 age group had the lowest representation, comprising only 3.6% of the Participants (Figure 4).

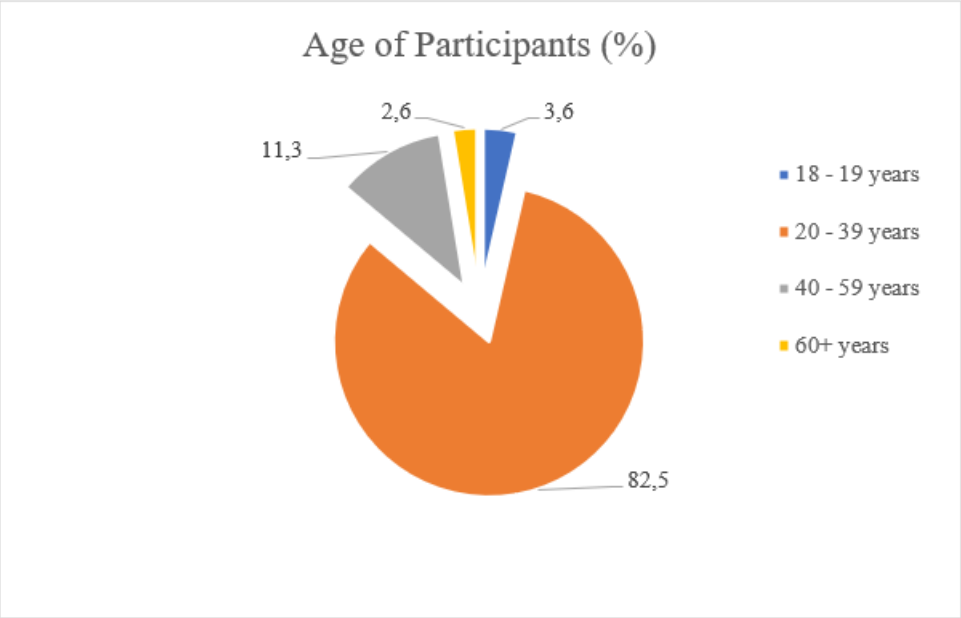

Figure 4 Age of Participants

4.2.4 Province of Residence

The survey results revealed a strong concentration of Participants in Gauteng, accounting for 84.6% of the total. Limpopo followed with 2.9% representation. Participation from the other provinces was minimal, all falling below the 2.6% threshold. Notably, no Participants indicated residence in the Northern Cape (Figure 5).

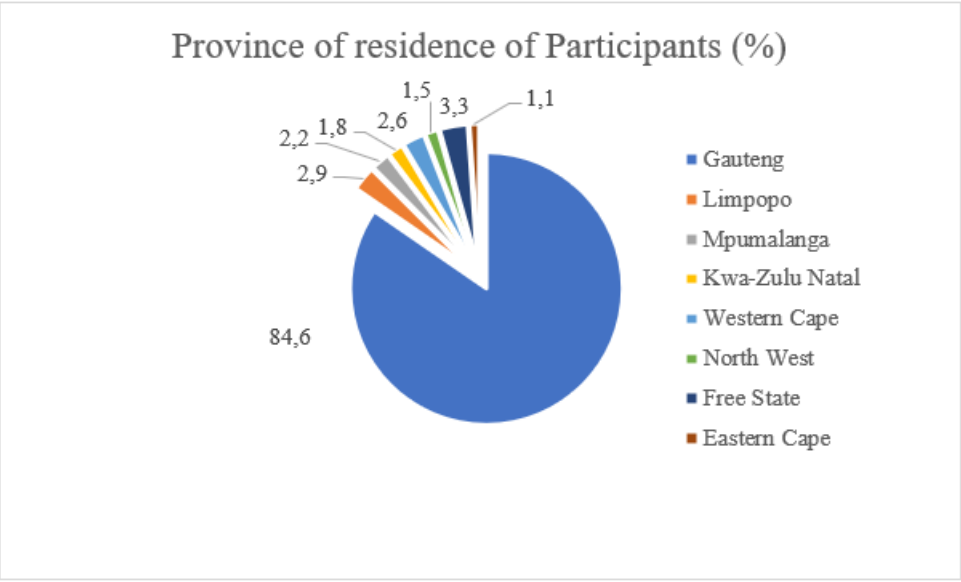

Figure 5 Province of Residence of Participants

4.2.5 Highest Qualification

The survey results demonstrate a significant presence of graduates within the sample group, comprising 51.8% of the total. Individuals with postgraduate qualifications followed and, constitute 24% of the Participants. In contrast, only 24% of the sample group indicated a senior certificate as their highest level of education (Figure 6).

