



**Moderating effect of service innovation in the Unified Theory of Acceptance and Use of Technology model – a mobile banking app perspective**

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## **DECLARATION**

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Philosophy (Corporate Strategy) at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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## **ABSTRACT**

The retail banking sector is undergoing unprecedented business disruptions due to changing consumer patterns and increased competition from non-banking institutions. The most practical responses to these new risks are digitalisation of the retail banking services and sourcing pragmatic approaches to transform the business strategies and operating models. This study focuses on understanding customer behaviour intentions when new digital innovations are introduced by retail banks. The study centres on mobile banking apps as a use case, examining behaviour intentions of customers who have already registered for the mobile banking app, with the analysis conducted using the unified theory of acceptance and use of technology model. In addition to the constructs in the unified theory of acceptance and use of technology model, personal innovativeness was incorporated as an antecedent. The analysis includes service innovation as a moderator. A quantitative study was conducted based on covariance-based structural equation modelling to test the hypotheses. The main findings were that facilitating conditions and personal innovativeness have a positive and significant relationship with behaviour intentions, whilst effort expectancy has a negative but significant relationship with behaviour intentions. Service innovation moderates the relationship between all the antecedents and dependent variables, with the exception of social influence. The implications for retail banks are that the service provider's role is significant in enabling behaviour intentions with the key indicators highlighted by facilitating conditions and service innovation. As a contribution, retail bankers must note that technology companies continue to gain competitive edge in the digitalisation of financial services offerings and may out-compete banks over time given their stronger disposition to service innovation.

**Keywords:** mobile banking app, m-commerce, service innovation, facilitating conditions, personal innovativeness, behaviour intentions.

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## LIST OF ABBREVIATIONS

4IR	Fourth Industrial Revolution
App	Application (computer and web-based)
CFI	Comparative fit index
CB-SEM	Covariance-based structural equation modelling
E-commerce	Electronic commerce
Fintech	Financial technology
M-commerce	Mobile commerce
M-payment	Mobile payment
RMSEA	Root mean square error of approximation
SDL	Service-dominant logic
SRMR	Standardised root mean squared residual
TLI	Tucker-Lewis index
UTAUT	Unified theory of acceptance and use of theory

## **CHAPTER 1: INTRODUCTION TO THE STUDY**

### **1.1 Introduction**

The acceleration of digital services is a common phenomenon across businesses that is triggered by transformational business strategies and business models required to achieve the stated growth aspirations (Taghizadeh, Rahman, Hossain, & Haque, 2019). As projects are implemented to transform services to digital, the success depends on the intentions and the users' behaviours to consume such services digitally for value creation to the customer and service provider (Dal Bó, Milan, & De Toni, 2018). This study explores several factors that could influence user behaviour intentions, focusing specifically on technology innovations in the form of a mobile banking app and its use among a sample of consumers in South Africa. Building on and exploring the existing research opportunities in this topic, this research includes an analysis of service innovation as a moderating effect that could significantly and positively impact customer behaviour intentions.

### **1.2 Background to the research problem**

The Fourth Industrial Revolution (4IR) continues to drive digital transformation of the world exponentially, thus directly impacting people's lives. The key catalyst of the 4IR is the Internet, which is evidenced through increased digital, speed, self-service, scale, and access in several economic activities (Esposito & Tse, 2018). The Internet's transformational effect is evident across various sectors, economies, countries, and populations (Ebert & Duarte, 2018). In parallel, the developments have changed the way services are offered to customers, utilising innovative and convenient approaches aimed at enhancing value for the customers and service providers (Miles, 1993).

The emerging models and strategies include data, artificial intelligence, and cloud computing to enhance how products are manufactured or developed, packaged, sold, and utilised (Levin & Cunningham, 2018). In 2020, Covid-19, a novel respiratory illness discovered in late 2019, caused challenges that further accelerated the digitalisation of business processes to mitigate gatherings and alleviate health risks (Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2019; Krishnamurthy, 2020). The benefits of this transformation are empirical evidence that digital should be the way of the future and that when the short-term Covid-19 challenges are resolved, digital acceleration will continue the momentum (Dwivedi et al., 2020).

The scale and pace of digitalisation imply that services are a predominant factor in driving business strategies and models (Vargo & Lusch, 2008). New and increased granularity and timing of data, connectivity, automation, and digital customer interface are challenging existing value chains in traditional businesses, forcing them to focus on service innovation more than they did historically (Bloching et al., 2015). This permeates various traditional business activities where products are being dematerialised to become virtual. For example, security services are fast becoming more digital, physical products like bank cards are being distributed and used digitally in online sales, and automated products like self-drive vehicles are becoming a common phenomenon (Esposito & Tse, 2018).

User behaviour intentions for digital services are the principal focus of this study, seeking to analyse and understand the factors influencing the consumers' behaviours towards technology-driven services. Unless customers are willing to adjust their behaviour intentions, their adoption of the new way of receiving services will not change, impacting the relationship with service providers. The academic theoretical anchor upon which these relationships are explored is the unified theory of acceptance and use of technology (UTAUT) model, which determines customers' behavioural attributes caused by technology or technology applications (Alghatrifi & Khalid, 2019; Venkatesh, Morris, Davis, & Davis, 2003). This model is a robust approach that has been utilised by researchers and corporate entities to find ways of improving or influencing user acceptance of technology applications (Dwivedi et al., 2019; Momani, 2020). The model comprises four antecedents – namely performance expectancy, effort expectancy, social influence, and facilitating conditions – and posits that these have a significant and positive impact on behaviour intentions. This study expands the model by incorporating an additional antecedent – personal innovativeness – as the fifth independent variable on the same postulation that it has a significant and positive impact on behaviour intentions (Slade, Dwivedi, Piery, & Williams, 2015).

Service innovation is the moderating effect being examined, given its postulated relationship with customer behaviours in situations where the customer experience changes (Bolton et al., 2018). Several scholars have indicated the ongoing need for service innovation as a critical driver for growth in businesses and an important catalyst for user acceptance of digital services to increase, with value creation to the customer and service provider (Bolton et al., 2018; Edvardsson et al., 2018; Lehrer, Wieneke, vom Brocke, Jung, & Seidel, 2018). In this study, service innovation is demonstrated as a

moderating effect in the application of the UTAUT model. The concept of service innovation is founded on the theory of service-dominant logic (SDL), which was developed to highlight that service is a critical and increasingly important component of the growth of businesses and economies (Vargo & Lusch, 2008). Noting that service innovation is a relatively novel research topic, its relationship with the UTAUT model is being tested in this study as a new focus.

Applied together, digitalisation of industries and service innovation are crucial co-drivers of e-commerce and most recently m-commerce (Zhong & Nieminen, 2015). As the business world continues to be characterised by volatility, uncertainty, complexity, and ambiguity, the digital transformation of business models and business strategies is geared mainly towards creating a fertile ground for the incumbent and emerging businesses to benefit from the new modes of doing business (Schwarz, Rohrbeck, & Wach, 2020). In other words, the transactional activities are completed almost entirely in a virtual world driven by technology. It is for this reason that consumers' behaviour intentions need to be studied, understood, and enhanced, taking a multifaceted approach of the sociological, psychological, marketing, and commercial perspectives (De la Sablonnière & Tougas, 2008).

Many industries are expected to benefit from digital transformations and service innovation, including retail banking. Customer-orientated service innovation has featured consistently in the top strategy themes of the Pricewaterhouse Coopers (PwC)'s regular publications of the banking survey (PwC, 2016, 2019). PwC's 2019 report highlighted that developing a customer-centric business model requires an understanding of the customers' needs, rather than products or pricing. The proposed shift is considered strategic, pointing to increasing the importance of service innovation.

In addition to service innovation, age and gender are being evaluated and tested as covariates to understand their impact on behaviour intentions. Age and gender are the embedded control variables in the UTAUT model (Venkatesh et al., 2003).

Banks depend heavily on technology and, through their life stages, have focused on innovation to address society's continued needs, which are to increase financial inclusion and respond to the ever-changing regulatory requirements (Mahmoud, Hinson, & Anim, 2018; Románova & Kudinska, 2016). The generational technology changes include the introduction of automated teller machines (ATMs) in the 1980s, Internet banking (i.e., a banking method where transactions are electronic via the Internet) in the 1990s, and,

most recently since the invention of the third generation (3G) mobile telephony, mobile banking is a breakthrough technology innovation in retail banking worldwide (Artha et al., 2020). Mobile banking was introduced in two stages with distinct innovative capabilities: mobile phone-enabled payments termed m-payments; and, in the last 10 years, mobile banking apps, which are applications downloaded to mobile phones or tablets by users and remain the current trend (Muñoz-Leiva, Climent-Climent, & Liébana-Cabanillas, 2017). Being the use case in this study, a mobile banking app is the most innovative approach to banking that makes full-scale retail banking and its ancillary services conveniently available to consumers anywhere and anytime (Kapoor & Vij, 2020).

For retail banking to be conducted through mobile phones, a number of further innovative initiatives are critical as key dependencies. These initiatives include access to smartphones, improvements in mobile telephony infrastructure, as well as concurrent innovations in software developments, payment technologies, security features, and most importantly the digital connectivity from the m-commerce ecosystem (PwC, 2019). The ecosystems enable a consumer to transact between different institutions through a seamless interface enabled on the mobile phone through an app (De Luna, Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2019).

For banking institutions to be responsive to innovation, organisational readiness must be a focus area for management teams (Yen, Wang, Wei, Hsu, & Chiu, 2012). To determine success in service innovation, the customers' experiences need to be understood, tracked, managed, and responded to by management (Dal Bó et al., 2018). A customer experience is considered an additional and useful perspective to the testimonials from a service provider's perspective in judging whether an improved service creates value or not. Manohar, Mittal, and Marwah (2019) observed that where innovation is co-created by various actors, it is more likely to result in a better outcome aligned to the desires and objectives of the service provider and the resultant customer satisfaction (Manohar et al., 2019).

### **1.3 Research problem**

The emerging digital activities required by the banking institutions to service customers, the mobile technological innovations, and the need for an m-commerce ecosystem are the crux of the research problem in this study. The research problem emanates from the below-mentioned business and theoretical considerations indicative of the key ingredients of this study.

The first consideration is that the banking institution introducing a mobile banking app needs to have a full understanding of the society where the product is being launched. Therefore, banks need to consider the population's age, gender, and education and literacy statuses, as these factors are believed to carry the critical sociological and psychological influences in user behaviour intentions (Baabdullah, Alalwan, Rana, Patil, & Dwivedi, 2019; Hanjaya, Kenny, & Gunawan, 2019; Thusi & Maduku, 2019). User behaviour intentions are neither a uniform approach, nor a permanent status for individuals, as they are influenced by ongoing changes in technology and consumers' circumstances (De la Sablonnière, Bourgeois, & Najih, 2013).

The second consideration is that behaviour intentions may be influenced by the required tools of trade, including access to smartphone technology, access to data, the complexity of the technology, and the criteria of the banking institutions for customers to use these facilities (Baabdullah, Alalwan, Rana, Patil, & Dwivedi, 2019; Wellen & Van Dijk, 2018). Developing economies, such as South Africa, are most likely to suffer this challenge, given that access to technology tools and overall infrastructure like electricity and data may be absent or inadequate (Baabdullah, Alalwan, Rana, Patil, & Dwivedi, 2019; Thusi & Maduku, 2019). Researchers and banking institutions would need to unpack the characteristics of their geopolitical presence and determine the infrastructure requirements for access to the mobile banking app. Infrastructure requirements are necessary and differ per economy, whether developed or developing, thus impacting consumers' abilities to use technology (Adapa & Cooksey, 2013; Hanjaya et al., 2019).

A third consideration is the characteristics of the mobile banking app. These include the physical features, service model, perceived value, and convenience, which make up the consumers' criteria for deciding whether or not to use the new technology (Liébana-Cabanillas, García-Maroto, Muñoz-Leiva, & Ramos-de-Luna, 2020). This is indicative of the need for banking institutions to specifically focus on service innovation as a transformational tool of the business model to ensure that the customers receive the service as intended (Mahmoud et al., 2018). Digital innovations create a platform for customers to provide instant and regular feedback and participate in the offering of the service, such as self-service and ratings, which are increasingly important benchmarks of whether the service offering is creating value or not (Ghazi, 2017; Kapoor & Vij, 2020).

In addition to these three business considerations, the theoretical considerations are a critical support for businesses, highlighting opportunities through which growth can be

supported. The fourth consideration is that there are several research gaps and opportunities in South Africa relating to user acceptance of technology introduced by retail bankers. In analysing the most recent studies, it is evident that Africa's research coverage on banking and digital inclusion is behind that of many developed countries (Famubode, 2018). The recommendations made in previous studies do not seem to have been addressed adequately by the service providers, given that similar outcomes of lower acceptance to the use of technologically driven retail banking products persisted from 2005 to 2020, which mainly reflected inadequate access to technology tools and lack of trust of the new services (Maduku, 2014b, 2016; Thusi & Maduku, 2019, 2020). Prior studies in South Africa have covered Internet banking, m-payments, and mobile banking apps with comparable outcomes of low acceptance (Redlinghuis & Rensleigh, 2010; Van Tonder, Petzer, Van Vuuren, & De Beer, 2018). Steenkamp and Burgess (2002) observed that consumer behaviours developed in a western cultural context must be examined for suitability in emerging consumer markets, as nomological relations may bring certain differential outcomes. The purpose of this study is to enhance the diagnostic tools and add to the proposed solutions for the persistent low penetration in various technologies in South Africa.

The last academic consideration is to illustrate the dynamism of this topic, as the UTAUT model has proved through its extensive use that the outcomes are far from uniform (Dwivedi et al., 2019; Venkatesh, Thong, & Xu, 2016). The examination of the moderating effects also show that the model must be understood and applied within the context of the data and defined circumstances (Kühn, Spies, & Petzer, 2015; Nel & Boshoff, 2017). The rationale for adding service innovation as a moderating effect and the covariates of age and gender is to illustrate that the UTAUT model is extremely sensitive to factors like the moderating and predictor effects (Momani, 2020; Venkatesh, Thong, & Xu, 2012). Meta-analyses on the UTAUT have demonstrated the elasticity of this model when expanded, applied, and integrated with other academic principles (Dwivedi et al., 2019; Khechine, Lakhal, & Ndjambou, 2016; Venkatesh et al., 2016). This study illustrates this by adding personal innovativeness to the UTAUT's original four antecedents and the harmony between these (Slade et al., 2015). Despite the added dimensions covered in this study, in evaluating the consumer behaviours for technology innovation, further research opportunities remain due to wide-ranging factors in psychology, sociology, marketing, and economics (De la Sablonnière, 2017; Thusi & Maduku, 2019).

#### **1.4. Research objectives**

The objectives of this research are set against a backdrop of the extension and application of the UTAUT model, illustrated through the examination of the customer behaviour intentions in the use of mobile banking apps in South Africa. The research objectives formulated for this study are to:

- Determine if the UTAUT constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions, when applied as antecedents, have a significant and positive relationship with behaviour intentions towards the use of a mobile banking app;
- Determine if personal innovativeness as an antecedent has a significant and positive relationship with behaviour intentions towards the use of a mobile banking app; and
- Determine if service innovation has a moderating effect on the relationship between the antecedents and behaviour intentions towards the use of a mobile banking app.

#### **1.5 The scope of this study**

This study's scope is determined by the research problem (section 1.3) and the research objectives (section 1.4), covering the research gaps in the South African banking sector and in relation to mobile banking apps. Unlike previous research that centred on respondents who may or may not be users of the technologically innovative products (Maduku, 2014a; Mhlanga, 2020; Redlinghuis & Rensleigh, 2010), this study focuses on people who have registered for the mobile banking app for a minimum of six months. In this study, customers' behaviour intentions remain relevant, as downloading the app does not equal using it, switching from previous banking digital products, or that the customer is satisfied with the app. This study seeks to understand behaviour intentions of a mobile banking app customer, rather than a targeted customer.

#### **1.6 Conclusion**

As the digital age is expected to continue to transform all industries and economies, this topic could be beneficial in every sphere of economic activity in businesses of all sizes and types. The study focuses on analysing factors that will significantly and positively impact consumer behaviours, resulting in enhanced user acceptance for technology



innovations. The user acceptance could create higher intensity of usage and in turn improve customer satisfaction and loyalty for sustainable value benefitting all actors. The structure of the subsequent sections of this research report is provided below.

- **Chapter 1: Introduction to the study**

Chapter 1 articulated the need for the research study based on existing and ongoing science development emanating from the work of other scholars. The research problem, research objectives, and scope of the study were explained and motivated. The context of the study was articulated, including defending the choice of the topic. In addition, the business and theoretical needs for the study were provided.

- **Chapter 2: Theory and literature review**

Chapter 2 provides context of the theoretical anchor chosen for the study, followed by a descriptive analysis of what the theoretical model entails, how it has been applied in prior research, and what relevance it draws to this research. Given that the UTAUT model has been chosen as the anchor for the study, an analysis of why and how it works is provided. The chapter also contains an overview of the banking sector and the theoretical and technical foundations relating to mobile banking apps, spanning m-commerce and its critical drivers. It is considered relevant to provide an analytical perspective of m-commerce transformations on contexts like developed versus developing economies and demographical differentiation, thus highlighting the constructs that will be tested as antecedents for behaviour intentions. This perspective is to demonstrate the research gap that this study is aimed to contribute towards in enhancing the knowledge of consumer behaviours relating to technology in a South African context. Moreover, the moderating effect of service innovation is discussed.

- **Chapter 3: Research questions and hypotheses**

The research questions with clear linkages from Chapters 1 and 2 are articulated and defended, followed by the hypotheses being proposed in the study and the theoretical basis of such hypotheses. The UTAUT model used in this study is included in this chapter.

- **Chapter 4: Research methodology**

Guided by credible academic approaches, Chapter 4 addresses this study's choice of methodology, which incorporates the philosophy, the approach, the purpose of research design, the research strategy, the time horizon, and the techniques and procedures. Further to the choice of methodology, this chapter discusses the proposed research methodology and design, which incorporates a target population, unit of analysis, sampling methods and size, measurement instrument, data gathering process, analysis approaches, and quality control. The research methodology's limitations are also identified and explained.

- **Chapter 5: Empirical results**

Chapter 5 provides a detailed feedback and analysis of the results of the study. This section starts with the study participants' demographical profile and banking patronage habits, which are the basis for detailed descriptive statistics. Several tables and graphs are included incorporating statistical results for normality of data, convergent and discriminant validity, and structural equation modelling, which is used to test the hypotheses. This chapter concludes with the statistical results of the hypotheses that were tested as well as outcomes from the moderating effects.

- **Chapter 6: Discussion of the results**

A discussion of the results of the study are presented in this chapter, covering some insights and key conclusions from the measuring scales, the relationships between the constructs, and the relationships with the moderating variables. This chapter identifies where the hypotheses are supported and not supported, interpreting these in line with the literature review covered in Chapter 2 and the research questions stated in Chapter 3.

- **Chapter 7: Conclusion**

This chapter recaps the stated objectives of this research and highlights the key findings in each hypothesis to motivate or discuss this study's learnings. This chapter discusses the theoretical and empirical contributions of the study in line with the envisaged contributions in Chapter 1. The study's limitations, recommendations, and future

research opportunities are articulated. This chapter concludes with clarification of whether the research achieved its stated objectives.

## **CHAPTER 2: THEORY AND LITERATURE REVIEW**

### **2.1 Introduction**

This chapter seeks to provide a theoretical basis for this research. This section starts with an overview of the banking industry and insights into the relevant digital evolution in servicing retail customers. Furthermore, it provides background and descriptive analysis of mobile banking apps, given that it is a use case in this study. Together, these provide a context of digital retail banking, and past and present trends (PwC, 2019).

The background in digital retail banking leads into a theoretical underpinning of the study, being the rationale and the mechanics of the UTAUT model together with discussions of all the constructs applicable in this study. The moderating effect, service innovation, is defined and discussed in relation to this study.

### **2.2 Banking industry overview**

Seeing as the presence and advancement of a banking sector is critical for prosperity in modern societies, retail banking is a focal point of how consumers become key actors. This era and concept of banking covers financial and digital inclusion, self-service and provides comprehensive financial support catering multiple perspectives of a retail customer (Levin & Cunningham, 2018). Across the world, whether in developing or developed countries, retail banking is experiencing a fundamental change in strategies and business models due to regulatory pressures as well as changes in consumer patterns and behaviours (Manohar et al., 2019). The role of non-banking sectors, such as technology, telecommunications and retail operations, in providing financial services is also a key driver for the inevitable evolution of the banking service offerings, focusing on simplified, convenient, and digital banking patterns (Lai & Van Order, 2017). More specific to developing economies, the World Economic Forum indicated that, in 2017, of 1.7 billion adults globally did not have banking accounts and that such differences are entrenched in the economic status of the relevant countries and the gender disparity, although it was reported that two thirds of the unbanked adults have a mobile phone (Demirgüç-Kunt, Klapper, Singer, Ansar, & Hess, 2018). Whilst the unbanked is an impediment, the mobile telephony penetration increases opportunities for banks to transform retail banking.