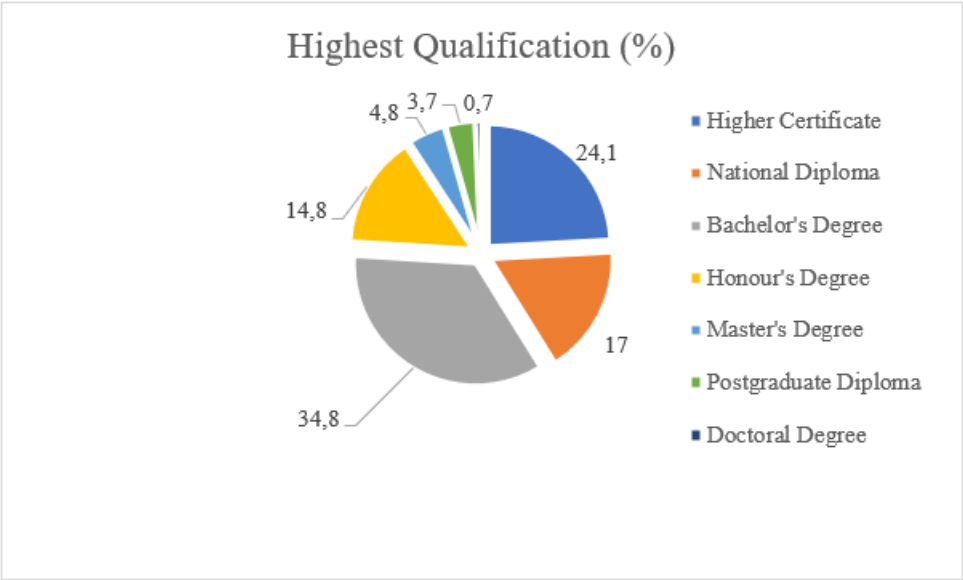

Figure 6 Highest Qualification of Participants

4.3 Quality Assurance Measurement Models

4.3.1 Construct Validity

Prior to conducting factor analysis, the suitability of the data for this technique was evaluated. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, which assesses the proportion of variance in the variables that are shared, yielded a value of 0.852 (refer to Table 1). This value exceeded the recommended threshold of 0.6, indicating high sampling adequacy. Furthermore, Bartlett's test of sphericity, which examines whether the correlation matrix is significantly different from an identity matrix, returned a statistically significant result ($p < 0.001$) (shown in Table 1). This significance confirms that the correlations among the variables are sufficiently strong to warrant factor analysis.

Table 1 KMO measure of the results of the Survey. KMO > 0.8 with 268 valid responses

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0,852
Bartlett's Test of Sphericity	
Approx. Chi-Square	1476,929
df	105
Sig.	<,001

Table 2 provides communalities, which quantify the extent to which each variable's variance is explained by the extracted factors. Variables with communalities below 0.4 have a minor contribution to the underlying factors. Two variables, namely SN1 and PR3, exhibit communalities below 0.5, suggesting a moderate level of contribution. Conversely, the remaining variables demonstrate communalities exceeding 0.5, indicating a substantial contribution to the extracted factors.

Table 2 Communalities of the 268 valid responses

Communalities		
	Initial	Extraction
PEU 1	1,000	,595
PEU 2	1,000	,634
PEU 3	1,000	,620
PEU 4	1,000	,575
SN 1	1,000	,436
SN 2	1,000	,571
SN 3	1,000	,666
PT 1	1,000	,642
PT 2	1,000	,623
PT 3	1,000	,503
PT 4	1,000	,515
PR 1	1,000	,689
PR 2	1,000	,723
PR 3	1,000	,360
PR 4	1,000	,588

Table 3 guides factor selection by retaining only those with eigenvalues exceeding 1. This criterion led to the selection of three components, which collectively explain 58.28% of the total variance. This percentage falls short of the recommended threshold of ~ 60%.