South Africa's coverage in retail banking is estimated at 80%, dominated by five large banks that offer retail banking products and services (Statistics South Africa, 2020). This coverage is provided by the largest banks – namely Absa, Capitec, FNB, Investec, Nedbank, and Standard Bank – which cover an aggregated 99% of the overall market (Statistics South Africa, 2020). Banks need scale and deeper share of customers' wallets, and want customers with a lower churn rate to improve their profitability (Románova & Kudinska, 2016). To achieve these goals, banks require more digital capabilities directly or through partnerships with fintech companies, telecommunications and other businesses, and need to continue to play a larger role in e-commerce and m-commerce (EY, 2017). The top executives of the banks surveyed by PwC (2019) indicated that changes in retail banking are inevitable and the focus is innovation, simplifying business and operating models, and gaining data advantages.

The asymmetrical coverage of mobile telephony is seen as a great opportunity by banks and technology companies to provide financial services to individuals – in part to close the gap for financial inclusion and in part to provide additional value to individuals' financial matters by simplifying how they transact (Mhlanga, 2020). Asymmetrical coverage refers to the mismatch between available or requisite infrastructure through mobile phones, and the absence of services that could be provided through phones. The mammoth challenge is the misalignment between the efforts of the banks investing in digital functionality and the persistent lack of enthusiasm by majority of customers, who opt to remain with the traditional banking experiences (Van Tonder et al., 2018). This study explores customer behaviour intentions with mobile banking apps as a use case to contribute to the knowledge base in this subject matter.

### **2.3 Historical context of digital banking**

Banking has always been driven by technology based on the concept that money works all hours of the day and across geographical boundaries (Lichtenstein & Williamson, 2006). The digital evolution of retail banking, commencing with ATMs, Internet banking, m-commerce and lately mobile banking apps, is an important part of understanding the user acceptance and the innovations in retail banking, given that many of the innovations have come into the market in the form of cannibalisation of predecessor digital services (Muñoz-Leiva et al., 2017; Slade et al., 2015). Cannibalisation implies that innovations were introduced with the intention that, after a phasing-in process and period, they will replace their predecessor products and services in part or in their entirety.

Through generations of technological enhancements, several studies continuously illustrate the long-tail adoption of technology, indicating that the use of Internet banking, m-payments, and mobile banking apps have in most cases lagged the enabling factors (Ameme & Wireko, 2016). Despite these investments and the focus on innovations, studies across the world show that retail banks have continued to face the threat of disruption by new-generation banking groups with no legacy technology burden and other non-banking players (Arner, Barberis, & Buckley, 2015). Consequently, to remain competitive, retail banks innovate and face the dualism of today's efficiencies and tomorrow's effectiveness (Ameme & Wireko, 2016; PwC, 2019). The most common findings from several studies indicate a business problem where banking institutions could require new investments whilst maintaining the old technologies, thus threatening the value creation objectives (Gong & Janssen, 2015).

## **2.4 Digital products in retail banking**

The digital transformation in the retail banking industry is motivated by changes in consumer habits and enabled by technology. The digitalisation has been in place for decades, but recently its impact, speed of diffusion, and change have been unprecedented (Soutter, Ferguson, & Neubert, 2019). The two important catalysts of digitalisation are the transformations of the internal organisation and the role of technology (Schmidt, Drews, & Schirmer, 2017). The sections that follow illustrate the various stages and chain effects of digitalisation in banks over a period of time.

### **2.4.1 Internet banking**

When it was introduced in the 90s, internet banking was a significant innovation that shifted the banking service to be accessible at all hours from anywhere driven by the fintech evolution. Internet banking is a web-based transacting capability facilitated predominantly through the computer that enables customers to view their present and past transactions, make payments (electronic funds transfer [EFT]), authorise transactions like money transfers, and load and remove beneficiaries. Several studies indicated that, despite its technological successes, user acceptance of Internet banking remained low.

Research conducted in South Africa on Internet banking indicates similar patterns of slow adoption, particularly by rural and less affluent communities (Ramavhona & Mokwena, 2016). The key findings for the low penetration in South Africa included

behaviour intentions influenced by lack of trust and perceived risks; constraints regarding facilitating conditions like availability of a computer, Internet and data; cultural and language barriers; and insufficient or irrelevant efforts by the banks (i.e., marketing campaigns and word of mouth) to migrate the customers (Maduku, 2014a; Ramavhona & Mokwena, 2016; Redlinghuis & Rensleigh, 2010; Van Tonder et al., 2018).

#### **2.4.2 Mobile payments**

Mobile payments is an adapted word defining a form of payment facilitated through mobile telephony (EY, 2017). Also known as m-payments or m-commerce, this technology took off following the emergence of 3G mobile telephony. The 3G mobile telephony, also known as smartphones, is the introduction of mobile phones with Internet capability and a catalyst for m-payments (Reaves, Scaife, Bates, Traynor, & Butler, 2015). The tools needed for m-payments include, but are not limited to, access to smartphones, tools to manage mobile purchase orders, m-banking for access to electronic banking on mobile devices, m-delivery (namely delivery of services on the mobile phones), and m-contracts (mobile service contracting) (Palmié, Wincent, Parida, & Caglar, 2020).

Liébana-Cabanillas, Muñoz-Leiva, and Sánchez-Fernández (2015) compared e-commerce and m-commerce, and observed that m-commerce is possible under the circumstances of maturity of the e-commerce and the growth potential of the m-commerce. Moreover, the greater penetration of e-commerce is an enabler for m-commerce given that both require similar types of users, levels of personalisation and diversity in buying motives, therefore they are two opposite sides of the same coin (Kapoor & Vij, 2020). Notably, in developed economies, the success of m-payments is led by mobile platforms, such as Apple Pay, Samsung Pay, Alipay, and WeChat, which were launched by technology companies rather than banking institutions (Liébana-Cabanillas et al., 2020; Reaves et al., 2015).

Whilst developed countries tend to carry fewer disadvantages than developing economies, the adoption of m-payments remains at disappointingly low levels across many countries. For example, Finland is the second highest country globally with technology-savvy attributes and has a smartphone penetration of 80%, but its use of mobile banking is sparse, making up only 4% of all transactions, compared to 30% Internet banking, 25% card, 18% invoices, and 16% PayPal (Shaikh, Alharthi, & Alamoudi, 2020). In Africa, the breakthrough success story in m-payments is with

Kenya's M-Pesa, which earned the country great visibility and is a global example of leapfrog concept and a credible example of financial inclusion (Lonie, 2010; Wellen & Van Dijk, 2018). Despite overwhelming evidence from other regions that education and industrialisation of the country plays a role in user adoption of technologies, Kenya was successful even with those characteristics missing, given that their impetus was due to the inadequate banking infrastructure and the early presence of an ecosystem (Wellen & Van Dijk, 2018). In South Africa, user acceptance remains low based on similar reasons to the case of Internet banking, where the facilitating conditions are inadequate (Thusi & Maduku, 2020).

## **2.5 Mobile banking apps**

A mobile banking app is a bank in the palm of a consumer's hand, as the product range is wider than the predecessor innovations, given that the app does everything that Internet banking and m-payment can do, in addition to being structured to transact, communicate, browse for other products offered by the bank, manage queries like changing transacting limits, acquire knowledge, and manage financial activities (Muñoz-Leiva et al., 2017; Poromatikul, De Maeyer, Leelapanyalert, & Zaby, 2019). Most of the mobile banking apps have significant features of co-creation with the customer, especially as the technology partners are commonly fintech companies (Arner et al., 2015). Co-creation includes functions like an ability to change the profiles and personalise the menu options. Therefore, a mobile banking app is a service not a product, which is the critical differentiator from its predecessor technologies (Kapoor & Vij, 2020). A mobile banking app has also been defined as an innovative channel for accessing banking services, where the customer interacts with a bank using a mobile device (Zhang, Lu, & Kizildag, 2018). The app is differentiated from previous technologies as it is a remote service offered by financial entities via a mobile phone, personal digital assistant or tablet to meet their customers' needs (Fenu & Pau, 2015; Muñoz-Leiva et al., 2017).

It is posited that a sustainable service innovation should have the agility to combine physical, digital, and social usefulness (Bolton et al., 2018). In the case of a mobile banking app, the concept would require that the app be based on physical infrastructure that is easy to obtain and use (the mobile phone), digital (the functions are indeed digital), and social (there are no discriminatory inhibitors). Bolton et al. (2018) and Keating, McColl-Kennedy, and Solnet (2018) conducted predictive studies forecasting that the tripartite alliance between social, physical, and digital realms will become necessary for



the next 30 years until 2050, when service innovation will outgrow product innovation in a business-to-consumer environment.

Mobile banking apps are a relatively new field in research, with a presumed increased future scope (Fenu & Pau, 2015). The limited extant research focuses largely on financial transactions and neglects some of the critical features that may impact user acceptance and a different experience from the predecessor technologies, and hence a value-adding contribution to the various actors, including banks (Shaikh et al., 2020). The financial transactions can take the form of transfer of funds, utility bill payments, wire transfers, and donations. Some of the non-financial transactions (NFT) of the mobile banking apps include processing information, customer assessment tools, loan options, descriptions of products and services, balance enquiry, email, chat/communication, notifications, alerts, and static updates like names, contact details, addresses. This aspect of the usefulness of the mobile banking app is believed to be overlooked by researchers (Shaikh et al., 2020). As cited by Shaikh et al. (2020), according to the Consumer and Mobile Financial Services Report 2016 and the Juniper Research 2018, 50% of the globally banked population using mobile banking apps utilise NFTs via the app, with 90% of those consumers using mobile banking apps to check account balances and transaction history and 36% using the apps to locate the nearest ATMs (Shaikh et al., 2020). This perspective is a useful contribution that may be a predictor of the potential differences between mobile banking apps and other retail banking technologies, and could influence customer intentions to use the app over time.

Another consideration for user acceptance of mobile banking apps is the changes in governmental attitudes and policies, which may support the trajectory of user acceptance of technologies, as illustrated by regulators becoming part of the ecosystem (Fenu & Pau, 2015). The advancement of consumer and industry regulations and the promulgation of new regulations in Europe and elsewhere, such as General Data Protection Regulation, the revised Payment Services Directive, and open banking regulations, have provided legal foundations to protect customers' personal and confidential information from misuse, and have infused innovation and development and spurred banking and financial organisations to collaborate and form partnerships across diverse industries, including banking and non-banking providers, such as fintech and telecommunications companies (Shaikh et al., 2020).

There are some technological considerations for influencing users' behaviour intentions and usage. For instance, the banking service provider must consider the asymmetric

perspective towards task-technology performance fit. This implies that the information systems (IS) and services must align with the customers' needs, failing which the user acceptance may remain low (Valaei, Nikhashemi, Bressolles, & Jin, 2019). This is particularly relevant for developing economies with innovation that is often based on a copycat approach from the developed world. In addition, the innovations in developing the mobile banking apps are novel and, in some cases, contain pervasive and systematic vulnerabilities ranging from botched certification validation and inadequate cryptography to several forms of information leakages that allow impersonation to occur undetected (Reaves et al., 2015). The literature reviews on user behaviours in relation to mobile banking apps show slow acceptance, with some concerns similar to those observed regarding m-payments (Thusi & Maduku, 2019, 2020). From the perspective of banks, there are many countries where the physical infrastructure, such as branches, is being drastically reduced based on empirical evidence that customers are beginning to use digital channels, albeit unknown if such alternative channels are provided by banks or technology companies like Apple Pay (Fenu & Pau, 2015).

## **2.6 Theoretical underpinning of this study**

The need for transformation of businesses and consumers alike towards technology adoption has always been an important topic in business strategies and models (Palmié et al., 2020). Many theoretical models relating to user acceptance behaviours in technology were developed and tested over the years, indicative of the critical drivers and effects of changes in human behaviours towards technology (Ameme & Wireko, 2016). Building on the foundations of other scholars, the UTAUT model developed by Venkatesh in 2003 became one of the most acceptable and commonly used in user acceptance research (Khechine et al., 2016; Momani, 2020; Venkatesh et al., 2016; Williams, Rana, & Dwivedi, 2015). The UTAUT combines and synthesises the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model, the Theory of Planned Behaviour (TPB), the Combined TAM and TPB model, the Model of PC Utilisation (MPCU), the Diffusion of Innovation Theory (DIT), and the Social Cognitive Theory (Venkatesh et al., 2003).

Amongst these models, the most popularly applied model as an alternative to the UTAUT is the TAM, developed by Davis in 1989 (Venkatesh et al., 2003). The UTAUT gained prominence ahead of the TAM because, whilst the TAM has been a reliable and valid model for user adoption in technology, it has been criticised for being generic on the individuals' opinions of novel technologies and is considered to have a deterministic

approach without considering users' unique circumstances or constraints (Slade et al., 2015). When it was developed, the UTAUT stood out because it was considered the most predictive, as it argues that behavioural aspects – namely intentions and use – are moderated by a combination of demographical features, such as gender, age, and the user's experience (Momani, 2020; Venkatesh et al., 2003, 2012). The subject matter of user acceptance of technology is complex, thus where appropriate, each of the theoretical models synthesised in the UTAUT are still in use, albeit selectively (Momani, 2020).

In creating the UTAUT, the key aspects of the previous eight models were unified, simplified, and addressed the shortcomings resulting in a model that could test user acceptance and design interventions, such as training and marketing (Venkatesh et al., 2003, 2016). One of the strengths of the UTAUT model is that it was able to remove several inherent biases, such as being distinct in testing either IS, psychology or sociology, and rather providing a blended view (Williams et al., 2015). The UTAUT is able to address three aspects: the individual's reaction to using technology, the intention to use technology, and the actual use of that technology (Venkatesh et al., 2003). As such, the UTAUT is usable across various sectors, such as education, healthcare, banking, and technology, and is suitable for use in developed and developing markets (Pham & Ahammad, 2017).

There are several examples where the UTAUT model enhanced the body of research on user behaviours (Dwivedi et al., 2019). The UTAUT model identifies key constructs that are predictive of the intention to use technology innovations. The dependent variable is often a sociological and psychological stimulus, which is a latent variable applicable to the user. Therefore, it is drawing on the critical aspects of human behaviour, which is an important ingredient in marketing studies (Venkatesh et al., 2003).

Illustrating the robustness of the UTAUT model, a meta-analysis covering 743 scientific journals that referenced the model from 2003 to 2013 and a sample drawn from 74 empirical studies was conducted to test the applicability and relevance of the UTAUT in various case studies (Khechine et al., 2016). The studies' findings validated the robustness of the model, indicating that nearly all the relationships were significant. In subsequent years, further meta-studies were conducted, evaluating applications and extension of the use of the model (Dwivedi et al., 2019; Momani, 2020; Venkatesh et al., 2016; Williams et al., 2015). The UTAUT model is adaptable, given that in addition to the original four constructs, researchers have been able to add other constructs to

adequately test several hypotheses while applying the same principles (Venkatesh et al., 2016).

In its early days, the UTAUT was applied to determine user technology acceptance by employees and management teams on processes that were being digitised or automated, as employers sought to improve their service and internal processes (Alrawashdeh & Al-Mahadeen, 2013; Yoo & Han, 2013). Whilst this was an important and relevant application of the UTAUT model, Venkatesh et al. (2012) proposed a sequel model, namely the UTAUT2, focusing on consumers and more weighted on marketing-related research, but still drawing on the principles articulated in the original model. The testing of user acceptance by consumers has continued to gain wider usage of the models, given that technological developments have changed businesses' landscapes due to ongoing challenging operating environments (Schwarz et al., 2020). Concurrently, the megatrends also drive further changes in business and consumer activities and with technology at the forefront of these changes, the need for testing user acceptance remains prominent (Esposito & Tse, 2018). The UTAUT3 was developed as a further extension of the UTAUT, adding a dimension of user acceptance in IS developments based on an agile approach, with several continuous enhancements to technology changes (Hong, Thong, Chasalow, & Dhillon, 2011).

This study is anchored on the UTAUT, as its constructs are fundamental to the niche focus chosen, being mobile banking apps in South Africa. Comparing the relevance of the UTAUT with the conceptual models that could be applied in this study, the TAM was found to be a strong IS or information technology (IT) adoption model in various organisational and cultural settings, but its main limitations are failure to capture the unconscious habits and social issues, and its biggest strength is perceived ease of use (Bouwman & Van de Wijngaert, 2009). The TPB's sociological aspects that could impact on consumers' behaviours, derived from Ajzen's theoretical foundations, are equally crucial to the current study (Madden, Ellen, & Ajzen, 1992). The benefit of the UTAUT is that it contains all these models. In their meta-analysis, Venkatesh et al. (2016) found that in testing user acceptance, context embedding task, social and physical dimensions could change intentions and use. In testing user acceptance for a technology application, such as a mobile banking app, a context of the user (who), location (where), time (when), rationale (why), task (activity), organisation (social), environment (physical), and technology (IT artefacts), are all noted as carrying significant relevance to individual technology acceptance and use (Venkatesh et al., 2016). In a mobile banking app,

arguably all these factors are present, making the UTAUT the most suitable model to apply.

The choice to apply the UTAUT is supported by previous comparative studies, where the model was applied in similar banking technology transformations (Mahmoud et al., 2018) and population targets (Arenas-Gaitán, Peral-Peral, & Ramón-Jerónimo, 2015). The UTAUT is used extensively in testing user acceptance on various mobile telephony applications ranging from education, telecommunication activities, m-commerce, social media and entertainment, which illustrates the robustness of the model (Akande, Badmus, Akindele, & Arulogun, 2020; Gunasinghe, Hamid, Khatibi, & Azam, 2019).

## **2.7 The key constructs in the study**

The UTAUT model operates on the basis of the four constructs, which are the antecedents for the intention to use and lead to the actual use of IT (Venkatesh et al., 2003). The theory maintains that these four key constructs have a positive and significant influence on users' intentions and usage behaviours, although the strength of the correlations has varied in various applications (Singh & Matsui, 2017).

The first three constructs – performance expectancy, effort expectancy, and social influence – are the direct determinants of usage intention and behaviour. The fourth construct, facilitating conditions, is the direct determinant of behaviour. In this study, it is relevant to unpack the customers' usage intentions, which could be impacted by the various alternatives available, thus affecting their decision to activate or not activate the app. The facilitating conditions construct is particularly relevant given the historically low user acceptance illustrated in previous studies in South Africa, where it was observed that access to Internet, appropriate technology tools, educational backgrounds, and trust were amongst the factors influencing low acceptance (Maduku, 2016; Petzer & Van Tonder, 2019; Redlinghuis & Rensleigh, 2010; Thusi & Maduku, 2019, 2020). The facilitating conditions relating to mobile banking apps are similar and, for the most part, as prohibitive as those required with the previous generations of technology requirements, mainly access and cost of the smartphone, data accessibility, ecosystem, and ease of use (Zhong & Nieminen, 2015).

The fifth construct, personal innovativeness, was added to the model expand the perspectives of the consumer-driven versus the service provider-driven transformation (Agarwal & Kothari, 2018; Slade et al., 2015). This construct has been identified as

critical in the case of agile technological developments, as the customer continuously experiences changes and enhancements, albeit incremental (Hong et al., 2011). Each of the antecedents is discussed in further detail below.

### **2.7.1 Antecedent 1: Performance expectancy**

Performance expectancy is the degree to which using a technology will provide benefits to customers carrying out certain activities (Venkatesh et al., 2012). This construct combined concepts, such as perceived usefulness, extrinsic motivation, outcome expectations, job fit and relative advantage, of the other models that UTAUT was developed from (Glavee-Geo, Shaikh, & Karjaluoto, 2017; Venkatesh et al., 2003). Venkatesh et al. (2003) considered performance expectancy to be the strongest predictor of intention and of significance at all points of measurement in voluntary and mandatory settings.

The actual usefulness of performance expectancy may be supported or refuted, but if the consumers believe that they need to participate, their perceived value is sufficient to switch their behaviours, which is the case with technology advances. A similar perspective was illustrated in a study on young Facebook subscribers in South Africa, which found that the use of Facebook has reignited some interest and participation in topics that youth previously disengaged in, as they perceived Facebook as a useful digital medium (Bosch, 2013). This is further explained as a relative advantage, implying that the customers will compare other alternatives before committing themselves to the use of this technology (Oechslein, Fleischmann, & Hess, 2014). The perceived relative advantage is a trigger for humans' natural competitiveness, reassuring them of an improved positioning (Karahanna, Ahuja, Srite, & Galvin, 2002). Moreover, performance expectancy carries extrinsic features motivated by externally imposed rewards, such as efficiency, or may be perceived as a punishment in the form of lack of access (Aguidissou, Shambare, & Rugimbana, 2018; Ryan & Deci, 2000).

To this extent, performance expectancy is a significant contributor to hedonic and utilitarian benefits and one of the most significant determinants of user behaviour intentions (Escobar-Rodríguez, Carvajal-Trujillo, & Monge-Lozano, 2014; Venkatesh et al., 2012). Performance expectancy is described as one of the strongest and most direct determinants of behaviour intentions (Chao, 2019). The mobile banking app is a robust transformation of a banking service model, with expected utilitarian benefits of convenience and efficiencies, hence performance expectancy is expected to be a

relevant indicator of behaviour intentions (Slade et al., 2015). The successful use of the M-Pesa product was orchestrated by the inadequate and inefficient banking system and, as it evolved with the entire e-commerce landscape underpinned by this product, illustrated the strong behaviour intentions where performance expectancy attributes are present (Wellen & Van Dijk, 2018).

### **2.7.2 Antecedent 2: Effort expectancy**

This construct is the degree of ease associated with customers' use of technology (Venkatesh et al., 2012). Constructs from prior models are the TAM, complexity (MPCU), and ease of use (Venkatesh et al., 2003). Effort expectancy could be illustrated through visual aspects, such as user interfaces, content design, and functional abilities, which could determine the behaviour intentions whether tried out or not (Mahfuz, Khanam, & Wang, 2016).

Having both been explored significantly as predictors of customer behaviour intentions and use, effort expectancy and performance expectancy are commonly associated (Varma, 2018; Venkatesh et al., 2003; Williams et al., 2015). This association is not surprising given the two constructs' theoretical linkage with the MPCU, DIT, and TAM as some of the foundational associations where these constructs were identified concurrently (Venkatesh et al., 2003, 2016). Despite the association of these constructs, their outcomes are neither predictable nor in sync. Effort expectancy is based on the customers making an effort, whether willingly or as a result of their context. Effort expectancy is commonly stronger with affluent people, presumed to be supported by reduced barriers like those experienced by poorer or less affluent people (Glavee-Geo et al., 2017). Additionally, culture has been identified in other studies as a potential barrier to effort expectancy, which was notable in Arabic communities where females are less likely to be involved in financial decisions and their use of financial technologies was lower than their male counterparts (Baabdullah, Alalwan, Rana, Patil, & Dwivedi, 2019). Furthermore, the lower the income level of the consumer, as illustrated in South Africa and Pakistan, the more adverse the effort expectancy, due to added structural societal constraints (Redlinghuis & Rensleigh, 2010; Shaikh, Glavee-Geo, & Karjaluo, 2018).

### **2.7.3 Antecedent 3: Social influence**

Social influence is the extent to which customers perceive the importance of others, whether family or friends, in their own behaviours of using a particular technology

(Venkatesh et al., 2012). This construct is also referred to as social norm that encompasses subjective norms, social factors, and image (Venkatesh et al., 2003). Social influence is a complicated construct, in that social influence in itself is impacted by context (De la Sablonnière, 2017). Individual behaviours change when their contexts change. The same applies to m-Commerce and digital banking, where users were found to be influenced by the subjective and social norms, such as following the societal trends, as observed with some individuals whose technology usage behaviours indicated willingness to use technology when in the United States, given societal norms, and the observed reduced intensity when they were in their home country of Egypt (Hassan & Wood, 2020).

Over time, technologies have altered the dynamics of business, partly placing immeasurable power in the hands of consumers. All the barriers to purchasing that once existed have been eroded and consumers now have infinite options that no longer depend on geography, time, price, and model or information limitations (Ghazi, 2017). Consequently, there has been a substantial change in consumer behaviours, with consumers becoming extremely demanding and having the power to significantly affect an organisation's reputation through, for example, an opinion posted on a blog, social media, or even the company's own website (Liébana-Cabanillas et al., 2020). Consumers rely on reviews to understand how others feel about a particular service, using them as key influencers for themselves (Ghazi, 2017). Mobile banking apps are no exception where social influence comes not only from the known surroundings of family and friends, but also from Android and Apple App Store ratings (Kapoor & Vij, 2020). Reliance on others' opinions is significant in the early stages of an experience or in mandatory settings and will fade as consumers gain experience (Venkatesh et al., 2003).

#### **2.7.4 Antecedent 4: Facilitating conditions**

This construct is defined as the considerations impacting the customers' perceptions of the resources and support available to perform (Venkatesh et al., 2003). The facilitating conditions construct is significant in mandatory and voluntary settings, but it was further posited that if the performance expectancy or effort expectancy are not present, facilitating conditions could become a higher-order predictor of intentions (Venkatesh et al., 2003). Of all the constructs, this is more challenging as its outcomes are not determined by the consumers' context, rather those of the other actors in the ecosystem and, more specifically, the service provider (Palmié et al., 2020). Ecer (2018) defined facilitating conditions as the external environments of helping consumers to overcome



barriers and hurdles to use new IT. These external environments can be wide-ranging factors, such as support and training from the banking institution, regulatory requirements like those that exist for market conduct, anti-money laundering, privacy and other security features in the mobile banking app, and the functioning of inter-operability amongst the actors in the ecosystem, especially in the e-commerce environment (Kapoor & Vij, 2020).

Various studies indicate that customers could benefit from an improvement in facilitating conditions, as long as the service provider makes an effort to provide them, particularly as the mobile banking app requires all actors to support the effort (Muñoz-Leiva et al., 2017). Mahmoud et al. (2018) observed that a service provider introducing new technologies needs to ensure that the organisational readiness becomes a parallel change management programme to support the external transformation for customers, which will create more aligned facilitating conditions. In another study, it was illustrated that where the service provider focuses on lean approaches or efficiencies, rather than on enhancing customer outcomes, the initiative may not be rewarding to either the service provider or customer (Gong & Janssen, 2015). In direct support of this study, facilitating conditions are posited to be the role of the service provider rather than the customer (Palmié et al., 2020).

### **2.7.5 Antecedent 5: Personal innovativeness**

Agarwal and Prasad (1998, p. 206) describe personal innovativeness as “the willingness of an individual to try out any new information technology”. They further posited that personal innovativeness is an indicator of risk propensity in individuals, given that there are people who are early adopters, majority and laggards in trying out new things. In a technology environment, personal innovativeness is analysed through Hwang’s theory of Personal Innovativeness in Information Technology (PIIT), indicating that PIIT influences the perceived ease of use, which influences the three other dimensions on online trust – namely benevolence, integrity and ability (Malaquias & Hwang, 2019). Furthermore, the concept of perceived personal innovativeness is related to the product or service itself, as well as user perception and the improving status of consumer emotion, interest, and consequently intention to use (Liébana-Cabanillas et al., 2020).

Based on prior studies in developed and developing countries and on various factors applied as extensions to the UTAUT and demographic considerations, it is evident that the behaviour intentions for using banking technologies require more research. One of

the concepts that is not commonly tested for behaviour intention is the customer's ability to explore the new technologies, based on their qualities of being savvy (Malaquias, Malaquias, & Hwang, 2018). These descriptors position personal innovativeness as a combined science. Behavioural and psychological sciences were evaluated as having a direct correlation with user acceptance behaviours in various changed environments, and when testing this in a setting of technological developments, they affirmed the presence of this correlation (De la Sablonnière, 2017; Lu, Yao, & Yu, 2005). There are also firm theoretical foundations supporting some of the observations on personal innovativeness, with the most prominent being the TPB and TRA, which were included in the UTAUT model (Madden et al., 1992).

On the foundation of Rogers' DIT, several authors have argued that individuals gain knowledge by synthesising a variety of media and communications, assess and accept the risks associated with trying out new things or acquiring new knowledge, and subsequently develop new and positive perceptions about the innovation in terms of its advantages and value (Agarwal & Prasad, 1998; Gbongli, Xu, & Amedjonekou, 2019; Liébana-Cabanillas et al., 2020; Lu et al., 2005). Personal innovativeness arises when individuals have navigated through these choices (Chen, Liao, Chen, Wang, & Zhuo, 2019).

Mobile banking apps are complex pieces of technology with activations that involve more players than the banking institution itself. Therefore, personal innovativeness is considered a relevant aspect to consider whether user behaviour intentions are impacted by the mobile banking app's technical configuration, which may differ from bank to bank, the type of smartphone being used, the reputational and trust issues relating to the bank or other actors, the counterparties they are transacting with, and may spark intention or disinterest for the individuals' risk appetite to try (Aboobucker & Bao, 2018). With the exception of China and some South East Asian countries, most developing countries have several characteristics causing them to have lower propensity for personal innovativeness (Soutter et al., 2019).

The use case for this study has specific idiosyncratic features, in that penetration of smartphones is still low in South Africa, enabling factors like the cost of data and inadequacy of the e-commerce ecosystem create a need to examine the effect of personal innovativeness in behaviour intentions. Other research where this was applied as an independent variable was in a study in the United Kingdom (UK), where non-users

of m-payment products were evaluated for behaviour intentions, with personal innovativeness being one of the constructs under consideration (Slade et al., 2015).

### **2.7.6 Dependent variable: Behaviour intentions**

Behaviour intentions are described as a social psychology and are explained by the motivational factors (Kwong & Lee, 2002). The composition of this construct is complicated by the vast meanings of the two words, whereby behaviour is the way someone behaves towards other people, whilst intention is the aim or plan. Behaviour intentions find meaning in the underlying theories driven by psychological studies (De la Sablonnière, 2017). Behaviour intentions are explained in the TPB, arguing that people do not fully control their behaviours, which are conditioned by rational factors related to the circumstances around the individuals (Ajzen, 1991). In addition, it is posited that there is an interwoven relationship between the concepts of intention, attitude, and behaviour, which culminated into the theoretical model of the Perceived Behaviour Control (Mainardes, Souza, & Correia, 2020). Behaviour intentions are controlled entirely by the consumer and, given that it occurs after the service is provided, it is a critical factor that should be understood and tracked by service providers (Maduku, 2016).

Behaviour intentions are demonstrated by the customers' deliberate commitment to use the technology, not once, but more frequently to derive the envisaged value. This study evaluated behaviour intentions as a dependent variable, indicating that behaviour intentions are aligned with the customers' outcomes. Several scholars have indicated motivational factors, such as customer satisfaction, value creation, and pricing, as some of the determinants of customers' behaviour intentions (Frey, Trenz, & Veit, 2019; Zhou, 2012).

### **2.8 Moderating effect: Service innovation**

Some considerations were given to introducing a moderating variable to the five constructs covered in section 2.7. The effect of a moderating variable is to categorically or quantitatively indicate the interaction of the independent and dependent variables, whereby the moderation could strengthen the relationship and indicate the direction of such a relationship (Creswell & Creswell, 2018). Several studies have identified at least 20 items, being non-exhaustive, as having a significant and direct impact on user behaviours – namely trust, risk or perceived risk, word of mouth, ease of use, usefulness, innovativeness, resistance to innovation, lack of confidence, socio-cultural effects,

previous experiences, quality and usability of websites/technology, attitudes, subjective norms, master of IT, cost, customer co-creation, habit and perceived advantage over alternatives (Casado-Aranda, Liébana-Cabanillas, & Sánchez-Fernández, 2018; Dwivedi et al., 2019; Momani, 2020; Venkatesh et al., 2016). These observations bear testimony to the relevance of the UTAUT and its elasticity on various factors (Khechine et al., 2016).

As discussed in this section, service innovation was chosen as a moderating effect due to its features where it is determined to be the role of the service provider to enable business transformation for services, of which digital services is relevant in this study (Dal Bó et al., 2018; Manohar et al., 2019). Service innovation is a relatively new concept in the academic sphere, given that it is a composite of service and innovation, which have served as foundations to many studies (Manohar et al., 2019). The concept of service has its foundations in Miles (1993), who centred on the prospects of services in the then new industrial economy, stating that attention is required in innovation in services. Miles (1993) highlighted that manufacturing and services are intertwined and interdependent activities, and that services like software and telematics are playing a major role in diffusing new technologies, techniques, and organisational styles. Alternatively, innovation is believed to be a mature topic partly emanating from Schumpeter's 1934 Theory of Innovation and it is paraphrased as the antecedent for business growth (Hollebeek et al., 2018).

Blending the two concepts, service innovation does not have a singular definition. Another view is that service innovation is a new service or a renewal of a service where the benefit is to create value for the customer (Witell, Snyder, Gustafsson, Fombelle, & Kristensson, 2016; Yen et al., 2012). Witell et al. (2016) stated that service innovation has four characteristics – firstly, that the outcome of service innovation is separated from the process of development; secondly, for the invention to be innovative, it must be in use; thirdly, it must be new to one of the actors; and lastly, such an invention must create value to some of the actors. Historically, some research findings were as abstract as stating that service innovation is the reverse cycle to product innovation, thus stating that it is completely different from product innovation (Barras, 1986; Ettlé & Rosenthal, 2011). Service innovation is more diverse and complicated, which makes it difficult to accomplish, because the enablement and assessment are separate functions (Dörner, Gassmann, & Gebauer, 2011).

Service innovation was identified as a relevant moderating variable that can be applied in this study, drawing on the knowledge gap where it is recommended in multiple literature reviews that service providers must modify their service models to enhance user behaviour intentions (Ameen, Shah, Sims, Choudrie, & Willis, 2020; Dal Bó et al., 2018; Zhang et al., 2018). Consequently, service providers or the banking institutions have the onerous task of ensuring that technology innovations, such as mobile banking apps, cannot be successful without an enhanced service that accords with the transformational business strategies and models that the apps present, failing which the investment returns will not be realised (Mahmoud et al., 2018; PwC, 2019; Schwarz et al., 2020). Vargo and Lusch (2004, 2008, 2017) founded the conceptual model of SDL, providing more academic tools to evaluate and study service innovation. The SDL conceptual model describes service innovation comprehensively and raises a number of new ideas that draw linkages to service as a new industrial economy (Vargo & Lusch, 2004). SDL brought into focus the need to measure innovation from the perspective of the user and expand the applications towards marketing studies (Grönroos, 2011; Grönroos & Voima, 2013). This study articulates, based on several literature reviews, that user behaviour intentions for a technological innovation is a combination of product, service and business strategy and model innovations (Liébana-Cabanillas et al., 2020). It is against this background that service innovation is critical to achieve the balance (Dörner et al., 2011).

## **2.9 Covariates: Age and gender**

Gender, as a variable in the UTAUT, was found to be more pronounced in developing economies and in less affluent communities, influenced by inadequate access to economic resources and paternalistic cultural norms (Baabdullah, Alalwan, Rana, Patil, & Dwivedi, 2019). A UTAUT model was credited for its ability to incorporate demographics in the form of gender and age and to draw on psychological and sociological attributes in the customer behavioural conditions (Venkatesh et al., 2012). In all five constructs, females were found to have a lower propensity of use than males, mainly because of cultural norms and economic means (Glavee-Geo et al., 2017). Gender as a moderator is less pronounced in developed economies and amongst affluent, educated, and tech-savvy individuals (Arenas-Gaitán et al., 2015; Baabdullah, Alalwan, Rana, Kizgin, & Patil, 2019; Slade et al., 2015). No known studies in South Africa have focused on a specific gender applied on mobile banking app or any predecessor banking technologies. However, other studies unrelated to banking have illustrated a consistent observation of females being disenfranchised; thus, the focus on

this component is warranted as it is plausible that the behaviour intentions of males and females could be different (Derera, Chitakunye, & O'Neill, 2014).

Similar to gender, the moderating effect of age is relevant from two perspectives – firstly, it is embedded in the UTAUT; and secondly, given that the use case is on technology, the concept of young people as digital natives is an appropriate unit of analysis (Esposito & Tse, 2018; Singh, 2012). The other critical business relevance of age is that a number of economies, mostly developed, have a stronger proportion of older people above 55 years of age than some of the developing countries, such as South Africa, where there is a large contingent of younger people below 35 years old (Famubode, 2018). Whilst young people are more adaptable to technology, the elderly people's propensity towards technology acceptance has been circumstantially influenced by other factors besides age, therefore it is not the opposite of young people's attitude towards technology (Arenas-Gaitán et al., 2015). A lot of research has focused on youth in examining behaviour intentions or usage behaviours in technology innovations, indicating that each study must be understood in its own context (Akturan & Tezcan, 2012; Liébana-Cabanillas, Marinković, & Kalinić, 2017; Owusu, Bekoe, Addo-Yobo, & Otioku, 2020; Shaw & Kesharwani, 2019).

## **2.10 Conclusion**

This chapter discussed the theoretical and literature basis for this research. It began with an overview of the banking industry and some of the relevant digital evolution in servicing retail customers. This section provided background and a descriptive analysis of mobile banking apps, which is the use case in this study. The contexts and literature coverage of the banking innovations and mobile apps draw relevance of this study to digital retail banking based on past and present trends (PwC, 2019).

The detailed review of the digital retail banking trends led into a theoretical underpinning of the study, being the rationale and mechanics of the UTAUT model, together with discussions of all the constructs applicable in this study. Personal innovativeness was added to the four UTAUT antecedents, exploring other psychometric features that could impact consumers' behaviour intentions. The moderating effect of service innovation was explored and defended as a positive and significant influence on the relationships between the antecedents of performance expectancy, effort expectancy, social influence, facilitating conditions, and personal innovativeness, and behaviour intentions towards the use of mobile banking apps. Chapter 2 laid a foundation and rationale for

the following section, where the research questions and hypotheses are proposed and defended with relevance to this study.

## **CHAPTER 3: RESEARCH QUESTIONS AND HYPOTHESES**

### **3.1 Introduction**

On the basis of the literature review covered in the previous chapter, Chapter 3 starts with the research questions that this study seeks to answer, based on the business and theoretical rationale as well as the research objectives stated in Chapter 1 (section 1.4). Following on the research questions, this chapter covers the theoretical model, which is an adaptation of the UTAUT model (Venkatesh et al., 2003). The antecedents applied in this study draw from the four constructs of the UTAUT model – namely performance expectancy, effort expectancy, social influence, and facilitating conditions. This study extended the UTAUT model by adding personal innovativeness as the fifth antecedent (Venkatesh et al., 2012). The model includes service innovation as a moderating effect, and gender and age as covariates (Ameen et al., 2020; Arenas-Gaitán et al., 2015; Slade et al., 2015). The hypotheses are developed, positing a positive and significant relationship between the antecedents and the dependent variable of behaviour intentions. Furthermore, the hypotheses are developed and posit that service innovation has a moderating effect on the relationships between the antecedents and behaviour intentions. The gender and age covariates are also examined for their impact on behaviour intentions.

### **3.2 Research questions**

The research questions are imperative to any research study, as they connect the literature review with the research methodology (Creswell & Creswell, 2018; Hair, Celsi, Money, Samouel, & Page, 2015). The research questions in this study are based on the research objectives outlined in section 1.4. The purpose of this research is to understand the moderating effect of service innovation in a UTAUT model, with the use case being mobile banking apps. As age and gender are control variables incorporated in the UTAUT, they will also be used for completeness in this study, although this not a primary focus of the research. It is inevitable that age and gender are embedded in the data that will be collected for completeness of the research. Therefore, inclusion of these as covariates is useful for further analysis of the research findings. To achieve this, the following research questions were formulated for the study:



**Research question 1:** Does performance expectancy, as an antecedent, have a significant and positive relationship with behaviour intentions towards the use of a mobile banking app?

**Research question 2:** Does effort expectancy, as an antecedent, have a significant and positive relationship with behaviour intentions towards the use of a mobile banking app?

**Research question 3:** Does social influence, as an antecedent, have a significant and positive relationship with behaviour intentions towards the use of a mobile banking app?

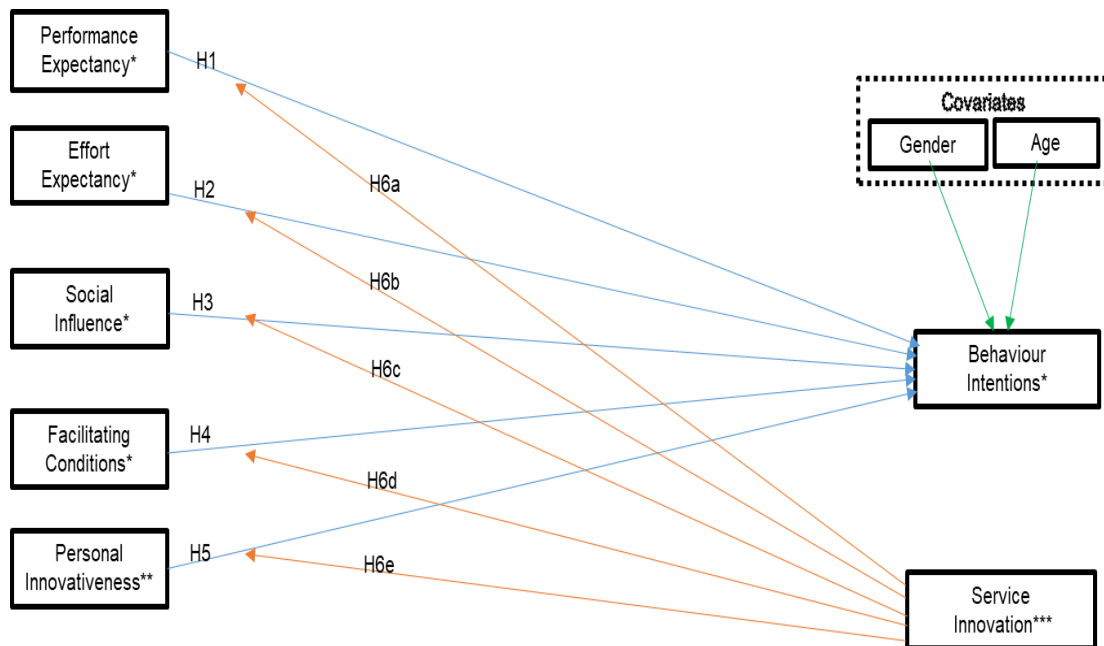
**Research question 4:** Does facilitating conditions, as an antecedent, have a significant and positive relationship with behaviour intentions towards the use of a mobile banking app?