Table 3 Total variance of the component being posed in the survey.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings					
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5,268	35,118	35,118	5,268	35,118	35,118	4,221	28,137	28,137
2	2,105	14,032	49,150	2,105	14,032	49,150	3,005	20,032	48,169
3	1,369	9,127	58,277	1,369	9,127	58,277	1,516	10,108	58,277
4	,955	6,365	64,641						
5	,837	5,582	70,223						
6	,747	4,983	75,206						
7	,652	4,344	79,549						
8	,560	3,735	83,284						
9	,485	3,236	86,520						
10	,446	2,974	89,494						
11	,380	2,533	92,027						
12	,369	2,458	94,485						
13	,308	2,053	96,538						
14	,271	1,809	98,347						
15	,248	1,653	100,000						

The scree plot (Figure 7), a graphical tool used in factor analysis, visually illustrates the eigenvalues associated with each component. The plot indicates a sharp "elbow" after the third component, suggesting a natural break in the variance explained. This supports the decision to retain the first three factors, which collectively account for most of the variance observed across all fifteen components.

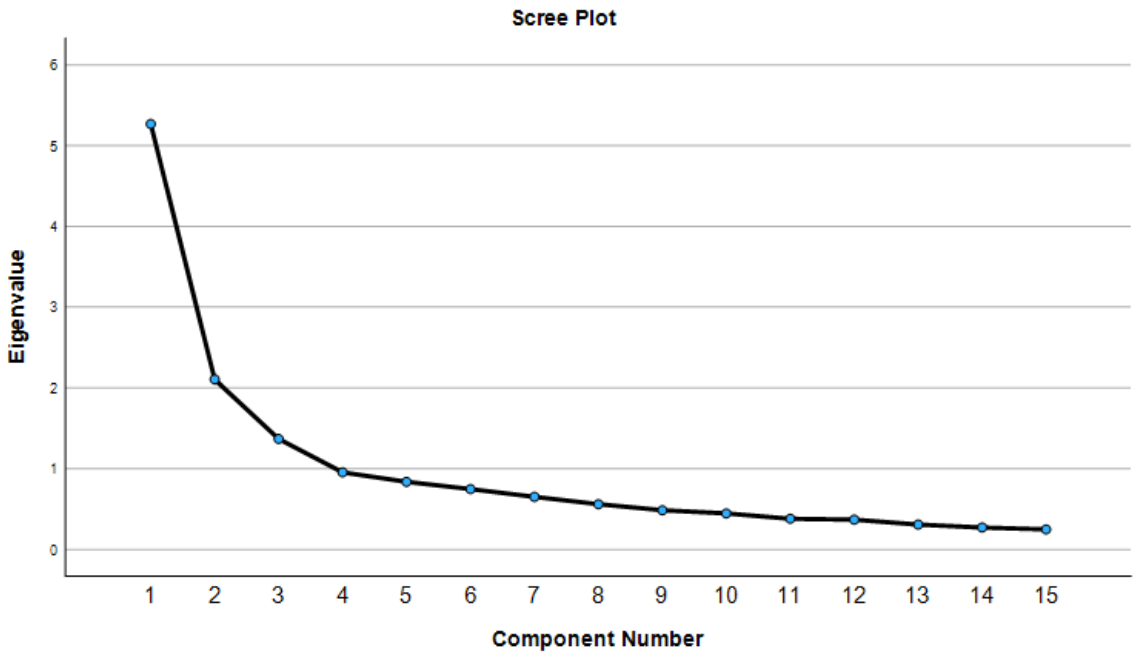

Figure 7 Scree Plot

Table 4 Component Matrix of the questions to the three components with top variance