**Research question 5:** Does personal innovativeness, as an antecedent, have a significant and positive relationship with behaviour intentions towards the use of a mobile banking app?

**Research question 6:** Does service innovation have a moderating effect on the relationships between the antecedents (namely performance expectancy, effort expectancy, social influence, facilitating conditions, and personal innovativeness) and behaviour intentions towards the use of a mobile banking app?

### **3.3 Context of the conceptual model**

The conceptual model is based on an adoption of the UTAUT model and is further elaborated through the additions of personal innovativeness as an antecedent (section 2.7.5) and service innovation as moderator (section 2.8). Covariates have been included in the conceptual model, although no hypotheses have been developed for them. The conceptual model is depicted in Figure 1.



**Figure 1: Conceptual model.** *Source:* Researcher’s own construct. *Notes:* \*adopted from the UTAUT model by Venkatesh et al. (2003); \*\*adopted from Slade et al. (2015); \*\*\*adopted from Manohar et al. (2020).

### 3.4 Relationships between the antecedents and behaviour intentions

Each construct is examined for its postulated relationship with behaviour intentions, as covered in sections 3.4.1 to 3.4.5 below.

#### 3.4.1 Relationship between performance expectancy and behaviour intentions

Performance expectancy is explained as incorporating key words like advantage, usefulness and job fit, and is considered the strongest predictor of intention (Glavee-Geo et al., 2017; Venkatesh et al., 2003). The relationship between performance expectancy and behaviour intentions has been confirmed in several studies relating to m-commerce, motivated by the observation that this is an individual’s perception of the advantage or usefulness (Alalwan, Dwivedi, & Rana, 2017; Liébana-Cabanillas, de Luna, & Montoro-Ríos, 2017). Considering Venkatesh’s definition that performance expectancy is a composite of the stated factors of usefulness, relative advantage, and extrinsic motivations (see section 2.7.1), Sair and Danish (2018) indicated that performance expectancy could apply only in part, thus its relationship must be determined based on these strong underlying indicators. However, there are more cases of performance expectancy displaying a positive and significant relationship with behaviour intentions (Aguidissou et al., 2018; Oechslein et al., 2014). Varma (2018) found that performance

expectancy had the strongest relationship with user behaviours on the basis of the convenience factors of the mobile banking app being available anywhere and any time. As the relationship between performance expectancy and behaviour intentions was found to be present in different contexts, incorporating banking technology services, the following hypothesis is proposed:

H<sub>1</sub>: Performance expectancy has a significant and positive relationship with behaviour intentions to use the mobile banking app.

### **3.4.2 Relationship between effort expectancy and behaviour intentions**

Several scholars have drawn close links between effort expectancy and performance expectancy, and in the context of their relationships with behaviour intentions, effort expectancy is determined by the consumer's effort, whereas performance expectancy is driven by the consumer's perceptions (Alalwan et al., 2017; Shaikh et al., 2018). Where the customer makes an effort, voluntarily or involuntarily, studies have found user behaviours to have been positively and significantly influenced by effort expectancy (Venkatesh et al., 2003). The circumstances under which consumers may not make an effort to use the technology include security concerns, cultural considerations, and less affluent communities, as reflected in studies conducted in South Africa and Bangladesh for banking digital products and e-learning (Mahfuz, Hu, & Khanam, 2016; Redlinghuis & Rensleigh, 2010; Yoo & Han, 2013). Similarly, a UK study that sampled people who were not willing to use the m-payments system found effort expectancy does not have a significant influence on behaviour intentions due to the ubiquity of technologies (Slade et al., 2015). However, other studies found that effort expectancy had a positive and significant influence on behaviour intentions or user behaviours based on the voluntary or mandatory circumstances that consumers face (Arenas-Gaitán et al., 2015; Varma, 2018). These different findings illustrate the dynamism of the UTAUT model in a differentiated context and in this study supports the following hypothesis:

H<sub>2</sub>: Effort expectancy has a significant and positive relationship with behaviour intentions to use the mobile banking app.

### **3.4.3 Relationship between social influence and behaviour intentions**

As discussed in section 2.7.3, social influence combines sociological and psychological factors and is also referred to as social norms, such as image, societal trends, and context (De la Sablonnière, 2017). This construct is a composite of several factors, such as social norms, image, and voluntariness, and could yield different outcomes in each factor (Lu et al., 2005). It is also illustrated that social influence is not only inspired by family and friends, but could be an adoption of trends as long as the customers consider the social attributes to be beneficial (Hassan & Wood, 2020). Consumer platforms where blogs or ratings are applicable to customers play a significant role as social influencers of customers' usage and behaviour intentions, much like the TripAdvisor or Zomato platforms do (Ghazi, 2017; Zhong & Nieminen, 2015). Kapoor and Vij (2020) showed that the role played by Android and Apple App Store ratings is not only helpful to the consumers regarding the choices they make, but it also provides unfiltered feedback to the service provider, demonstrating that the direct and significant relationship is posited to be in force. Based on these findings, the below hypothesis is proposed:

H<sub>3</sub>: Social influence has a significant and positive relationship with behaviour intentions to use the mobile banking app.

### **3.4.4 Relationship between facilitating conditions and behaviour intentions**

The facilitating conditions are provided by the service provider. Therefore, behaviour intentions depend a lot on what actions are taken by the service provider, as well as when and how (Arenas-Gaitán et al., 2015). Facilitating conditions are significant in mandatory and voluntary settings, but it was further posited that if performance expectancy and effort expectancy are not present, facilitating conditions could become a higher-order predictor of intentions (Venkatesh et al., 2003). Arenas-Gaitán et al. (2015) contended that facilitating conditions influence behaviour intentions under work conditions for consumers, and these intentions are further affected by age, gender, experience, and the requisite support provided. In an agile environment with constant technology-driven changes, the facilitating conditions construct is considered the most critical determinant of behaviour intentions and usage, although this eases as experience is gained (Hong et al., 2011).

Furthermore, in a study on female user acceptance of technology in the United Arab Emirates, Ameen et al. (2020) asserted that inclusion policies are a critical factor for

technology use and training will not be sufficient without positive facilitating conditions. Several studies uncovered that facilitating conditions, which are provided by the service provider, are necessary and were in many cases found to have a significant and positive influence on behaviour intentions (Baabdullah, Alalwan, Rana, Patil, & Dwivedi, 2019; Hong et al., 2011; Patil, Tamilmani, Rana, & Raghavan, 2020). Mahmoud et al. (2018) observed that a service provider introducing new technologies needs to ensure that the organisational readiness becomes a parallel change management programme to support the external transformation for customers, which will create more aligned facilitating conditions. Based on these findings and indicators of the positive and significant influence between facilitating conditions and behaviour intentions, the hypothesis proposed is:

H<sub>4</sub>: Facilitating conditions have a significant and positive relationship with behaviour intentions to use the mobile banking app.

#### **3.4.5 Relationship between personal innovativeness and behaviour intentions**

Personal innovativeness is examined commonly as a moderating effect or a mediator towards technology-driven outcomes of behaviour intentions or the use of the technological development (Agarwal & Kothari, 2018; Malaquias & Hwang, 2016). Gbongli et al. (2019) investigated personal innovativeness as an antecedent and found that the positive and significant influence is more prevalent in affluent societies, emanating from the postulation by Agarwal and Prasad (1998) that the courage and risk attitude of consumers are what drive personal innovativeness. Moreover, it was found that personal innovativeness has a significant impact on hedonic values, as illustrated in a study in a Chinese setting, where cultural attributes were key drivers towards an innately higher personal innovativeness (Ashraf, Hou, & Ahmad, 2019). Liébana-Cabanillas et al. (2020) showed that personal innovativeness is related to the product or service itself, as well as user perception and the improving status of consumer emotion, interest, and intention to use. Whilst it is necessary to determine whether personal innovativeness is an antecedent or any other type of variable, some studies have found a significant and positive relationship with behaviour intentions. Personal innovativeness can be inspired by the service at hand. For instance, mobile banking apps' technical configuration may differ from bank to bank, the type of smartphone being used, the reputational and trust issues relating to the bank or other actors, and the counterparties they are transacting with, which have the ability to ignite intention or interest for the

individuals' risk appetite to engage (Aboobucker & Bao, 2018). With that background, the hypothesis is proposed as per below:

H<sub>5</sub>: Personal innovativeness has a significant and positive relationship with behaviour intentions to use the mobile banking app.

### **3.5 Moderating effect: Service innovation**

Research on service innovation in the banking sector has been limited, partly because of the ongoing debates regarding innovation, product innovation, and service innovation (Finoti, Bonfim, Didonet, Segatto, & Toaldo, 2018; Vargo & Lusch, 2008). A compelling perspective of the continuing importance of service innovation in current times and in the future was debated and presented in a framework developed to guide service providers on the multiple dimensions of service and the roles of various players (Bolton et al., 2018; Vargo & Lusch, 2017). The detailed examinations and literature review on the UTAUT, focusing on South Africa and abroad, indicated that despite several investments and efforts by banking institutions, user acceptance through usage and behaviour intentions remains low (Redlinghuis & Rensleigh, 2010; Thusi & Maduku, 2019; Van Tonder et al., 2018). Studies have made various recommendations, including additional support by banks, training or better communication, and specialised offerings in the business model to cater for specific customer circumstances (Edvardsson et al., 2018; Mahmoud et al., 2018; Sillanpää & Junnonen, 2012).

The primary moderating effect is the service innovation, as it has been identified as a research gap in literature, particularly considering user acceptance of technology applications (Maduku, 2016; Mahmoud et al., 2018; Mombeuil, 2020; Van Tonder et al., 2018). In addition, service innovation requires the service provider firm's management to be attuned towards supporting the innovative business models, such as where customers are being introduced to a mobile banking app (Manohar et al., 2019). As a moderator in this study, service innovation is to be examined for its ability to influence the relationship between the antecedents and the dependent variables.

Whilst some researchers (Shaikh et al., 2018) argued that awareness of innovations like mobile banking apps will improve customer behaviours towards the intention and eventual use of the product, other scholars (Glavee-Geo et al., 2017) posited that even if awareness is increased, this is not sufficient to boost user acceptance and the service providers must rethink the concept of service innovation. Given the dynamism and critical

role through which service innovation could moderate a relationship between an antecedent and behaviour intentions, the following hypotheses are proposed:

H<sub>6a</sub>: Service innovation has a moderating effect on the relationship between performance expectancy and the behaviour intentions towards the use of a mobile banking app.

H<sub>6b</sub>: Service innovation has a moderating effect on the relationship between effort expectancy and the behaviour intentions towards the use of a mobile banking app.

H<sub>6c</sub>: Service innovation has a moderating effect on the relationship between social influence and the behaviour intentions towards the use of a mobile banking app.

H<sub>6d</sub>: Service innovation has a moderating effect on the relationship between facilitating conditions and the behaviour intentions towards the use of a mobile banking app.

H<sub>6e</sub>: Service innovation has a moderating effect on the relationship between personal innovativeness and the behaviour intentions towards the use of a mobile banking app.

### **3.6 Age and gender as covariates**

Gender and age were added to the UTAUT model as embedded moderating effects to highlight the sociological and psychological aspects of behaviour intentions in the use of technologies (Venkatesh et al., 2003, 2012). Focusing first on gender, several studies have examined gender by conducting research targeting female participants, as the postulated idiosyncrasies apply exclusively to females (Ameen et al., 2020; Riquelme & Rios, 2010; Zhang, Choi, & Kim, 2018). In most of the studies, females were found to have a lower propensity to use the technologies than males mainly because of cultural norms and economic means (Glavee-Geo et al., 2017). Gender as a moderator or covariate is less pronounced in developed economies and amongst affluent, educated, and tech-savvy individuals (Arenas-Gaitán et al., 2015; Baabdullah, Alalwan, Rana, Patil, & Dwivedi, 2019; Slade et al., 2015). There is no known study in South Africa that focuses on a specific gender regarding use of mobile banking apps or any predecessor banking technologies.

Similar to gender, age has been examined in several studies and since this study's use case is on technology, the concept of young people as digital natives is an appropriate unit of analysis (Esposito & Tse, 2018; Singh, 2012). Research findings have been mixed, indicating that the age influence is present in studies that centre on the elderly, compared to when young people are the key focus (Arenas-Gaitán et al., 2015; Okari, 2017; Owusu et al., 2020). Similarly, it has been found that in some hedonic outcomes, the user behaviour intentions could not be differentiated by age (Bosch, 2013).

### **3.7 Conclusion**

This chapter constructed six research questions on the basis of the research objectives created in Chapter 1 and the literature review covered in Chapter 2. The theoretical model, which identified five antecedents – performance expectancy, effort expectancy, social influence, facilitating conditions, and personal innovativeness – was presented, and incorporated service innovation as a moderator as well as gender and age as covariates. The relationships between the constructs were discussed and these supported the proposed hypotheses for the antecedents, moderator, and covariates. The next chapter focuses on the research methodology for this study.



## **CHAPTER 4: RESEARCH METHODOLOGY**

### **4.1 Introduction**

This chapter builds on Chapter 3, where the conceptual model (section 3.3), research questions, and hypotheses are the catalysts for the type of methodology that is practical and applicable for any study (Hair et al., 2015). Given the application of a quantitative analysis in this study, this chapter looks at the critical steps that were followed therein. The purpose of a research methodology is to provide evidence of how the theories were applied in selecting research methodologies, how data was collected and analysed, and which tools were considered appropriate. This section concludes with an outline of the ethical issues and the limitations of the methodology.

### **4.2 Choice of methodology**

The choice of methodology was guided by the critical steps laid out in academic studies and used in research conducted in this field of study (Creswell & Creswell, 2018; Saunders, Lewis, & Thornhill, 2009). The key steps followed in this research are outlined in the sections that follow.

#### **4.2.1 Philosophy**

This research was based on a positivist ontology, emanating from a world view that tests rather than develops theory. The applied philosophy was built on empirical assumptions and the evaluation of a causal relationship between the predictions and the identified plausible outcomes (Creswell & Creswell, 2018). The UTAUT model was an important foundation of this research. The positivist approach has been used in countless research related to consumer behaviours for testing psychological, sociological, marketing, and managerial factors (Jung, Kwon, & Kim, 2020). This study centred on a behavioural marketing activity (Slade et al., 2015).

#### **4.2.2 Approach**

This research had its foundations in deterministic theory, as user behaviours are caused by the constructs identified in the UTAUT (Sousa, 2010). The research also had a deductive reasoning, anticipated to reach a logical conclusion regarding the causal relationship between the independent and dependent variables. A deductive approach

is in line with a typical positivist ontology (Sousa, 2010). Both deterministic and deductive approaches are common in an application of the UTAUT, having been studied broadly across various psychological and sociological perspectives in spheres of marketing and business transformations (Venkatesh et al., 2016).

#### **4.2.3 Methodological choices**

A quantitative approach, a mono-method, was selected for this study. Data was collected through a self-administered questionnaire and analysed using statistical software tools (Creswell & Creswell, 2018).

#### **4.2.4 Purpose of the research design**

This study's research design was descripto-explanatory, as it focused on mobile banking apps as a situation or problem and explained the causal relationship between the independent and dependent variables, emphasising how these relationships are moderated by service innovation (Creswell & Creswell, 2018; Sousa, 2010). Explaining the applicable theories and technologies and the relatable independent and dependent variables were the key motivations for this research design, which are key attributes of descripto-explanatory research (Creswell & Creswell, 2018). The emphasis was on explaining the theory, the causal relationships, and the validity and reliability of the selected quantitative data in a highly structured approach (Saunders et al., 2009). Quantitative studies have been applied in several studies similar to the current study (Glavee-Geo et al., 2017; Mahmoud et al., 2018; Slade et al., 2015).

#### **4.2.5 Research strategy**

As the research methodology for this study was quantitative, a self-administered survey was preferred as it is considered efficient and sufficient to obtain unfiltered feedback. Previous studies in South Africa have successfully illustrated that collecting quality survey data through this approach is possible (Maduku, 2014b; Petzer & Van Tonder, 2019; Redlinghuis & Rensleigh, 2010).

#### **4.2.6 Time horizon**

Given the rapid technology changes for consumers and service providers, a cross-sectional study was deemed adequate to test user acceptance for any banking service

(Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2014; Mahmoud et al., 2018; Slade et al., 2015). In addition, cost considerations and time limitations supported this approach (Creswell & Creswell, 2018). Moreover, the moderating effects illustrated that, if certain boundaries are removed, the users' behaviour intentions may adjust (Aliaño, Hueros, Franco, & Aguaded, 2019). The relevant survey data was collected from 2 to 27 October 2020 in two sessions – firstly, pilot data was collected and some adjustments were administered, followed by final and complete data being received on 27 October 2020. The earlier than anticipated feedback illustrated a significant interest in the study.

#### **4.2.7 Techniques and procedures**

The survey was highly structured, based on Likert-type scale questionnaires applied in previous and similar studies (Mahmoud et al., 2018; Petzer & Van Tonder, 2019; Slade et al., 2015). The techniques followed a pattern as laid out in the theory of a reasoned action, a theory developed by Saunders et al. (2009) as a step-by-step guide to structuring research methodology. The questionnaire was self-administered with no open-ended questions. The respondents for this study were sourced by Consulta Panel, a well-known independent market research company in South Africa whose role was to collect data from their broad network of relevant respondents capable of managing the self-administered questionnaires (Petzer & Van Tonder, 2019).

### **4.3 Proposed research methodology and design**

#### **4.3.1 Population**

The targeted population were all people in South Africa, older than 18 with a bank account and registered as users of a mobile banking app for a period of at least six months. The bankable population was at 70% (Deloitte Africa & Mastercard, 2019). This population was appropriate to collect a sample considered relevant for this research (Creswell & Creswell, 2018).

#### **4.3.2 Unit of analysis**

The unit of analysis was adult individuals with a banking relationship, a smartphone, and who had a mobile banking app for no less than six months. The rationale for this was based on the acknowledgement that banks are giving mobile banking a critical focus

based on investments and elevation of mobile as an opportunity for transformation of their respective businesses (Mhlanga, 2020; Shaikh et al., 2020).

#### **4.3.3 Sampling method and size**

A non-probability sampling method was preferred. Silver and Johnson (2018) supported this choice, reporting that, as of the end of 2017, South Africa's mobile phone penetration was 91%, of which 51% were smartphones. The target population required filtering, resulting in a purposive sampling approach. A sampling design is a single stage and information received was anonymised in line with the best practice applicable in the South African market (Creswell & Creswell, 2018). The screening was conducted through inbuilt tools to ensure quality and relevance of respondents. Consulta Panel was utilised in line with industry practice given their diverse access to consumers and their technical and marketing expertise (Deng, Lu, Wei, & Zhang, 2010; Petzer & Van Tonder, 2019).

The targeted sample size was 270 respondents. The 27 survey items were considered in the context of a recommended optimal number of responses, based on  $p:v$  hypothesis (where  $p$  represents sample size and  $v$  is the independent variable), where for every independent variable a sample of 10 was required (Hair, Black, Babin, & Anderson, 2010). In other words, the minimum responses required in this research were 270. Comparable studies have covered samples ranging from 189 responses (Glavee-Geo et al., 2017) to 500, although the targeted sample for utilising covariance-based SEM (CB-SEM) was recommended to be any number in excess of 100 (Hair et al., 2015). The responses applied in the final data analysis were 287, after discarding 17 responses, which were disqualified due to incompleteness.

#### **4.3.4 Measurement instrument**

A web-based survey design was used to investigate the relationships between the antecedents and the independent variable. This was an anonymous, structured, and self-administered questionnaire, as illustrated in Annexure B. The survey had three sections of questions covering demographical information, banking patronage habits, and the significance and positive relationship between the antecedents and the user behaviour intentions to use the mobile banking app. The screening questions included in the survey were age and length of time using the mobile banking app.

The last section of the survey was mandatory and was the most critical for testing the hypotheses and answering all the questions. In compiling the questions, Venkatesh's UTAUT scale (Venkatesh et al., 2003) and the personal innovativeness scale (Slade et al., 2015) were modified for this study. The items were measured on a seven-point unlabelled Likert-type scale, ranging from 1 (strongly disagree) to 7 (strongly agree) (Saunders et al., 2009). All constructs were reflective and could be measured on the same scale (Diamantopoulos & Winklhofer, 2001).

#### **4.3.5 Data gathering process**

Consulta Panel consultants gathered the data for this study. As recommended for quantitative studies (Saunders et al., 2009), a pilot survey of no less than 30 respondents was run to test the robustness of the design and content as well as any other anomalies. The pilot started on 2 October and, by 4 October, 72 respondents had answered the survey, which led to the pilot being closed and the data being analysed. Five questionnaires were incomplete, meaning data could only be used from 67 pilot responses. After the pilot phase and all the necessary but minor modifications were done, the final survey was distributed to thousands of Consulta Panel members, which duly completed within five days, well ahead of the expected minimum of two weeks. All respondents could be reached through the Internet, adding to the quality consideration (Creswell & Creswell, 2018). Collecting the data through the Internet was efficient and reliable (Fowler, 2009). A survey was designed to ensure it can produce valid and reliable results and was sized to be completed in 10 minutes, whilst the respondent is still fully engaged (Story & Tait, 2019).

#### **4.3.6 Analysis approach**

A multivariate method of CB-SEM was selected for this research based on Saunders' decision tree (Saunders et al., 2009) to test the causal relationships between the antecedents and dependent variable (Hair et al., 2015). CB-SEM was run in Mplus version 8.4 and incorporated the moderating effect of service innovation, wherein the Hayes PROCESS was run (Hayes, 2012). PROCESS is an add-on to the existing tools, playing an important role of providing an expansion of the number and complexity of models that combine moderation and mediation in a single, easy-to-use interface (Hayes, 2012).

CB-SEM is preferred for analyses of the multi-variate variables. The preference for SEM emanates from the reflective, rather than formative measures, which were used in this study to assess all the constructs (Diamantopoulos & Winklhofer, 2001). The benefits of using this multivariate model include its ability to assess interrelationships between several independent and dependent variables simultaneously and that SEM accounts for measurement error, which is a common concern in survey-based research (Svensson, 2015). The typical CB-SEM steps, such as calculating the construct validity, composite reliability (CR) and model fit matrices, are all covered in full (Jarvis, MacKenzie, & Podsakoff, 2003). A structured approach to testing validity and reliability was followed, and such steps required that the item structure, metric measure, theory testing, replications, validations, outcomes, and reconnections be triangulated to ensure that the results are robust and have empirical or scientific basis (Babin & Svensson, 2012).

Data screening and validation tests are critical in a quantitative study, confirmatory factor analysis (CFA) was considered necessary to test the correlation between the predictor variables, given that they are hypothesised models and assume a multivariate normality of data (Schmitt, 2011). An overarching consideration was that CB-SEM is predominantly used to test rather than develop theory and was therefore supported as a confirmatory approach in this study (Svensson, 2015).

As a final step, the structural model was estimated to test the main effects (the positive and significant relationships) posited in the hypotheses (Creswell & Creswell, 2018). All the antecedents were reflective. Given that data screening and validation tests are critical in quantitative studies, applying CFA was necessary to this research to confirm or reject the correlation between the antecedent and the dependent variables (Svensson, 2015). The purpose of the CFA is to assess the validity of the constructs to analyse the psychometric properties of the items used to measure the constructs, applying three criteria of model fit – namely convergent reliability and validity and discriminant validity. The relevant stages applied in SEM are the definition of individual constructs, the development of the model, and the design of the study, which were undertaken before data analysis are all described in this chapter (Hair, Ringle, & Sarstedt, 2011; Markus, 2012). In Chapter 5, the measurement of the model is estimated and assessed in terms of model fit, thus allowing the structural paths as well as the study's hypotheses to be tested.

#### **4.3.7 Assessment of quality**

Ahead of testing the hypotheses, the quality of the data was analysed and confirmed for fitness, applying the conventional approaches for a quantitative study (Hair et al., 2015). The first step was to discard the incomplete questionnaires or any outliers, given the basic assumption of normality of data in a quantitative study, which led to detailed descriptive statistics that visually indicated any outliers in the data (Saunders et al., 2009).

Data must be assessed for skewness and there are various statistical tools available for this purpose. This study, with a sample of 287 respondents, applied Kolmogorov-Smirnov and Shapiro-Wilk analyses to test skewness (Pallant, 2011).

The reliability and validity of data are necessary to ensure the research can be relied upon and these are tested through a scale reliability measure known as Cronbach's alpha (Saunders et al., 2009). The Cronbach's alpha and CR values were calculated and assessed for whether they were less than the recommended 0.7 (Hair et al., 2010). Furthermore, as CFA is recommended as a key instrument of condensing a large number of variables to few common factors (Hair et al., 2015), factor loadings of each item were observed and a determination was made regarding their appropriateness and if they were within the guided outputs. The outputs from these assessments were the main reason for the removal of four of the 27 items from the questionnaire, leading to an enhancement of the Cronbach's alpha and CR.

Another control feature was model fit statistics, which also benefitted from the removal of the items where factor loadings were disqualified, and the rerun of the model fit statistics was able to support the model fit for testing the hypotheses (Hair et al., 2010; Kachouie, Mavondo, & Sands, 2018; Singh & Matsui, 2017). CB-SEM was considered appropriate for this study and was run on IBM Mplus version 8.4. The measurement model was estimated to assess the psychometric properties of the scales used to measure the stipulated constructs in the study. This is illustrated through the model fit test set out in section 5.6.1. If the model fit test was not acceptable, data required modification and recalibration until the model fit test was acceptable. Furthermore, sections 5.6.2 and 5.6.3 assessed the construct convergent validity and reliability, and discriminant validity respectively. These tests constituted key elements of recommended construct reliability and validity (Bagozzi & Yi, 2012; Hair et al., 2010; Svensson, 2018).

#### **4.4 Limitations of methodology**

This study's methodology had a number of limitations. Therefore, the results must always take full cognisance of the impact of these limitations on the outcomes. The most prominent limitation was that the study was conducted only in English in South Africa, where multiple languages are spoken and there could be limited comprehension by non-English-speaking respondents. The mitigating factor was that most people who met the criteria would most probably be able to communicate fully in English.

The second limitation was that the survey was self-administered, leaving the respondents to use their own interpretations. Consequently, the questionnaire adopted a scale previously used in similar studies proved for robustness and efficacy to ensure that most respondents understood and could answer all the questions. As an additional risk mitigation, the survey contained only 27 items and could be completed in 10 minutes.

The third limitation was that the questionnaire was self-administered and accessible via email. This implies that customers who did not have an email address or were unable to access one were precluded from participating in the study. The target population in this study was people who had registered for a mobile banking app for at least six months, which assumes that they already had access to Internet as the app is a web-based platform.

Several frameworks could have been applied in this study, noting that the study of behaviour intentions fits into psychological, sociological, and marketing sciences. If a framework or model other than the UTAUT had been applied in this study, the outcomes would have been different from the current outcomes.

Moreover, the survey had no open-ended questions, meaning the research was only based on a set of hypotheses that will either be supported or not supported. There was no avenue to explore what the respondents' wishes or feedback was as this avenue was not applicable to this study (Creswell & Creswell, 2018).

#### **4.5 Ethical considerations**

All ethical considerations were considered in the determination of the research methodology. The assessment of ethical approach was approved ahead of the



commencement of the research and, at the conclusion of the study, there were no known ethical constraints that could have impacted the research.

#### **4.6 Conclusion**

Chapter 4 covered the research methodology steps as advanced by various academic studies (Hair et al., 2015; Saunders et al., 2009). This chapter provided the step-by-step guidance of the chosen methodology and its relevance, as well as motivations for the choices in the research approach. The proposed research methodology and design, conclusions, and limitations applicable for the chosen methodology were discussed.

## **CHAPTER 5: EMPIRICAL RESULTS**

### **5.1 Introduction**

The objective of this chapter is to provide the research results from the data collected from the self-administered questionnaires, which were analysed and tested in accordance with the research methodology covered in Chapter 4. Chapter 5 takes a comprehensive approach to data analysis, starting with the examination of the sample profile, banking patronage habits, and assessment of the normality of distribution (sections 5.2 and 5.3). The descriptive statistics pertaining to the study's constructs are presented in section 5.4, whilst section 5.5 addresses the normality of distribution. Thereafter, CB-SEM is applied to estimate the study's conceptual model using Mplus version 8.4. After assessing the measurement model for construct validity and reliability, the structural model is estimated to assess the main effects. The structural model includes covariate constructs to control the effects of gender and age. The study provides statistical outcomes of whether this research's replications and hypotheses are supported or not, illustrated in Table 14, and the moderating effects are further analysed in Figures 2–5. Finally, Hayes' PROCESS macro for SPSS is used to determine whether services innovation acts as a moderator in the study, as presented in Table 15.

### **5.2 Demographic profile of the sample in the study**

The demographics cover six aspects relevant to this study – namely gender, age, marital status, home language, employment status, and level of education. Table 1 summarises the demographics of the respondents.

**Table 1: Demographic profile of the respondents**

Demographic information		Frequency	Percentage (%)	Valid percentage (%)
Gender	Male	181	63.1	63.1
	Female	103	35.9	35.9
	Prefer not to say	3	1.0	1.0
	<b>Total</b>	<b>287</b>	<b>100.0</b>	<b>100.0</b>
Age	AGE1: 18–47	93	32.4	33.0
	AGE2: 48–61	96	33.5	34.0
	AGE3: 62 or older	93	32.4	33.0
	Not provided	5	1.7	
	<b>Total</b>	<b>287</b>	<b>100.0</b>	<b>100.0</b>
Marital status	Single	45	15.7	15.7
	Married or living with a partner	211	73.5	73.5
	Living with parents	6	2.1	2.1
	Divorced or separated	25	8.7	8.7
	<b>Total</b>	<b>287</b>	<b>100.0</b>	<b>100.0</b>
Home language	Afrikaans	82	28.6	28.6
	English	142	49.5	49.5
	Sepedi	9	3.1	3.1
	Sesotho	8	2.8	2.8
	Setswana	12	4.2	4.2
	Tshivenda	2	0.7	0.7
	isiNdebele	1	0.3	0.3
	isiXhosa	14	4.9	4.9
	isiZulu	13	4.5	4.5
	isiTsonga	3	1.0	1.0
	Other	1	0.3	0.3
<b>Total</b>	<b>287</b>	<b>100.0</b>	<b>100.0</b>	
Employment status	Self-employed	55	19.2	19.2
	Full-time employed	147	51.2	51.2
	Part-time employed	9	3.1	3.1
	Full-time student	2	0.7	0.7
	Housewife or house husband	4	1.4	1.4
	Retired	58	20.2	20.2
	Unemployed	11	3.8	3.8
	Other	1	0.3	0.3
	<b>Total</b>	<b>287</b>	<b>100.0</b>	<b>100.0</b>
Level of education	Some primary school	2	0.7	0.7
	Primary school completed	2	0.7	0.7
	Some high school	4	1.4	1.4
	Matric/Grade 12 completed	44	15.3	15.3
	Post-matric diploma/certificate	97	33.8	33.8
	Bachelor's degree	57	19.9	19.9
	Postgraduate qualification	81	28.2	28.2
	<b>Total</b>	<b>287</b>	<b>100.0</b>	<b>100.0</b>

Source: Researcher's own collated data

Based on the information in Table 1, 63.1% of the study’s respondents are male and 35.9% are female. From the respondents who were willing to disclose their age, the age analysis was stratified into three groups: AGE1 is 18–47 years old and constitutes 32.4% of the respondents; AGE2 is 48–61 years old and contains 33.4% of the participants; and AGE3 is 62 years and older and comprises 32.4% of the respondents. The youngest respondent is 23 years old and the oldest is 84 years old, in line with the quota set for the study, as stated in section 4.3.1. Concerning respondents’ marital status, 73.5% are married or living with a partner. The most common home language is English (49.5%), followed by Afrikaans (28.6%), with the balance of the nine South African home languages making up a total of 21.6%, and only 0.3% having a non-specified home language. Of the respondents, 51.2% have full-time employment with an organisation, 20.2% are retired, and 19.2% are self-employed. The respondents’ levels of education are dominated by those with a bachelor’s degree or postgraduate qualification, comprising a combined 48.1%, with a further 33.8% of the respondents having a post-matric diploma or certificate. Consequently, it is noted that most respondents have a high literacy level.

### 5.3 Banking patronage habits

The banking patronage habits section of the questionnaire asked respondents to indicate the time period during which they have been customers of a bank. The respondents could only answer the questionnaire if they had a registered mobile banking app and had been using it for more than six months. Where these criteria were not satisfied, the participants were disallowed from continuing with the questionnaire. Lastly, the respondents were asked to answer “yes” or “no” to the additional or alternative methods they used for their banking needs. Table 2 provides a summary of these patronage habits collated.

**Table 2: Length of time with the banking institution**

Length of time with the banking institution	Frequency	Percentage (%)	Valid percentage (%)
0–10 years	67	23.3	23.3
11–20 years	80	27.9	27.9
21–30 years	48	16.7	16.7
31–40 years	49	17.1	17.1
41 or more years	43	15.0	15.0
<b>Total</b>	<b>287</b>	<b>100.0</b>	<b>100.0</b>

Source: Researcher’s own collated data

Table 2 illustrates that most of the respondents have longevity with the bank whose mobile banking app they are using. Fifteen per cent of respondents have been customers of their respective banks for 41 or more years, 17.1% for 31–40 years, 16.7% for 21–30 years, and 27.9% for 11–20 years. Table 3 captures the responses regarding consumers' regular use of banking facilities for their banking needs, including ATMs, EFTs, credit cards, money transfers, or mobile banking apps.

**Table 3: Method of meeting banking needs**

Method	“Yes” to use	“No” to use	Total	Percentage (%) of frequent users	Percentage (%) of non-frequent users
ATM	184	103	287	64.1	35.9
EFT	260	27	287	90.6	9.4
Credit card payments	190	97	287	66.2	33.8
Money transfer	136	151	287	47.4	52.6
Mobile banking app	269	18	287	93.7	6.3
Other	10	277	287	3.5	96.5

*Source:* Researcher's own collated data

Table 3 tabulates the results of the question where respondents were requested to indicate “yes” or “no” to the method of banking they often utilise. Respondents could answer “yes” to as many of the methods as they considered to be applicable to them. The results show that a large number of respondents specified various channels for their banking needs – 64.1% use ATMs, 90.6% use EFTs, 66.2% utilise credit cards for payments, and 93.5% use mobile banking apps. At 47.4%, money transfers have a comparatively lower frequency of use. In addition, 3.5% of the respondents stated that they often use banking channels that were not specified.

#### **5.4 Descriptive statistics for the study's constructs**

Descriptive statistics provide guidance for the critical features of the data in the study (Creswell & Creswell, 2018; Trochim, Donnelly, & Arora, 2016). In this study, the descriptive statistics for each construct and its related items were calculated and the results are included in this section and presented in Table 4, on the basis of lowest and highest mean in each category. A detailed table is included in Annexure E.

**Table 4: Descriptive statistics for individual items**

Item	Variable	N	Mean	Standard deviation	Variance
<b>Performance expectancy</b>					
PE1	I find my mobile banking app useful in my daily life.	287	6.23	1.242	1.543
PE2	Using the mobile banking app increases my chances of achieving things that are important to me.	287	5.62	1.577	2.488
<b>Effort expectancy</b>					
EE2	My interaction with the mobile banking app is clear and understandable.	287	6.14	1.248	1.556
EE3	I find the mobile banking app easy to use.	287	6.17	1.250	1.562
<b>Social influence</b>					
Scl1	People who are important to me think that I should use the mobile banking app.	287	4.75	1.961	3.844
Scl2	People who influence my behaviour think that I should use the mobile banking app.	287	4.57	2.018	4.071
<b>Facilitating conditions</b>					
F11	I have the resources necessary to use the mobile banking app.	287	6.61	0.954	0.910
F15	I can get help from others when I have difficulties using the mobile banking app.	287	5.04	1.947	3.792
<b>Personal innovativeness</b>					
PI2	Among my peers, I am usually the first to explore new apps.	287	4.61	1.842	3.393
PI4	My bank's mobile banking app is consistent with the latest technological innovations in banking services.	287	5.93	1.273	1.621
<b>Service innovation</b>					
Svl2	My bank has significantly improved its mobile banking app.	287	5.97	1.414	1.999
Svl4	The time my bank takes to serve me has reduced drastically due to my use of the mobile banking app.	287	5.76	1.533	2.351
<b>Behaviour intentions</b>					
B11	I intend to continue using the mobile banking app.	287	6.48	1.112	1.237
B12	I will always try to use the mobile banking app in my daily life.	287	6.02	1.514	2.293

Source: Researcher's own findings summarised

Table 4 summarises the comprehensive descriptive statistics of each construct and the attributable items, with a focus on measuring the central tendency to analyse the distribution of the data relative to the centre (Trochim et al., 2016). A detailed set of data is included in Annexure E. Data distribution is critical in quantitative studies to ensure each scale reveals a normal distribution with a base assumption to apply parametric statistical techniques (Pallant, 2011). Only the lowest and the highest mean are included, indicating that the responses had a positive skew, being at the top end of the seven-point

Likert-type scale. In aggregate, the data displayed in Table 4 does not indicate a high probability of outliers and it represents individual items' mean scores ranging from 4.61 to 6.61 extracted from a seven-point Likert-type scale, with one representing "strongly disagree" and 7 "strongly agree". Table 5 displays the descriptive statistics for each construct as well as the composite mean scores and standard deviations.

**Table 5: Descriptive statistics for constructs**

Construct	N	Mean	Standard deviation
Performance expectancy	287	5.928	1.326
Effort expectancy	287	6.153	1.193
Social influence	287	4.654	1.959
Facilitating conditions	287	6.060	1.002
Personal innovativeness	287	5.087	1.461
Service innovation	287	5.853	1.327
Behaviour intentions	287	6.237	1.263

*Source:* Researcher's own collated data

A standard deviation was calculated in Tables 4 and 5 as a measure of dispersion. A standard deviation is a more reliable and accurate estimate of dispersion, because an outlier can exaggerate the range. In this study, it was concluded that approximately 92.6% of the individual item scores fall within 2 standard deviations of the mean. Similarly, the standard deviation in the constructs estimates that their scores are all within 2 standard deviations of the mean. A standard deviation of more than 3 is considered a strong indicator of outliers in the data (Markus, 2012).

## 5.5 Normality of distribution

As a criteria for conducting SEM, the primary assumptions, adequacy of the sample size, and normal data distribution need to be tested (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). Normality tests are then used to determine if the data has a normal or bell curve distribution, given the underlying assumption of data normality (Yap & Sim, 2011). The most common estimation test is to apply the maximum likelihood estimate (MLE) to reflect the conventional standard errors (Hair et al., 2015). As per Tables 4 and 5, the study has non-parametric data, thus it was logical to run tests to assess skewness or proportions of normality. The appropriateness of the type of skewness test is determined by the sample size.

Table 6 displays the results of the statistical testing of the skewness through normality testing. Since the sample size was greater than 50 but smaller than 300, Kolmogorov-

Smirnov and Shapiro-Wilk tests were considered appropriate for this study (Hair et al., 2010).

**Table 6: Normality of distribution on individual items**

Item	Variable	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
<b>Performance Expectancy</b>							
PE1	I find my mobile banking app useful in my daily life.	0.324	287	0.000	0.662	287	0.000
PE2	Using the mobile banking app increases my chances of achieving things that are important to me.	0.236	287	0.000	0.813	287	0.000
PE3	Using the mobile banking app helps me accomplish things more quickly.	0.281	287	0.000	0.697	287	0.000
PE4	Using the mobile banking app increases my productivity.	0.253	287	0.000	0.774	287	0.000
<b>Effort Expectancy</b>							
EE1	Learning how to use the mobile banking app is easy for me.	0.273	287	0.000	0.676	287	0.000
EE2	My interaction with the mobile banking app is clear and understandable.	0.273	287	0.000	0.697	287	0.000
EE3	I find the mobile banking app easy to use.	0.283	287	0.000	0.679	287	0.000
EE4	It is easy for me to become skilful at using the mobile banking app.	0.267	287	0.000	0.696	287	0.000
<b>Social Influence</b>							
Sc1	People who are important to me think that I should use the mobile banking app.	0.163	287	0.000	0.885	287	0.000
Sc2	People who influence my behaviour think that I should use the mobile banking app.	0.158	287	0.000	0.891	287	0.000
Sc3	People whose opinions I value prefer that I use the mobile banking app.	0.167	287	0.000	0.881	287	0.000
<b>Facilitating Conditions</b>							
FC1	I have the resources necessary to use the mobile banking app.	0.418	287	0.000	0.453	287	0.000
FC2	I have the knowledge necessary to use the mobile banking app.	0.371	287	0.000	0.567	287	0.000
FC3	Using the mobile banking app helps me accomplish things more quickly.	0.315	287	0.000	0.687	287	0.000
FC4	The mobile banking app is compatible with other technologies I use.	0.293	287	0.000	0.730	287	0.000



FC5	I can get help from others when I have difficulties using the mobile banking app.	0.198	287	0.000	0.858	287	0.000
<b>Personal Innovativeness</b>							
PI1	When I heard about the mobile banking app, I looked for ways to experiment with it.	0.155	287	0.000	0.876	287	0.000
PI2	Among my peers, I am usually the first to explore new apps.	0.131	287	0.000	0.915	287	0.000
PI3	I like to experiment with the mobile banking app.	0.179	287	0.000	0.892	287	0.000
PI4	My bank's mobile banking app is consistent with the latest technological innovations in banking services.	0.234	287	0.000	0.792	287	0.000
<b>Service Innovation</b>							
Sv11	My bank has significantly improved the functionalities of its mobile banking app.	0.262	287	0.000	0.752	287	0.000
Sv12	My bank has significantly improved its mobile banking app.	0.264	287	0.000	0.726	287	0.000
Sv3	My bank provides services quicker than before as a result of the innovative mobile banking app.	0.248	287	0.000	0.775	287	0.000
Sv4	The time my bank takes to serve me has reduced drastically due to my use of the mobile banking app.	0.242	287	0.000	0.788	287	0.000
<b>Behaviour Intentions</b>							
BI1	I intend to continue using the mobile banking app.	0.407	287	0.000	0.527	287	0.000
BI2	I will always try to use the mobile banking app in my daily life.	0.305	287	0.000	0.688	287	0.000
BI3	I plan to continue using the mobile banking app frequently.	0.351	287	0.000	0.631	287	0.000

Source: Researcher's own results. Notes: <sup>a</sup>Lilliefors Significance Correction; df = degrees of freedom; sig. = significance.