Component Matrix[a]			
	Component		
	1	2	3
Q9__Mobile_payment_apps_are_likely_to_be_reliable	,782		
Q8__I_believe_that_my_transactions_on_mobile_payment_apps_are_likely_to_be_safe	,770		
Q12__Do_you_think_the_security_of_mobile_payment_apps_is_good_enough	,737		
Q13__I_feel_confident_that_my_personal_data_is_secure_on_mobile_payment_apps	,728		
Q11__I_am_confident_that_my_transactions_with_mobile_payment_apps_are_transparent	,700		
Q15__Is_security_authentication_on_the_mobile_payment_apps_sufficient	,665		
Q10__Many_things_may_not_go_wrong_with_my_transactions_with_mobile_payment_apps	,597		
Q3__Mobile_payment_apps_are_easy_to_use	,580		
Q4__It_is_easy_to_learn_how_to_use_mobile_payment_apps	,563		
Q5__the_people_important_to_me_think_I_should_use_the_mobile_payment_apps	,551		
Q1__Do_you_think_that_mobile_payment_apps_make_it_easy_to_perform_transactions		,623	
Q2__Mobile_payment_gateways_enable_me_to_do_transactions_quicker		,564	
Q7__I_feel_under_social_pressure_to_use_the_mobile_payment_apps			,781
Q6__It_is_expected_of_me_to_utilise_the_mobile_payment_apps			,543
Q14__I_have_experienced_security_issues_(Fraudulent transactions, loss of funds, data breaches) _on the mobile payment apps			,458
Extraction Method: Principal Component Analysis.[a]			
a. 3 components extracted.			

The analysis (in Table 4) reveals a pattern of strong correlations between Component 1 and Question 9 (variable). Furthermore, Component 2 demonstrates moderate to strong correlations with 2 variables, while Component 3 exhibits similar correlations with 3 variables. However,

the correlation between Component 3 and Question 14 (variable) is notably weaker, with a correlation coefficient below 0.5.

4.3.2 Correlation Matrix

Table 5 Correlation Matrix between the constructs

	PEU 1	PEU 2	PEU 3	PEU 4	SN 1	SN 2	SN 3	PT 1	PT 2	PT 3	PT 4	PR 1	PR 2	PR 3	PR 4
PEU 1	1,000														
PEU 2	,631	1,000													
PEU 3	,484	,486	1,000												
PEU 4	,385	,428	,625	1,000											
SN 1	,195	,268	,301	,423	1,000										
SN 2	,267	,331	,292	,223	,475	1,000									
SN 3	-,073	-,110	-,057	-,084	,068	,258	1,000								
PT 1	,217	,310	,356	,302	,291	,190	,066	1,000							
PT 2	,265	,375	,337	,402	,405	,289	-,029	,638	1,000						
PT 3	,095	,174	,142	,135	,292	,233	,208	,471	,487	1,000					
PT 4	,211	,277	,299	,297	,278	,288	,111	,554	,531	,432	1,000				
PR 1	,140	,208	,258	,237	,270	,213	,081	,598	,539	,428	,478	1,000			
PR 2	,088	,135	,258	,229	,279	,219	,089	,570	,509	,477	,497	,729	1,000		
PR 3	,092	,044	,006	,052	,004	,018	,152	-,107	-,125	-,126	-,029	-,170	-,234	1,000	
PR 4	,142	,252	,200	,203	,248	,136	,092	,524	,450	,354	,426	,610	,621	-,222	1,000

Table 6 Overall Correlation matrix for the variables

	PEU	**SN**	**PT**	**PR**
PEU	1,000			
SN	0,157	1,000		
PT	0,255	0,219	1,000	
PR	0,152	0,150	0,341	1,000

The correlation matrix reveals the linear relationships between the study variables, indicating whether these relationships are positive or negative. Correlation analysis helps identify potential covariances between variables of interest. Correlation coefficients range from -1 to +1, with values closer to -1 or +1 signifying strong linear relationships. While most variable relationships are positive, some negative correlations do exist. For instance, PEU 1, 2, and 3 exhibit negative correlations with SN3, and PR3 shows negative correlations with PT 1, 2, and 3, as well as other PR constructs (shown in Table 5). Notably, Table 6 shows that the highest correlation is between Perceived Trust (PT) and Perceived Risk (PR) on mobile payment gateway usage, whereas the lowest correlation exists between Subjective Normative (SN) and Perceived Risk (PR).

4.3.3 Reliability Testing

Reliability testing aims to determine the extent to which the measurement procedures consistently produce comparable results. Cronbach's alpha, a widely used statistical measure, was utilised to assess the internal consistency of the constructs employed in this research. A Cronbach's alpha value of at least 0.7 is commonly accepted as an indicator of acceptable reliability. The reliability analysis was based on a sample size of 246 valid responses (48 responses were excluded).