A Kolmogorov-Smirnov test is a non-parametric test in which a  $p$ -value is computed from a maximum difference of the cumulative distributions of two data tests. Shapiro-Wilk test for normality is applied when a continuous variable is being examined (Yap & Sim, 2011). Normal distributions are an underlying assumption of many statistical procedures, hence the null hypothesis of normality is tested (Yap & Sim, 2011). In this study, normality of distribution on individual items and the original constructs were tested and both illustrated a  $p$ -value of 0.000, which indicates that the data does not exhibit univariate normality. Subsequently, the study's measurement and structural models cannot be estimated using MLE. Instead, the maximum likelihood method (MLM) estimator was applied, as it

produces parameter estimates with standard errors and a mean-adjusted chi-square test statistic, which are robust to non-normality testing (Muthén & Muthén, 1998–2017).

## 5.6 Structural equation modelling

CB-SEM was used to test the hypotheses, as explained in section 4.3.6. The processes and outcomes of the tests are detailed below.

### 5.6.1 Assessment of the original model for model fit

The model fit assessment is aimed at assessing the psychometric properties of the scales used and these are measured against the recommended cut-off values (Hair et al., 2015; Svensson, 2015).

**Table 7: Model fit statistics**

	Fit indices (original measurement model)	Fit indices (adjusted measurement model)	Recommended cut-off value
Satorra-Bentler $\chi^2/df$ ratio	3.41	2.36	< 3
Chi-square value ( $\chi^2$ )	1034.424	493.333	NA
Degrees of freedom (df)	303	209	NA
Scaling correction factor for MLM	1.4952	1.5395	NA
Root mean square error of approximation (RMSEA)	0.093	0.069	< 0.08
Comparative fit indices (CFI)	0.872	0.942	> 0.9
Tucker-Lewis index (TLI)	0.851	0.929	> 0.9
Standardised root mean square residual (SRMR)	0.104	0.051	< 0.08

*Source:* Researcher's own collated data

From Table 7, it can be deduced that the original measurement model does not display acceptable model fit. The original fit index for Satorra-Bentley is above 3, whereas the cut-off is less than 3. In addition, the original fit indices for RMSEA and SRMR are both in excess of 0.08, while the CFI and TLI are less than 0.9 (Hair et al., 2014; Hox & Bechger, 1998). These measures are considered best practice as they are applied widely and RMSEA is described in literature as an absolute fit index, whereas CFI and TLI are incremental fit indices (Xia & Yang, 2019). If the fit indices fail, an acceptable mitigation is an adjustment of the data as deemed appropriate (Xia, Yung, & Zhang, 2016). However, the construct validity and reliability were tested for all the original items included in the study, and the results are presented in Table 8 below.

Table 8: Construct validity and reliability for original measurement model

Constructs	Factor loading estimate	S.E. Est.	t-value	p-value	AVE	Cronbach's alpha	CR
<b>Performance expectancy</b>					<b>0.803</b>	<b>0.936</b>	<b>0.942</b>
PE1	0.905	0.014	65.429	0.0001			
PE2	0.852	0.026	33.097	0.0001			
PE3	0.93	0.011	85.06	0.0001			
PE4	0.896	0.014	62.136	0.0001			
<b>Effort expectancy</b>					<b>0.844</b>	<b>0.966</b>	<b>0.956</b>
EE1	0.883	0.022	39.549	0.0001			
EE2	0.933	0.012	76.686	0.0001			
EE3	0.928	0.013	73.975	0.0001			
EE4	0.93	0.012	79.667	0.0001			
<b>Social influence</b>					<b>0.910</b>	<b>0.973</b>	<b>0.968</b>
Sc1	0.913	0.013	69.142	0.0001			
Sc2	0.976	0.007	142.555	0.0001			
Sc3	0.971	0.008	124.223	0.0001			
<b>Facilitating conditions</b>					<b>0.501</b>	<b>0.782</b>	<b>0.827</b>
FC1	0.613	0.058	10.627	0.0001			
FC2	0.745	0.038	19.85	0.0001			
FC3	0.847	0.02	43.243	0.0001			
FC4	0.817	0.027	30.219	0.0001			
FC5	0.433	0.041	10.684	0.0001			
<b>Personal innovativeness</b>					<b>0.641</b>	<b>0.865</b>	<b>0.874</b>
PI1	0.877	0.022	40.302	0.0001			
PI2	0.805	0.023	34.442	0.0001			
PI3	0.9	0.016	56.51	0.0001			
PI4	0.579	0.049	11.785	0.0001			
<b>Service innovation</b>					<b>0.752</b>	<b>0.922</b>	<b>0.922</b>
Sv1	0.98	0.007	145.434	0.0001			
Sv2	0.973	0.007	140.989	0.0001			
Sv3	0.814	0.026	31.111	0.0001			
Sv4	0.661	0.035	18.807	0.0001			
<b>Behaviour intentions</b>					<b>0.841</b>	<b>0.930</b>	<b>0.941</b>
BI1	0.876	0.018	48.948	0.0001			
BI2	0.913	0.012	76.298	0.0001			
BI3	0.961	0.009	111.656	0.0001			

Source: Researcher's own collated data. Notes: \*statistically significant at  $p < 0.05$ , two-tailed; S.E. Est. = standard error of the estimate; AVE = average variance extracted; CR = composite reliability.

When assessing construct validity, CFA is considered an appropriate tool for convergent and discriminant validity. CFA uses factor loading estimates greater than 0.7, Cronbach's alpha, measuring level of consistency, and CR, which are all required to have values greater than 0.7 (Hair et al., 2010; Said, Badru, & Shahid, 2011). Table 8 illustrates that Cronbach's alpha and CR are greater than 0.7 in all constructs, indicating validity and reliability respectively. However, the factor loadings highlighted in items FC1, FC5, PI4, and Svl4 are lower than 0.7 and have to be removed (Hair et al., 2010; Xia & Yang, 2019). Appropriate outcomes from the actions required for the items with lower factor loading estimates are addressed in Tables 9 and 10.

### 5.6.2 Convergent validity and reliability

Following the removal of items FC1, FC5, PI4, and Svl4, the measurement model was re-estimated. Table 9 displays the resultant validity and reliability re-estimates.

**Table 9: Construct validity and reliability for re-estimated measurement model**

Constructs	$\beta$	S.E. Est.	t-value	p-value	AVE	Cronbach's alpha	CR
<b>Performance expectancy</b>					<b>0.804</b>	<b>0.936</b>	<b>0.943</b>
PE1	0.903	0.017	52.953	0.0001			
PE2	0.853	0.026	33.174	0.0001			
PE3	0.931	0.013	73.486	0.0001			
PE4	0.898	0.018	48.611	0.0001			
<b>Effort expectancy</b>					<b>0.844</b>	<b>0.966</b>	<b>0.956</b>
EE1	0.882	0.025	35.019	0.0001			
EE2	0.932	0.014	66.214	0.0001			
EE3	0.929	0.014	65.580	0.0001			
EE4	0.930	0.013	70.146	0.0001			
<b>Social influence</b>					<b>0.910</b>	<b>0.973</b>	<b>0.968</b>
Scl1	0.913	0.014	67.378	0.0001			
Scl2	0.976	0.007	135.813	0.0001			
Scl3	0.971	0.009	110.444	0.0001			
<b>Facilitating conditions</b>					<b>0.637</b>	<b>0.849</b>	<b>0.840</b>
FC2	0.728	0.053	13.745	0.0001			
FC3	0.853	0.022	39.406	0.0001			
FC4	0.809	0.032	25.453	0.0001			
<b>Personal innovativeness</b>					<b>0.753</b>	<b>0.901</b>	<b>0.901</b>
PI1	0.871	0.023	38.325	0.0001			
PI2	0.813	0.027	30.454	0.0001			

PI3	0.916	0.016	57.743	0.0001			
<b>Service innovation</b>					<b>0.855</b>	<b>0.940</b>	<b>0.946</b>
Svl1	0.980	0.007	135.321	0.0001			
Svl2	0.976	0.007	135.678	0.0001			
Svl3	0.807	0.03	27.031	0.0001			
<b>Behaviour intentions</b>					<b>0.841</b>	<b>0.930</b>	<b>0.941</b>
BI1	0.874	0.025	35.577	0.0001			
BI2	0.913	0.015	62.708	0.0001			
BI3	0.962	0.009	108.399	0.0001			

Source: Researcher's own results. Notes: \*statistically significant at  $p < 0.05$ , two-tailed;  $\beta$  = standardised estimate; S.E. Est. = standard error of the estimate; AVE = average variance extracted; CR = composite reliability.

The overall results in Table 9 indicate good reliability of all the items, as both the Cronbach's alpha and CR coefficients are greater than 0.7 (Hox & Bechger, 1998). Furthermore, the AVEs of all the constructs are greater than the cut-off of 0.5 (Hair et al., 2014).

Consequent to the recalculated data after the removal of items FC1, FC5, PI4 and Svl4, it was necessary to recalculate the composite mean scores and standard deviations for the implicated constructs. These results are shown in Table 10.

**Table 10: Descriptive statistics for redefined constructs**

Construct	N	Mean	Standard deviation
Facilitating conditions	287	6.217	1.09480
Personal innovativeness	287	4.805	1.70009
Service innovation	287	5.884	1.37312

Source: Researcher's own collated data

Similar to Table 5, the adjusted descriptive statistics in Table 10 display acceptable standard deviations that are within 2 measures of the mean. The mean indicates a positive skew, given that a seven-point Likert-type scale was applied. The responses contain an acquiescence bias, which is a response rate that is an agreement bias to a statement in the questionnaire (Kuru & Pasek, 2016). Given that an acquiescence bias is likely impacting factor loadings and inflating reliability of the items being tested, the factor analysis conducted in this study is acceptable as a mitigating factor (Baron-Epel, Kaplan, Weinstein, & Green, 2010; Kuru & Pasek, 2016).

### 5.6.3 Discriminant validity

The purpose of discriminant validity is to determine whether the constructs in the model are truly distinct from one another (Creswell & Creswell, 2018). There is evidence of discriminant validity when the square root of the AVE exceeds the correlations between each pair of constructs (Fornell & Larcker, 1981; Nel & Boshoff, 2017). Table 11 shows the square root of the AVE (bold and diagonal) compared to the correlations with each pair of constructs below the diagonal.

**Table 11H: Discriminant validity for re-estimated measurement model**

<b>Constructs</b>	<b>Performance expectancy</b>	<b>Effort expectancy</b>	<b>Social influence</b>	<b>Facilitating conditions</b>	<b>Personal innovativeness</b>	<b>Service innovation</b>	<b>Behaviour intentions</b>
Performance expectancy	<b>0.897</b>						
Effort expectancy	0.783	<b>0.918</b>					
Social influence	0.373	0.218	<b>0.954</b>				
Facilitating conditions	0.880	0.823	0.369	<b>0.798</b>			
Personal innovativeness	0.513	0.489	0.506	0.548	<b>0.868</b>		
Service innovation	0.673	0.621	0.392	0.727	0.569	<b>0.925</b>	
Behaviour intentions	0.815	0.692	0.381	0.899	0.577	0.667	<b>0.917</b>

Source: Researcher's own collated data

As per Table 11, it can be determined that some evidence of discriminant validity exists, since most constructs' square root of the AVE exceed the correlation with other constructs (Fornell & Larcker, 1981). Nevertheless, as highlighted in Table 11, there are some exceptions involving the relationships between facilitating conditions and performance expectancy, facilitating conditions and effort expectancy, and facilitating conditions and behaviour intentions.

The discriminant validity can be assessed through various approaches, such as examining the difference in chi-square value between the nested and unconstrained CFA models where the correlation between the two constructs is constrained to unity (Shiu, Pervan, Bove, & Beatty, 2011). This study conducted bootstrapping to reassess the chi-square difference test (Van der Westhuizen, 2018). The chi-square difference test compares the size of the discrepancies between the expected and the actual results based on the number of variables. Table 12 provides the results of the bootstrapping from the discriminant validity re-estimates.

**Table 12: Assessing discriminant validity for re-estimated model using the Satorra-Bentler chi-square difference test**

Construct pairs	Scaling factor freely estimated model	Scaling factor fixed model	df free	df fixed	$\chi^2$ free	$\chi^2$ fixed	Satorra-Bentler scaled chi-square	df	p-value *
Facilitating conditions and performance expectancy	1.608	1.825	13	14	31.095	60.575	13.03135609	1	0.000
Facilitating conditions and effort expectancy	2.984	3.183	8	9	48.626	64.442	12.57130744	1	0.000
Facilitating conditions and behaviour intentions	2.458	2.352	8	9	35.423	55.808	29.27401006	1	0.000

Source: Researcher's own collated data. Notes: df = degree of freedom;  $\chi^2$  = chi-square statistic; \*p = 0.01.

From the results illustrated in Table 12, it can be seen that the difference in chi-square value exceeds 3.84 in all instances (Shiu et al., 2011). Therefore, there is sufficient evidence for discriminant validity, which was necessary before continuing with the



estimation of the structural model. Moreover, a  $p$ -value of 0.000 indicates that discriminant validity is present between the constructs concerned.

### 5.7 Structural model estimation for hypotheses testing

The structural model was estimated and assessed based on the conceptual model determined in Chapter 2. The purpose of this section is to determine, statistically, whether the proposed structural model fits the data collected from the survey (Kühn & Bothma, 2018). Given this context, the goodness of fit should be assessed according to the conceptual model developed for the study. Table 13 presents the findings from this assessment.

**Table 13: Model fit statistics for the structural model**

Fit indices	Value	Recommended cut-off value
Satorra-Bentler $\chi^2/df$ ratio	2.63	< 3
Chi-square value	406.980	NA
Degrees of freedom	155	NA
Scaling correction factor for MLM	1.5536	NA
RMSEA	0.076	< 0.08
CFI	0.938	> 0.9
TLI	0.924	> 0.9
SRMR	0.048	< 0.08

*Source:* Researcher's own collated data. *Notes:* df = degree of freedom;  $\chi^2$  = chi-square statistic.

The results in Table 13 show that the measurement model fits the data adequately, with all the values being within the recommended cut-off values. The measures for the constructs are attitudes and personality traits that elicit behaviours, and were identified as reflective (Diamantopoulos & Winklhofer, 2001). The constructs fit the structural model and specified structural paths, as illustrated in Table 12 (Hair et al., 2015). Given that the structural model fits well, the structural path could then be tested, as presented in Table 14.

**Table 14: Standardised estimates in the structural model**

Structural path		$\beta$	S.E. Est.	$p$ -value*	$t$ -value	Result
Performance expectancy	→ Behaviour intentions	0.066	0.094	0.480	0.706	Not significant
Effort expectancy	→ Behaviour intentions	-0.178	0.069	0.010	-2.589	Significant
Social influence	→ Behaviour intentions	-0.017	0.040	0.669	-0.428	Not significant
Facilitating conditions	→ Behaviour intentions	0.926	0.112	0.000	8.243	Significant
Personal innovativeness	→ Behaviour intentions	0.136	0.046	0.003	2.973	Significant
<b>Covariate effects</b>						
GENDER	→ Behaviour intentions	0.034	0.054	0.531	0.626	Not significant
AGE1	→ Behaviour intentions	-0.109	0.083	0.193	-1.302	Not significant
AGE2	→ Behaviour intentions	0.093	0.046	0.041	2.045	Significant
AGE3	→ Behaviour intentions	0.052	0.086	0.546	0.604	Not significant

Source: Researcher's own collated data. Notes: \*statistically significant at  $p < 0.01$ , one-tailed;  $\beta$  = standardised estimate; S.E. Est. = Standard error of the estimate; AGE1 = 18–47 years old; AGE2 = 48–61 years old; AGE3 = 62 years old and above.

As illustrated in Table 14, the structural paths represent the hypotheses that were tested and the outcome of the testing. The most positive and most significant relationship is between facilitating conditions and behaviour intentions ( $\beta = 0.926$ ;  $p < 0.0005$ ). Personal innovativeness also indicates a positive and significant relationship with behaviour intentions ( $\beta = 0.134$ ;  $p = 0.003$ ), whereas effort expectancy has a significant but negative relationship with behaviour intentions ( $\beta = -0.178$ ;  $p = 0.010$ ). Two of the antecedents with higher  $p$ -values do not have a significant relationship with behaviour intentions, namely performance expectancy ( $\beta = 0.066$ ;  $p = 0.480$ ) and social influence ( $\beta = -0.017$ ;  $p = 0.669$ ). A  $p$ -value that indicates a significant relationship must be less than 0.01 (Hair et al., 2010). The results are as follows:

- H<sub>1</sub>: Performance expectancy has a positive and statistically non-significant relationship with behaviour intentions to use the mobile banking app. H<sub>1</sub> is not supported.
- H<sub>2</sub>: Effort expectancy has a negative and statistically significant relationship with behaviour intentions to use the mobile banking app. H<sub>2</sub> is supported.
- H<sub>3</sub>: Social influence has a negative and statistically non-significant relationship with behaviour intentions to use the mobile banking app. H<sub>3</sub> is not supported.

- H<sub>4</sub>: Facilitating conditions have a positive and statistically significant relationship with behaviour intentions to use the mobile banking app. H<sub>4</sub> is supported.
- H<sub>5</sub>: Personal innovativeness has a positive and statistically non-significant relationship with behaviour intentions to use the mobile banking app. H<sub>5</sub> is supported.

The covariates were also tested for their impact on behaviour intentions and only the AGE2 category has an effect on behaviour intentions ( $\beta = 0.093$ ;  $p = 0.041$ ). A  $p$ -value lower than 0.05 indicates strong evidence against the null hypothesis, implying that there is a significant relationship between the antecedent and the dependent variable (McLeod, 2019). The above-mentioned results cover the relationships in the structural model. The moderating effects are explained in the section that follows.

### 5.8 Moderation analyses for hypotheses testing

Table 15 contains the results of the moderation test conducted using Hayes' PROCESS macro version 3.5, as specified in the conceptual model (Hayes, 2012).