Table 7 Cronbach's Alpha

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
,821	,838	15

Table 7 demonstrates the reliability of all constructs, with a Cronbach Alpha of 0.838, indicating high internal consistency. A 5-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree), was used for data collection.

Table 8 Constructs' Mean and Standard deviation.

	Mean	Std. Deviation
Ease of Use (PEU)		
PEU 1	4,55	,769
PEU 2	4,39	,840
PEU 3	4,30	,821
PEU 4	4,17	,793
Subjective Normative (SN)		
SN 1	3,85	,978
SN 2	3,66	1,082
SN 3	2,35	1,185
Trust (PT)		
PT 1	3,66	1,005
PT 2	3,76	,918
PT 3	3,04	1,111
PT 4	3,62	,895
Perceived Risk (PR)		
PR 1	3,20	1,080
PR 2	3,28	1,062
PR 3	2,58	1,293
PR 4	3,35	1,080

The analysis in Table 8 reveals that most constructs have mean scores of 3 or higher. However, SN 3 ("I feel under social pressure to use the mobile payment apps") has a mean of 2.35, which rounds to 2, suggesting disagreement among Participants. Moreover, PR 3 ("I have experienced security issues (Fraudulent transactions, Loss of funds, data breaches) on the mobile payment apps") has a mean of 2.58, rounding to 3, indicating a neutral response (neither agree nor disagree).

Table 9 Descriptive statistics of combined variables

Constructs	N	Minimum	Maximum	Mean	Std. Deviation
Ease of Use (PEU)	246	1	5	4,353	0,806
Subjective Normative (SN)	246	1	5	3,287	1,082
Trust (PT)	246	1	5	3,520	0,982
Perceived Risk (PR)	246	1	5	3,103	1,129

Among the factors examined, Ease of Use (PEU) exhibited the highest mean score at 4.353, indicating strong agreement (refer to Table 9). Trust followed with a mean of 3.520, suggesting a positive perception. Perceived Risk had the lowest mean score at 3.103 (refer to Table 9), indicating a neutral response, neither agreeing nor disagreeing with the statements related to risk.

5 Chapter 5: Discussion of Findings

5.1 Introduction

While chapter 4 presented and described the findings of this study, chapter 5 provides a more nuanced understanding by critically analysing the results of the research questions. This was achieved by discussing and linking the findings within the broader context of existing literature, allowing for a deeper understanding of the observed findings.

5.2 Demographics

5.2.1 Age

This study found that individual differences, such as age, gender, and experience affect the adoption of mobile payment gateways. This is in line with the findings of Venkatesh et al. (2003), who found that these demographic factors are recognised as potential moderators of the relationships between the UTAUT factors and technology adoption. In this study, it is found that individuals aged 20-39 years demonstrated a higher propensity to adopt mobile payment gateways with 82.5% of the sample suggesting a positive relationship between this demographic and the four core constructs of the UTAUT model. Moreover, Mothogae (2023) reported that most of their participants were between the ages of 18 to 35 years and this age group has been considered as the early adopters of technology and is in line with the UTAUT and TAM models.

5.2.2 Gender

This study indicated that gender plays a role in the likelihood of using mobile payment systems. Younger women, representing 57.7% of the study's participants, were the most inclined to use these systems. This result supports Mothogae's (2023) findings, which also showed a significant positive relationship between gender and mobile payment use, with women making up 59% of their study's participants. However, this current study's findings contrast with those of Reynolds et al. (2023), who suggested that gender is not a significant factor in mobile payment adoption in countries where awareness of such systems is already high. Furthermore, Reynolds et al. (2023) found that in developing countries, women tend to be less aware of and less likely to use mobile payments, a finding that directly contradicts the results of this study.

5.2.3 Education

Over half of the participants held university degrees, suggesting a positive correlation between education level and the adoption of digital payment gateways. This aligns with Mothogae's (2023) research, which also found a statistically significant link between education and digital payment adoption, with over 80% of their participants holding university degrees. The higher education level of participants in both studies is thought to have facilitated their understanding and use of mobile payment systems, thereby promoting adoption.

5.3 Factors Influence Users to Adopt Digital Payment Gateway Systems

5.3.1 UTAUT

Understanding the factors influencing individual technology acceptance is a crucial area within information systems (IS) research (Chang, 2012). The findings of this research reveal that some factors relating to the UTAUT model adopted in this study, as well as the demographic factors affect the adoption of the payment gateway system in South Africa. Some of the factors are explained as follows:

5.3.1.1 Perceived Ease of Use (PEU)

Perceived ease of use (PEU) of mobile payment gateways emerged as the strongest factor influencing adoption in this study, with a high mean score of approximately 4.3 out of 5 and a standard deviation of 0.806. This suggests a strong positive perception of ease of use, with 86% of participants reacting favourably. This aligns with previous research, such as Aljarrah (2016), who identified perceived usefulness and ease of use as key drivers of technology adoption. Furthermore, the findings support Indarsin and Ali (2017), who also observed a positive impact of PEU on user attitudes towards technology.

5.3.1.2 Subjective Norms (SN)

Prior research, including Chang (2012), indicates that subjective norms can directly shape perceptions of usefulness and ease of use. This study supports this, revealing a correlation of 0.157 between aspects of ease of use and subjective norms. This suggests that social influences play a role in how individuals perceive the usefulness and ease of use of technology, potentially using technology to boost their social standing and influence within their social groups. This is particularly noticeable among those aged 20-39, a demographic often influenced by social

trends and a desire to remain current with technological advancements. This observation is consistent with Joa and Magsamen-Conrad (2021), who also found that perceived social norms surrounding technology adoption can increase the intention to use modern technologies.

5.3.1.3 Perceived Trust (PT)

Studies have consistently shown that a lack of trust poses a significant barrier to the long-term success of any financial system. A study conducted in Korea highlighted perceived trust and perceived risk as core constructs, demonstrating that trust has a negative influence on perceived risk (Nguyen and Nguyen, 2020). This underscores the critical importance of building and maintaining consumer trust to mitigate the risks associated with m-commerce and similar technologies, thereby facilitating increased adoption of mobile payment gateway systems (Maqablesh et al., 2016). The strong correlation between perceived trust and perceived risk observed in this study (Table 6) further emphasises this interrelationship. This emphasises the need to effectively promote the adoption of mobile payment gateways, service providers must prioritise building and maintaining strong trust relationships with consumers by effectively addressing and mitigating the perceived risks associated with their services which is in line with the findings and recommendations by Ponte, et al. (2015).

5.4 Risk Concerns on the Usage of Digital Payment Gateway Systems

5.4.1 Perceived Risk (PR)

Perceived risk is a key factor in technology adoption, reflecting how concerns about potential risks, like security breaches (Penney et al., 2021), affect consumer acceptance. In this study, participants' perceived risk had a neutral mean score of 3.103, indicating that most were neither particularly worried nor concerned about the risks associated with mobile payment systems. This contrasts with a Ghanaian study (Abdul-Hamid et al., 2019) of 403 participants across five cities, which found a significant negative relationship between perceived risk and mobile money adoption ($p < 0.016$). That study suggested higher perceived risk discouraged adoption, while the current study suggests a more neutral stance on risk. The discrepancy between the findings of the current study and the Ghanaian study could be due to several contextual differences. These might include variations in the level of awareness and understanding of mobile payment systems, variations in the regulatory frameworks governing mobile payments, or cultural differences in risk perception and tolerance.

5.4.1.1 Mobile Payment Gateway Security

Mobile technology has revolutionised consumer access, initially evolving from web-based applications (Froese, 2010). The COVID-19 pandemic further accelerated the adoption of this technology, facilitating online transactions between businesses and consumers (Ramokgopa, Smallwood, and Allen, 2023). However, a significant barrier to the widespread adoption of mobile payment gateways remains: a lack of user trust stemming from security concerns. This study found participants to be indifferent to the risks associated with mobile payment gateway adoption. Furthermore, this study revealed a moderate positive correlation (0.341) between perceived risk (PR) and perceived trust (PT), suggesting a complex interplay between these two factors. Encryption and authentication are fundamental to secure payment systems (Puchert, 2025), and without these, no system can be considered truly safe.