**Table 15: Testing for moderating effects**

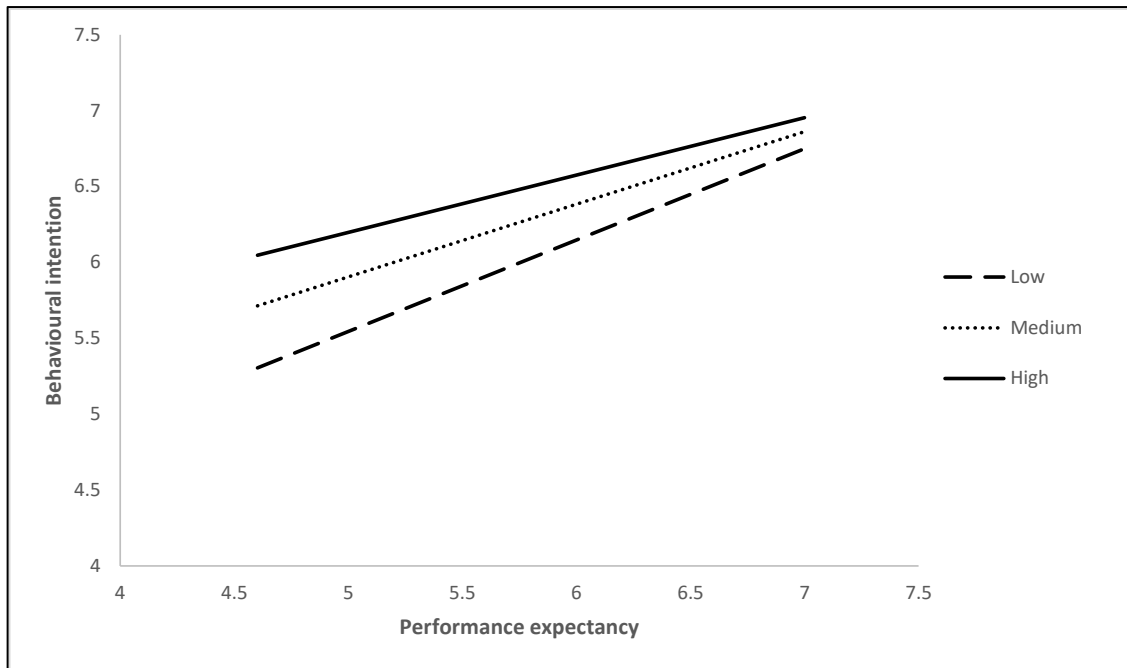
Variables			Interaction effect [LLCI; ULCI]	$p$ -value	$t$ -value	Result
X	M	Y				
Performance expectancy	Service innovation	Behaviour intentions	-0.0903 [-0.1244; -0.0562]	0.0001*	-5.2104	Moderation
Effort expectancy	Service innovation	Behaviour intentions	-0.1000 [-0.1384; -0.0617]	0.0001*	-5.1346	Moderation
Social influence	Service innovation	Behaviour intentions	-0.0216 [-0.0615; 0.0182]	0.2865	-1.0679	No moderation
Facilitating conditions	Service innovation	Behaviour intentions	-0.0767 [-0.1153; -0.0381]	0.0001*	-3.9078	Moderation
Personal innovativeness	Service innovation	Behaviour intentions	-0.1236 [-0.1639; -0.0833]	0.0001*	-6.0349	Moderation

*Source:* Researcher's own collated data. *Notes:* \*statistically significant at  $p < 0.01$ , two-tailed; X = exogenous variable; M = moderating variable; Y = endogenous variable; LLCI = lower level confidence interval; ULCI = upper level confidence interval.

Moderation is evident when the interaction effect ( $X*M$ ) is statistically significant, the bias-corrected confidence intervals do not contain zero, and the  $p$ -value is less than 0.01. The main results of the moderation test are as follows:

- $H_{6a}$ : Service innovation has a moderating effect on the relationship between performance expectancy and behaviour intentions towards the use of a mobile banking app.  $H_{6a}$  is supported.
- $H_{6b}$ : Service innovation has a moderating effect on the relationship between effort expectancy and behaviour intentions towards the use of a mobile banking app.  $H_{6b}$  is supported.
- $H_{6c}$ : Service innovation does not have a moderating effect on the relationship between social influence and behaviour intentions towards the use of a mobile banking app.  $H_{6c}$  is not supported.
- $H_{6d}$ : Service innovation has a moderating effect on the relationship between facilitating conditions and behaviour intentions towards the use of a mobile banking app.  $H_{6d}$  is supported.
- $H_{6e}$ : Service innovation has a moderating effect on the relationship between personal innovativeness and behaviour intentions towards the use of a mobile banking app.  $H_{6e}$  is supported.

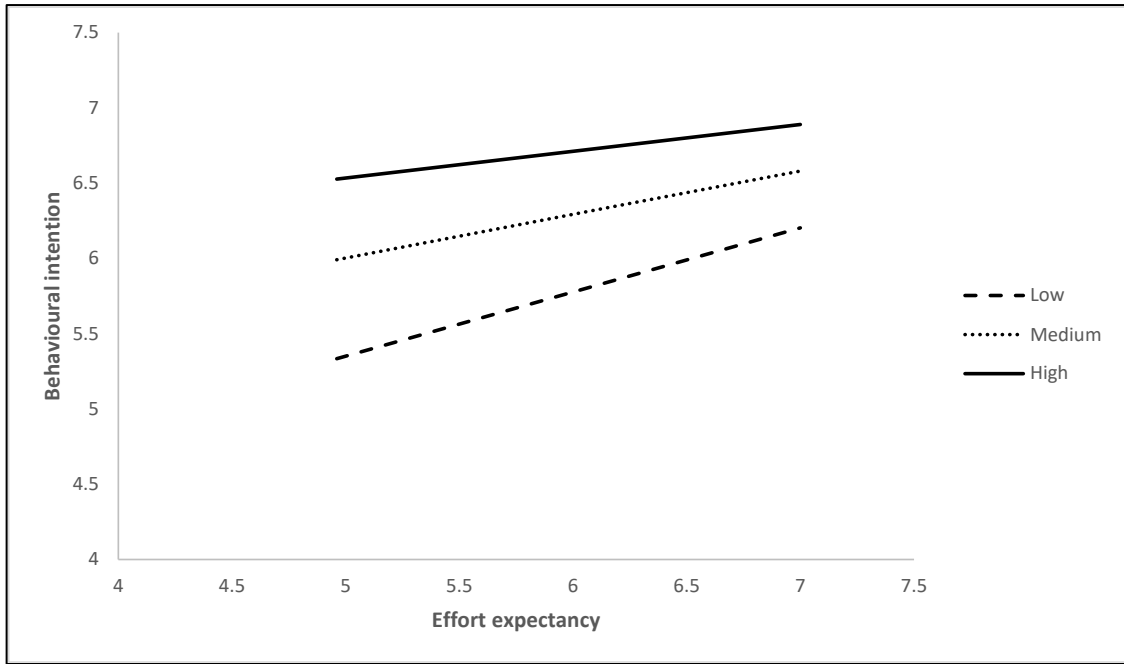
Where the interaction effect is found to be significant, the Johnson-Neyman technique is recommended to further probe the interaction effect, with a used bias-corrected bootstrapping at  $n = 5000$  applied to calculate the confidence intervals (Hayes, 2017). In this study, where the interacting effects were significant and did not exceed zero, the interaction effects were probed further using the Johnson-Neyman technique to calculate the regions of significance for moderation effect (Nel & Boshoff, 2017). To use the Johnson-Neyman procedure, both the LLCI and ULCI must present negative significance, as was the case in Table 15 (Hayes, 2017). Using this technique, the criteria is the significance of the value of the Y axis and the significance of the steepness of the gradient, reflecting that a steep gradient indicates a stronger moderation effect (Hayes, 2012). The relevant outcomes are included in Figures 2–4, with the key results being further explained below.



**Figure 2: Conditional effect of performance expectancy on behaviour intentions at different levels of service innovation.** *Source:* Researcher’s own collated data.

*Notes:* Low = 1 SD below the mean; medium = mean; high = + 1 SD above the mean; SD = standard deviation.

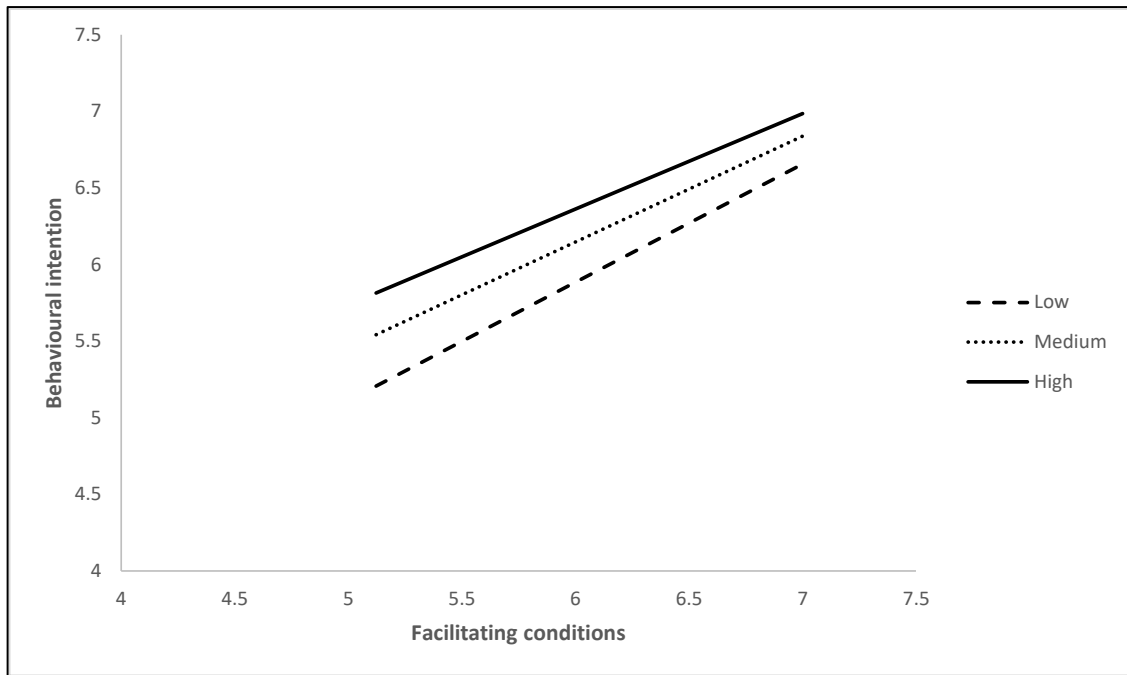
The conditional effect of performance expectancy on behaviour intentions is stronger at low levels of service innovation than medium or high levels. Therefore, the moderation effect of service innovation becomes weaker as performance expectancy increases. Moderation is tested to examine the effect of the moderation on the independent variable and its features as a continuous measure. The Johnson-Neyman test examines that the moderating effect of service innovation is a continuous measure that influences the existing relationship between the independent and dependent variables, assuming no multicollinearity (Hayes, 2017; Nel & Boshoff, 2017). A  $p$ -value < 0.01 representing confidence factor above 99% illustrates that the posited moderating effect is significant, further supported by the LLLI and ULCL, which do not exceed zero [LLLI = -0.1244; ULCL = -0.0562].



**Figure 3: Conditional effect of effort expectancy on behaviour intentions at different levels of service innovation.** *Source:* Researcher's own collated data.

*Notes:* Low = 1 SD below the mean; medium = mean; high = + 1 SD above the mean; SD = standard deviation.

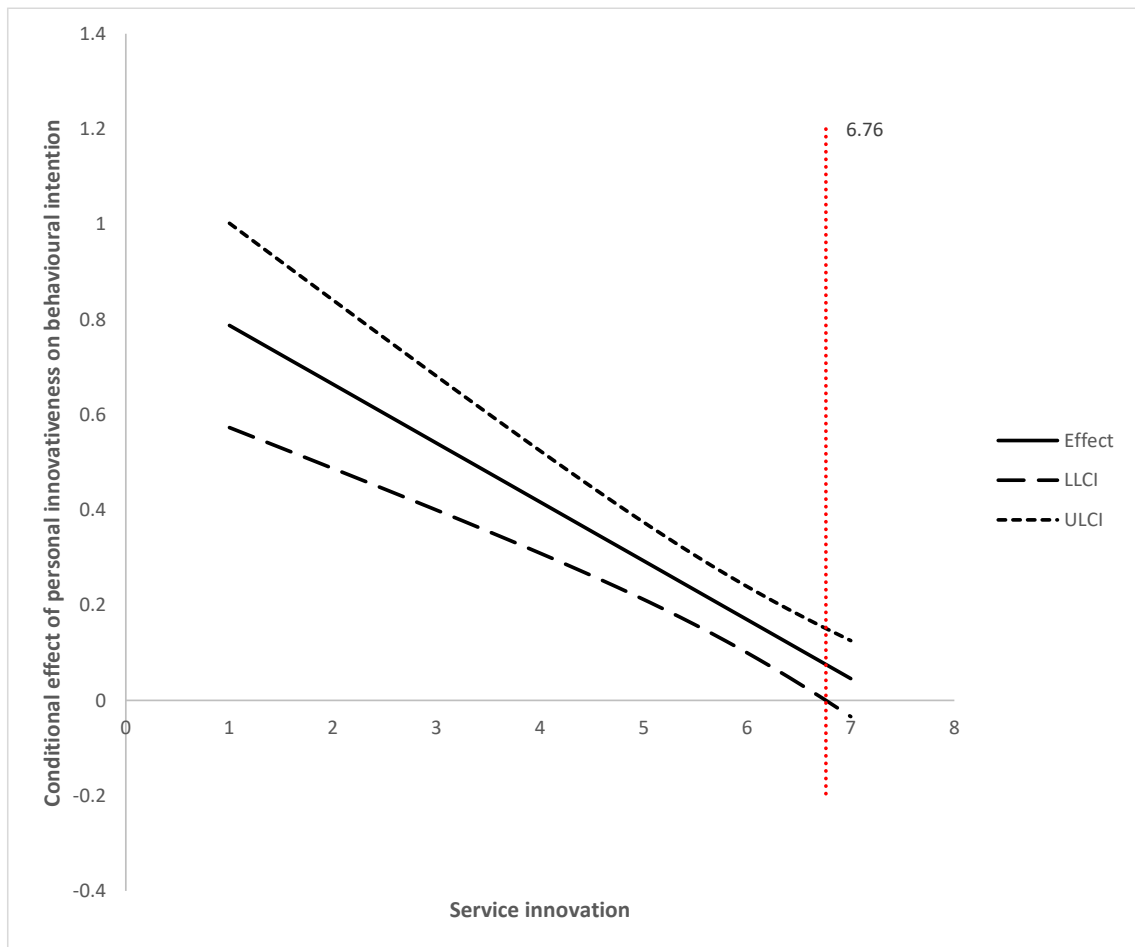
The conditional effect of effort expectancy on behaviour intentions is stronger at low levels of service innovation than medium or high levels. Therefore, the moderation effect of service innovation becomes weaker as effort expectancy increases. The ULCI and LLCI do not exceed zero [LLCI = -0.1384; ULCI = -0.0617], supporting the finding that the moderating effect is significant.



**Figure 4: Conditional effect of facilitating conditions on behaviour intentions at different levels of service innovation.** *Source:* Researcher's own collated data.

*Notes:* Low = 1 SD below the mean; medium = mean; high = + 1 SD above the mean; SD = standard deviation.

The conditional effect of facilitating conditions on behaviour intentions is stronger at low levels of service innovation than medium or high levels. Therefore, the moderation effect of service innovation becomes weaker as facilitating conditions increase. The ULCI and LLCI do not exceed zero [LLCI = -0.1153; ULCI = -0.0381], further supporting the results that the moderating effects are significant.



**Figure 5: Conditional effect of personal innovativeness on behaviour intentions at different values of service innovation.** *Source:* Researcher’s own collated data.  
*Notes:* ULCI = upper limit confidence interval; LLCI = lower limit confidence interval.

Figure 5 illustrates that the conditional effect of personal innovativeness on behaviour intentions is significant until a service innovation value of 6.76. From the value of 6.76 to 7 as a limit from the Likert-type scale, the conditional effect of personal innovativeness on behaviour intentions is no longer significant, and the effect decreases as the service innovation scores increase. Although the  $p$ -value indicates significance of the moderating effects, the gradient is steep and negative, indicating that the conditional effect of personal innovativeness on behaviour intentions could be dramatically different.

Personal innovativeness is the risk appetite level of an individual; hence, it is unsurprising that, despite higher service innovation levels, the moderating effect is no longer effective (Agarwal & Prasad, 1998; Malaquias et al., 2018). The negative gradient is also possibly explained by the fact that innovative people are exploratory and inquisitive, thus their likely adoption of technologies may not depend solely on support from the service provider through service innovation (Lai, Hsu, & Lai, 2010).



## **5.9 Conclusion**

This chapter displayed the results of the analysis of the self-administered survey in which the hypotheses stated in Chapter 2 were tested. A total of 287 valid responses were analysed using CB-SEM. The data was assessed for normality using Kolmogorov-Smirnov and Shapiro-Wilk tests. The measurement model was tested using CFA, followed by reliability and validity assessments. Reliability and convergent and discriminant validity testing were satisfactorily concluded ahead of assessing the structural models using CB-SEM. The model fit indices were confirmed as acceptable, followed by the evaluation of the regression weights and significance levels for hypotheses testing. Finally, the moderation analysis was performed using the Johnson-Neyman techniques. The next chapter discusses the results in terms of the hypotheses and literature.

## **CHAPTER 6: DISCUSSION OF THE RESULTS**

### **6.1 Introduction**

The objectives of Chapter 6 are to discuss the results by interpreting them in line with the conceptual model and hypotheses and, where possible, relating the results to the relevant literature as stated in Chapter 2. This section covers the discussion of measurement scales and the relationships between the constructs and the moderation effect to interpret the results from Chapter 5.

### **6.2 Testing and analysis of the data**

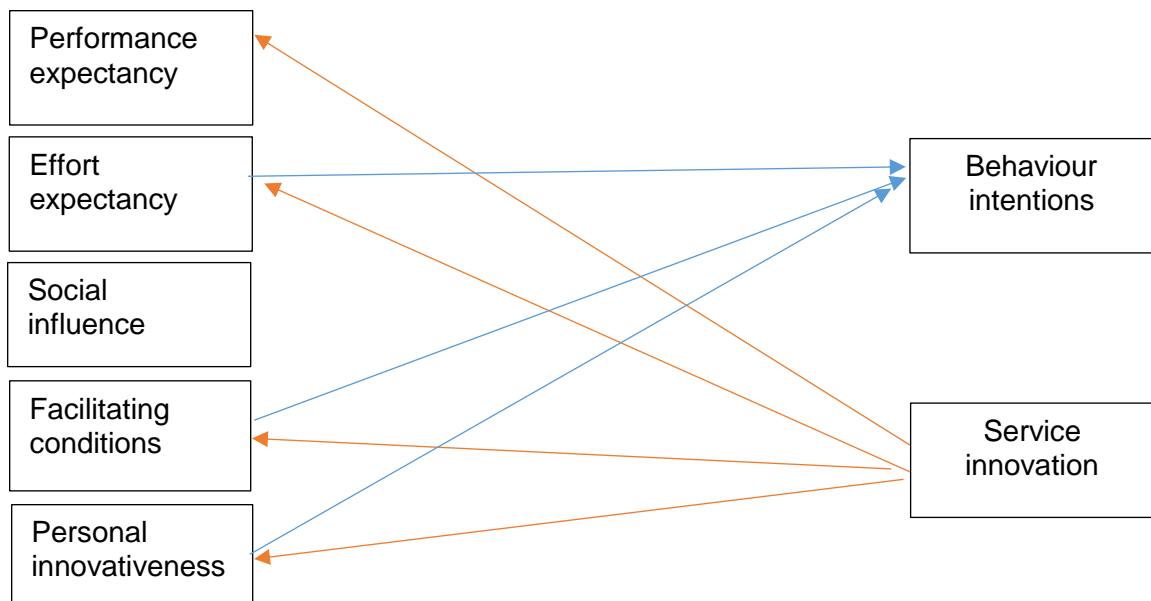
In line with the research methodology stipulated in Chapter 4, the sample size of 287 respondents was achieved and, in accordance with the CB-SEM technique, the data was tested for normality of distribution, reliability and validity in Chapter 5. In testing skewness, the Kolmogorov-Smirnov and Shapiro-Wilk tests were conducted (Table 6) and as the data was a non-parametric distribution (section 5.5), an MLM estimator was applied to estimate standard errors and mean adjusted chi-square test statistics. The next step was an assessment of the model fit (section 5.6.1; Table 7), which revealed that the fit indices for Satorra-Bentley, RMSEA, and SRMR were all above the cut-off values and adjustments were necessitated where appropriate.

All 27 items in the original questionnaire and all five constructs met the criteria for reliability, incorporating internal consistency and CR, although the factor loading estimates in four items were lower than the recommended value of 0.7 (section 5.6.1; Table 8). This necessitated the removal of the items with low factor loadings – namely FC1, FC5, PI4, and Svl4. The items that were removed originated as follows: FC1 and FC5 were subsets of facilitating conditions, PI4 was from personal innovativeness, and Svl4 was from service innovation. Given that there were sufficient residual questions, none of the constructs were impacted by the removal of the items stated above, except for minor changes to the AVE, CR, and the internal consistency and refined descriptive statistics (section 5.6.2; Tables 9 and 10). The model fit statistics for estimating the measurement model was repeated and a model fit was achieved (sections 5.6.3 and 5.7; Tables 12 and 13). The reassessment of the constructs and their items were satisfactory, resulting in the reliability and convergent tests being acceptable.

The discriminant validity test was conducted according to the Fornell and Larcker (1981) criterion in which the evidence of discriminant validity is achieved when the square root of the AVE exceeds the correlations between each pair of constructs (section 5.6.3; Table 11). This was not achieved in the case of the correlations between facilitating conditions and performance expectancy, facilitating conditions and effort expectancy, and facilitating conditions and behaviour intentions. The Satorra-Bentler chi-square re-estimates for discriminant validity were conducted and provided evidence for discriminant validity.

### 6.3 Proposed relationships between constructs

Overall, 10 replications and hypotheses were tested, as illustrated in Table 13 and Table 14 respectively. Three hypotheses were not supported, whilst the remaining seven were supported. The following section provides details relating to the results in each relationship that was tested. The supported hypotheses are included in Figure 6 below.