5.4.1.2 End-User Security Awareness

The global information security market, projected to reach $170.4 billion in 2022 (Gartner Research, 2018), is fuelled by increasing data breaches, hacking, phishing, malware, and mobile device theft. Even with the controlled environments offered by platforms like Google and Apple, security breaches remain a concern, with threats like phishing, malware apps, and click-fraud persisting (Weichbroth and Lysik, 2020). This aligns with this study's finding of a neutral reaction to perceived risk (3.103), suggesting a lack of proactive self-protection against fraud. This underscores the need for increased consumer security awareness. As Ophoff and Robinson (2014) highlight, understanding user perspectives is crucial for bridging the gap between security managers and users. This understanding can lead to the development of more effective security measures and better security practices. By improving user knowledge of best security practices, compliance can be significantly enhanced (Balapour, Nikkhah, and Sabherwal, 2020).

5.4.1.3 Mobile Payment Gateways System Providers

The rapid growth of Mobile Payment Systems (MPS) in developing countries highlights their transformative potential (Phajane, 2023). Several factors contribute to this expansion. Firstly, socioeconomic conditions in these economies are pushing a transition from cash to digital transactions, as evidenced by the strong Subjective Norms (over 3.5 for SN1 and SN2) observed in this study. This shift is further encouraged by the cost-effectiveness of mobile payment apps, particularly for services like money transfers, which often offer lower fees than

traditional methods (Ahmed et al., 2021). Secondly, widespread mobile phone access has been crucial (Phajane, 2023). In many developing countries, mobile phone penetration exceeds access to basic services like electricity and clean water (Phajane, 2023), providing a solid base for mobile payment adoption, which aligns with the strong perceived ease of use found in this study. While this study found a neutral level of perceived risk, security concerns remain a major obstacle to even wider adoption, a concern highlighted by another research (Weichbroth and Lysik, 2020).

5.4.1.4 Regulation

Various regulatory bodies in South Africa oversee e-commerce platforms to maintain security and reliability (Mothibi & Rahulani, 2021), for instance, the Electronic Communications and Transactions Act (ECTA) of 2002, which mandates compliance with regulations like the Protection of Personal Information Act (POPIA) to ensure consumer protection and cybersecurity (International Trade Administration, 2024). Information security is crucial for protecting data confidentiality and integrity, especially in the face of evolving cyber threats globally, including in South Africa, where the use of mobile payment systems is growing exponentially (Balapour, Nikkhah & Sabherwal, 2020; Weichbroth & Lysik, 2020). This study found a neutral perceived risk level among South African consumers, while other research suggests that perceived risks can significantly hinder mobile payment adoption in the country (Lee, 2013; Chen, 2017).

South Africa's regulatory environment is often seen as biased towards established banks, hindering innovation in mobile financial services (Chen, 2017). The low social pressure score (2.35) observed in this study concerning mobile payment gateway usage may be a result of regulatory policies that do not currently incentivise the adoption of mobile payments in the country. This contrasts with China's e-commerce market has experienced explosive growth, driven by widespread smartphone use and a strong preference for online shopping (Wang, 2024; Huang, 2020). This highlights the potential for rapid adoption given the right conditions, including user-friendly platforms and a supportive regulatory environment. China's success demonstrates the importance of a clear legal framework, and active regulatory bodies focused on consumer protection and market stability (Huang, 2020).

Secondly, the limited success of mobile money services like M-Pesa in South Africa compared to Kenya further illustrates the challenges posed by the regulatory landscape (Phajane, 2023). The Financial Sector Conduct Authority (FSCA) acknowledges this and advocates for a more

supportive regulatory framework that encourages digitisation and the development of accessible financial services (Mothibi & Rahulani, 2021). Most importantly, this framework should address key consumer concerns like perceived ease of use (PEU) and perceived risk to promote wider adoption of digital payments.

The increase in the digital payment sector holds significant economic potential for South Africa and the broader African continent, with digital commerce projected to reach $180 billion, or 5.2% of Africa's total GDP by 2025 (African Leadership Magazine, 2024). South Africa's 66% increase in online sales in 2023, exceeding ZAR 30 billion (International Trade Administration, 2024), underscores this trend and the importance of PEU for South African consumers. Effective collaboration among South African regulators, the government, mobile payment providers, and consumers is vital for enhancing mobile payment security and fostering adoption within the country (Phajane, 2023; Weichbroth & Lysik, 2020). Learning from international examples, including China's approach, this collaboration will be crucial for ensuring that the regulatory framework remains relevant and effective in the rapidly evolving South African mobile payment landscape, addressing the specific needs and concerns of South African users.

6 Conclusion

6.1 Introduction

This chapter concludes this empirical study which aimed to identify and explain the factors that influence users' adoption of digital payment gateway systems, as well as determine how users respond to risk concerns on the usage of digital payment gateway systems. In this chapter, the results of the findings are summarised, and policy recommendations based on the problem statement, as well as recommendations for future research based on the limitations of this study, are also provided.

6.2 Summary

This study aimed to analyse the factors influencing the adoption of digital payment gateway systems in South Africa and to explore how users perceive the risks associated with these systems. An online survey of 294 participants provided the data, which was analysed using Qualtrics XM, SPSS, and Microsoft Excel. The results indicated that factors from the Unified Theory of Acceptance and Use of Technology (UTAUT), specifically Ease of Use, Subjective Norms, and Perceived Trust, influence the adoption of mobile payment gateway systems. The study also found that participants had a neutral perception of the risks involved in using these systems. Moreover, gender, age and experiences have been shown to influence the UTAUT and TAM model.

This study's participants were primarily young adults aged 20-39, revealing a strong positive correlation between gender and mobile payment usage. Women constituted a majority (57%) of the participants, and a considerable proportion of at least 50% held university qualifications, suggesting a link between higher education levels and the adoption of mobile payment gateways.

This study establishes a positive correlation between perceived ease of use (PEU) and Perceived Trust (PT) influencing mobile payment gateway adoption. The findings demonstrate a strong link between perceived ease of use (PEU) and both the adoption and activation of mobile payment systems. This suggests that when users find these systems easy to use, they are prone to incorporate them into their routines. Furthermore, while social influence demonstrates a positive impact on mobile payment adoption, research suggests that individual

perceptions of usefulness, security, and convenience may exert a more substantial influence on the adoption of digital payment technologies.

While global studies indicate that perceived risk discourages digital payment adoption, this research found a neutral risk perception. The preference for traditional banking and in-person interactions suggests that some individuals value the perceived security of human contact when managing finances. This highlights an opportunity for the financial industry to improve digital offerings, building trust by replicating the security and personalised experience of traditional banking within the digital space, while collaborating closely with regulatory bodies.

6.3 **Policy recommendations**

Financial inclusion policies are crucial for engaging stakeholders, i.e., government, regulators, agents, etc.) to foster digital adoption in South Africa. To further support these policies, regulatory adjustments are needed to create a more level playing field, allowing more market participants, especially non-financial institutions, to enter. This will encourage diverse value propositions, offering a wider range of services that benefit mobile money customers, expanding the scope of these services and promoting healthy competition. The study's findings suggest that South African consumers are advanced in their usage and are open to incorporating more financial services beyond simple money transfers.

The study found that most participants were between 20 and 39 years old, significantly influenced by social pressure, and attracted to the convenience of digital mobile payment gateways. Businesses should capitalize on this by exploring partnerships with social media platforms, offering features that resonate with younger demographics. Marketing strategies should also be strengthened to establish a strong presence within the same social media environment.

Given the rise in cyber threats like fraud, consumer security and privacy are essential for modern businesses. Mobile payment gateway vendors must proactively educate users on security best practices to protect their information and privacy, thereby maintaining trust and promoting digital adoption in South Africa. This effort should involve key stakeholders, including regulatory bodies like the Electronic Communications and Transactions Act (ECTA), the South African Reserve Bank (SARB), mobile payment vendors, and the broader South African community.

6.4 **Recommendation for further research**

This study is limited by its sole focus on South Africa, chosen primarily for ease of data collection. It also did not explore all aspects of the UTAUT model, which restricts a complete understanding of how these factors influence consumer behaviour. Future research should investigate the interrelationships between all UTAUT constructs for a more nuanced understanding. Cross-cultural studies in other countries are also needed to determine if these findings are generalizable and to identify any variations in consumer attitudes and behaviours.

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