**Figure 6: Hypotheses supported following regression analysis.**

Source: Researcher's own construct.

Figure 6 incorporates all the supported hypotheses – namely H<sub>2</sub>, H<sub>4</sub>, H<sub>5</sub>, H<sub>6a</sub>, H<sub>6b</sub>, H<sub>6d</sub>, and H<sub>6c</sub>. The details of each relationship are detailed in the sub-sections below. The null hypotheses, not supported and not included in the figure, were H<sub>1</sub>, H<sub>3</sub>, and H<sub>6c</sub>.

### **6.3.1 Relationship between performance expectancy and behaviour intentions**

H<sub>1</sub>, which posited that there is a positive and significant relationship between performance expectancy and behaviour intentions, is included in Table 14 and was not supported ( $\beta = 0.066$ ;  $p = 0.480$ ). This finding does not accord with the theoretical perspective of Venkatesh et al. (2003), who stated that this construct is the strongest predictor of intentions and has material significance at all measurement points in voluntary and mandatory settings. Although the product carries extrinsic motivations, perceived usefulness and job fit relative to other products, other studies have found that user behaviours may still not be transformed, implying other factors weigh more strongly against the key attributes of performance expectancy (Kühn et al., 2019; Lai et al., 2010; Slade et al., 2015). These attributes could be security concerns, cultural factors, and convenience or habit based on several studies in South Africa and further afield (Dagada, 2013; Liébana-Cabanillas, De Luna, & Montoro-Ríos, 2017). In this study, the respondents indicated sufficient access to alternative methods of doing their banking, such as EFTs, Internet banking and m-payments, may be able to provide some of the functions obtainable from mobile banking apps (section 5.3; Table 3). This reason would be consistent with the UK research where a null hypothesis on performance expectancy was derived as respondents were unwilling to use the new technology as a result of the existing alternatives (Slade et al., 2015). The demographics in this sample can be compared with developed economies, given the higher levels of education and geographical coverage, which were mainly cities (section 5.2; Table 1). However, other previous studies in South Africa covering demographics with a stronger rural footprint could yield a different outcome (Maduku, 2014a; Nkoyi, Tait, & Van der Walt, 2019).

### **6.3.2 Relationship between effort expectancy and behaviour intentions**

The second hypothesis (H<sub>2</sub>) – there is a positive and significant relationship between effort expectancy and behaviour intentions – was significant but negative ( $\beta = -1.178$ ;  $p = 0.010$ ), supporting the posited hypothesis (section 5.7; Table 14). Effort expectancy is more objective as it is often illustrated by visual aspects like content design, interfaces or functional abilities. The negative beta implies that when effort expectancy increases, behaviour intentions decrease, although a significant relationship exists as indicated by the  $p$ -value. Effort expectancy and performance expectancy are both posited as the critical determinants of behaviour intentions, with effort expectancy even being the predictor of performance expectancy (Shaikh et al., 2020). It is posited that effort

expectancy is more significant when the customers have limited experience (Venkatesh et al., 2003). Mobile banking apps are the latest technology offering in banking and are thus supportive of these research findings (PwC, 2019). Effort expectancy carries utilitarian and hedonic features, meaning the social, psychological, and economic needs of the customer can be fulfilled (De la Sablonnière et al., 2013). With over 73% of the respondents being employed by an institution or self-employed (section 5.2; Table 1), the respondents could be making a greater effort to use technology for business purposes and this utilitarian need has been illustrated to drive higher user acceptance and behaviour intentions (Alrawashdeh & Al-Mahadeen, 2013). In addition, it has been demonstrated that when individuals are willing to participate in a particular cause, the ability to succeed is driven by their own effort, which is a rationale that may supersede other logic (Mahfuz, Hu, & Khanam, 2016). The respondents in this study, which incorporating 33% of people aged over 62, indicated a higher willingness to engage in technology use (Table 3).

### **6.3.3 Relationship between social influence and behaviour intentions**

H<sub>3</sub>, positing that there is a positive and significant relationship between social influence and behaviour intentions, was not supported ( $\beta = -0.017$ ;  $p = 0.669$ ). There are several possible reasons why the hypothesis was not supported in this study. The first is that the sample in this study comprised mainly of affluent individuals based on their level of education, with 80% of participants having post-matric qualifications, nearly 70% in a full-time job, and 63% being male (section 5.2; Table 1). These are some of the attributes of individuals who were found to be agnostic to cultural and social pressures, relying rather on their own advancement (Adapa & Cooksey, 2013; Baabdullah, Alalwan, Rana, Kizgin, & Patil, 2019).

Another possible reason for H<sub>3</sub> not being supported is that where resistance or difficulties to penetrate banking technology products have been prevalent in South Africa, previous studies have illustrated these individuals to have been largely from black, rural, and poorer communities (Agarwal & Kothari, 2018; Ramavhona & Mokwena, 2016). Social influence is also a bigger factor for less affluent people and in the early stages of the relationship or in mandatory circumstances (Venkatesh et al., 2012). The respondents in this study comprised 75% of people whose home language was English and Afrikaans and these individuals are unlikely to fit the profile of rural, African, poor, and less affluent, and have proven to already possess credible experience with their banks.

The other possible reason for the non-supported hypothesis is that a large percentage of the respondents have a mature experience and relationship with their banks, with 76.7% having a banking longevity of more than 11 years and larger percentages being frequent users of various banking platforms, such as EFTs, Internet banking, and the mobile banking app (section 5.3; Table 3). Considering that the non-users of mobile banking apps were disallowed from completing the survey, it is by design that the respondents would not include less-experienced banking customers (section 5.2). Moreover, a mobile banking app is accessible when a customer has an existing relationship with the bank and is only accessible with a smartphone, making it a high barrier to entry (Kapoor & Vij, 2020; Mombeuil, 2020).

#### **6.3.4 Relationship between facilitating conditions and behaviour intentions**

H<sub>4</sub>, which postulated that there is a positive and significant relationship between facilitating conditions and behaviour intentions, was supported in this study ( $\beta = 0.926$ ;  $p = 0.000$ ). This finding is in line with the study of Venkatesh et al. (2003), who articulated that the absence of performance expectancy and effort expectancy could be the main catalyst for facilitating conditions to become a higher-order predictor of behaviour intentions. This construct is seen as an outcome of the ecosystem of the consumer and is often supported in research where scholars recommend that banking institutions reconsider their service models or products to make it practical and attractive for customers to transition to technology (Arenas-Gaitán et al., 2015).

One of the indicators of the positive relationship between facilitating conditions and behaviour intentions is where technology is being introduced in a job environment, as the lack of choice, productivity, and training would ensure that users gradually or forcefully transform (Alrawashdeh & Al-Mahadeen, 2013; Yoo & Han, 2013). Given the profile of the study's respondents, it is probable that they use technology in their careers and an adaptation of this for their personal banking needs would have been much easier. It is notable that the  $p$ -value at 0.000 ( $p$ -value < 0.0005) indicated the strongest and most positive and significant relationship between facilitating conditions and behaviour intentions. A  $p$ -value < 0.0005 in a regression model reflects a significant relationship (Kühn et al., 2015).

Facilitating conditions are context-driven and considered to be the least correlated to the other construct (Liébana-Cabanillas, Noguera, Herrera, & Guillén, 2013). This construct

is also defined as being driven by external factors that assist customers to reduce the barriers and hurdles to use the new technology platforms, including the models and strategies of the service provider (Ecer, 2018). As observed in Table 2, the respondents who have a relationship of greater than 11 years with their banks constituted 76.7%. Therefore, is it likely that the facilitating conditions are perceived as positive for the respondents to try use a new product and influence the behaviour intentions.

Several scholars have observed that facilitating conditions bring something different from the other UTAUT constructs, as they are a direct determinant of behaviour, whilst performance expectancy, effort expectancy, and social influence are the determinants of usage intentions and behaviours (section 2.6). It is within this context that facilitating conditions are the responsibility of the service provider (section 2.7.4) (Muñoz-Leiva et al., 2017; Palmié et al., 2020).

### **6.3.5 Relationship between personal innovativeness and behaviour intentions**

H<sub>5</sub> posits that there is a positive and significant relationship between personal innovativeness and behaviour intentions, and was supported in this study ( $\beta = -0.136$ ;  $p = 0.003$ ). The profile of the respondents presents several qualities of access to technology and likelihood or familiarity with self-service, illustrated by 93,7% being frequent users of the mobile banking app, 90,6% were frequent users of EFT and 64.1% being frequent users of an ATM (section 5.3; Table 3).

Literature supports the findings of this hypothesis, illustrating the individual's personal willingness to try new things or even take risks (Agarwal & Prasad, 1998). Despite the data being skewed towards the most affluent part of society, the respondents scored personal innovativeness lower than other questions, with the mean value of 5.08 unadjusted and 4.80 after adjusting for a question that presented a low factor loading in the discriminant validity testing (section 5.6.2; Table 10). These mean tests were the second lowest and only higher than social influence.

It is also notable that personal innovativeness had a negative relationship with behaviour intentions – as personal innovativeness increased, there was an observed decrease in behaviour intentions. Furthermore, this study illustrated that the more affluent the community, the more likely they will be adaptable and willing to try new technologies (Adapa & Cooksey, 2013; Shaikh et al., 2018).

#### 6.4 Moderating effect of service innovation

A set of hypotheses – namely  $H_{6a-e}$  – was formulated postulating that service innovation has a moderating effect on the relationships behaviour intentions have with performance expectancy, effort expectancy, social influence, facilitating conditions, and personal innovativeness (section 3.5). The findings indicated that service innovation does not have a moderating effect on the relationship between social influence and behaviour intentions ( $\beta = -0.0216$ ;  $p = 0.2865$ ). The hypothesis is therefore not supported. The relationship between performance expectancy and behaviour intentions is moderated ( $\beta = -0.0903$ ;  $p = 0.0001$ ), hence  $H_{6a}$  is confirmed. The hypothesis is therefore not supported. The relationship between effort expectancy and behaviour intentions is moderated ( $\beta = -0.1000$ ;  $p = 0.0001$ ), hence  $H_{6b}$  is confirmed. The relationship between facilitating conditions and behaviour intentions is moderated ( $\beta = -0.0767$ ;  $p = 0.0001$ ), therefore  $H_{6d}$  is confirmed. Lastly, the relationship between personal innovativeness and behaviour intentions is moderated ( $\beta = -0.1236$ ;  $p = 0.0001$ ), meaning that  $H_{6e}$  is confirmed.

Literature reviews have illustrated that both personal innovativeness and effort expectancy have a significant influence when the new technology is first accessed by the customer (Khalilzadeh, Ozturk, & Bilgihan, 2017; Slade et al., 2015). In this study, it is demonstrated in section 5.8 and Figure 4 that, although personal innovativeness is moderated by service innovation, this is only applicable up to a limit of 6.76 value. The most probable reason for this finding is that personal innovativeness is defined as an act of willingness and largely driven by customers themselves (Agarwal & Prasad, 1998; Malaquias et al., 2018). The strong presence of facilitating conditions is also likely to counter personal innovativeness, providing a rationale for the limitations in the moderating effects, noting that several years after developing the UTAUT model, Venkatesh et al. (2012) refined the model to ensure marketing effects in user behaviours. Furthermore, access to smartphones, Internet and language advantage could be helpful traits for personal innovativeness to be moderated by service innovation, as customers have achieved the first layer of self-help before they require the banking service provider to support them (Gera, Mittal, Batra, & Prasad, 2017).



## 6.5 Age and gender as covariates impacting behaviour intentions

The data collected includes demographical analysis in which 63% of respondents were male and 36% female, with only 1% being unwilling to disclose the information. Studies conducted in several geographical and societal contexts have indicated a bias, where females were impacted by several factors, such as lower income, lower access to resources like smartphones, and cultural barriers (Ameen et al., 2020; Liébana-Cabanillas, Muñoz-Leiva, & Sánchez-Fernández, 2018). The differentiator was where affluent societies are involved, there would be no notable differences between males and females concerning user acceptance and behaviour intentions in using technology (Glavee-Geo et al., 2017). As gender was analysed as a covariate in this study, it was embedded in the testing of the data. Similar to other studies, the findings are agnostic to gender, illustrated through the relevant statistical values showing a non-significant correlation ( $\beta = 0.034$ ;  $p = 0.531$ ).

Similar to gender, age was analysed as a covariate and the results displayed the following values based on the three categories of age profiles: the AGE1 group for respondents aged 18–47:  $\beta = -0.109$ ;  $p = 0.193$ ; the AGE2 category of participants aged 48–61:  $\beta = 0.093$ ;  $p = 0.041$ ; and the AGE3 category comprising respondents aged above 62:  $\beta = 0.052$ ;  $p = 0.086$ . The AGE2 category, comprising 48 to 61 years, was the only group that indicated a positive and significant relationship with behaviour intentions. Literature has illustrated that age is an important moderator in some respects, but to be more meaningful, a hypothesis and sample may need to be designed for an age-related study (Arenas-Gaitán et al., 2015). Studies where age was a key factor showed that, under certain conditions, age becomes agnostic (Bosch, 2013; Owusu et al., 2020). One such study illustrated that in South East Asia and in China, where societal adoption of technology is very high, factors impacting user behaviours do not identify any significant differences distinguished by age (Deng et al., 2010). In Africa, one such illustration is that the use of social media platforms, such as Facebook, is appealing to people of all ages similarly when it comes to banking products, with the concerns and fears of youth in some cases found to be similar to adults, even if young people are digital natives (Hanjaya et al., 2019). The finding where one age category was significant is recommended to be read in conjunction with other factors. Moreover, the age categories in this study were not scientifically stratified, but rather split evenly three ways for ease of statistical analysis. However, it is inconclusive why the AGE2, being 48 to 61 year

olds, displayed a different outcome from the AGE1, below 48 years old, and AGE3 which is above 61 years old..

## **6.6 Conclusion**

This chapter discussed the results of the testing of the UTAUT model as applied in this study and presented in Chapter 5. The first section of this chapter discussed the measurement scales and was followed by a detailed exploration of the relationships between the antecedents and the dependent variable. Each antecedent – namely performance expectancy, effort expectancy, social influence, facilitating conditions, and personal innovativeness – was discussed and contextualised to the survey-based data collected for this study. The chapter explored factors that could rationally explain the major results identified in Chapter 5 (sections 5.7 and 5.8). The overall findings indicated that facilitating conditions had the strongest and most positive relationship with behaviour intentions, with several lead factors postulating that the sample that responded – mainly city dwellers and affluent and economically active individuals – would be the potential key driver of the findings.

Furthermore, this chapter discussed the results of the moderation analyses, where service innovation was used as a moderating effect in the antecedents. The key insight illustrated that the moderating effect had a significant relationship with several hypotheses relating to performance expectancy, effort expectancy, facilitating conditions, and personal innovativeness. The main exception was the relationship between social influence and behaviour intentions, which was shown not to be moderated by service innovation.

## **CHAPTER 7: CONCLUSION**

### **7.1 Introduction**

This chapter synthesises and discusses the key findings of this study, incorporating the outcomes of each of the proposed hypotheses, the business and theoretical contributions, the limitations of the study, and the recommendations for the retail banking senior leadership, fintech companies, and mobile telephony role players. The implications of this research are applicable for corporate strategy in several organisations and sectors focusing on financial services.

This study was conducted to understand the application of an expanded UTAUT model in the relationships between the selected antecedents and customer behaviour intentions, with mobile banking apps as a use case. The expanded UTAUT model is applied based on its four constructs – namely performance expectancy, effort expectancy, social influence, and facilitating conditions – and the added construct of personal innovativeness, which expands the model (Gbongli et al., 2019; Hong et al., 2011; Venkatesh et al., 2016). In analysing these relationships, the study also examined whether service innovation has a moderating effect on the relationship between each antecedent and behaviour intentions. Gender and age were also tested as covariates in terms of whether they impact behaviour intentions. The research was conducted to address the research objectives set out in section 1.4 and the research questions as stated in section 3.2 (Creswell & Creswell, 2018). To achieve this, an extensive literature review was conducted in Chapter 2, and a theoretical model was developed (section 3.3), a combination of which led to the development of 10 hypotheses (sections 3.4 and 3.5), which were formulated and tested. This chapter focuses on the study's key findings, contributions, limitations, and recommendations.

### **7.2 Key findings relating to the study**

There were six hypotheses posited in this study, structured firstly as the five hypotheses relating to the conceptual model and the sixth hypothesis relating to the moderating effect. The moderating effect was tested through five sub-hypotheses. Whilst there is no specific hypothesis for these, the covariates were also tested to determine their impact on behaviour intentions. The findings examined in Chapter 6 have several implications and insights on this study, which are addressed in the following three sub-sections.

### **7.2.1 Hypotheses relating to the conceptual model**

The outcomes illustrated a split where two hypotheses were not supported whilst three were supported. As was discussed in section 2.8, previous studies on testing the applicability of the UTAUT models have indicated variable outcomes, thereby expanding the knowledge base of several factors impacting consumers' behaviours in the use of technology innovations (Casado-Aranda, Liébana-Cabanillas, & Sánchez-Fernández, 2018; Dwivedi et al., 2019; Momani, 2020; Venkatesh et al., 2016).

In this study, performance expectancy and social influence were found to not have a positive and significant influence on behaviour intentions, therefore their hypotheses were not supported. The UTAUT model is dynamic and there is no uniform set of outcomes, as the context plays a role in the determination of the relationships. By focusing on respondents already registered for mobile banking apps for at least six months, this study anticipated an examination of the behaviour intentions of continuity with and commitment to the technology. Contrasting this with most of the literature reviewed in Chapter 2 regarding user acceptance and behaviour intentions in South Africa, a larger number of the studies were conducted to examine customers' potential for participation and not specifically customers who had already registered for mobile banking apps (Dagada, 2013; Ramavhona & Mokwena, 2016; Redlinghuis & Rensleigh, 2010; Van Tonder et al., 2018). The likely reason for the hypotheses concerning performance expectancy and social influence not being supported could be related to the acquired mobile banking app experience of the respondents.

It was unexpected that  $H_1$  was not supported, especially as it is motivated in the model as a predictor of behaviour intentions (Venkatesh et al., 2003). However, in situations where there are other factors, such as security, that weigh more heavily in consumers' minds, performance expectancy may not enjoy a significant and positive relationship with behaviour intentions. The simple observation that the customers are registered for the mobile banking apps already may be the reason why perceived usefulness is no longer relevant, as customers would have determined whether the app was useful to them or not. Similarly, social influence is critical at a point of making the first decision during which time the customers may want to take some extra comfort from what others say about the new innovation. Despite the differences in contexts, many studies have illustrated the elasticity of the UTAUT based on psychological and sociological aspects for the consumer. The retail banks and fintech businesses will need to find a balance between

the utilitarian features and the features that support continuity for the customers in order to align with the ongoing changes in technology and the customers' needs.

Literature also illustrates in several instances that customer behaviours are constantly changing based on circumstances (Slade et al., 2015). Venkatesh et al. (2003) incorporates experience as one of the behavioural aspects which determines intentions and use of technology (Venkatesh et al., 2003; Mombeuil, 2020). It is therefore conceivable that the same cohort of customers included in this study may have displayed a different performance expectancy and social influence before they acquired their experience of using the mobile banking app. The rapid changes in technology could impact the consumer intentions and behaviours as the updated features of the mobile banking app or the development of competing technologies may re-rate the perceived usefulness at a point in time (Edvardsson, et al., 2018).

Effort expectancy displayed a significant, albeit negative relationship with behaviour intentions, causing the hypothesis to be supported. Venkatesh et al. (2012) considered effort expectancy to be one of the strongest indicators of user acceptance impacting behaviour intentions and use. The finding in this study is not surprising, given that the respondents are mostly affluent, educated, and have limited barriers to technology participation (section 5.2), especially mobile banking apps. Moreover, the negative relationship is potentially due to the mature profile of the respondents, noting that effort expectancy was found in other research to have been strong at the beginning of the experience and reducing over time. Effort expectancy is a valuable feature for the service provider as the more engaged the customers are, the more awareness they will gain on updates, convenience, and frequent use of the technology (Kapoor & Vij, 2020). Retail banks could note this approach as being one of the reasons behind the success of WeChat and Apple Pay, and ensure their servicing models engage the customers more regularly.

The key findings in this study are that both facilitating conditions and personal innovativeness have positive and significant relationships with behaviour intentions. The insights that may be deduced from the positive relationship with facilitating conditions indicate that, as pronounced in the PwC (2019) annual survey of bank chief executive officers (CEOs), there is strong awareness and preparedness to transform banks' offerings to digital offerings, and the market segment that the respondents of this study covered are enjoying such benefits already. The candidates receive support and also have capacity for self-help through their own strong personal innovativeness. These

observations point to the need for banks and other interested parties, such as fintech firms, to examine this digital transformation on a segmented, rather than a holistic basis. Many banks only have one prototype of a mobile banking App, yet the characteristics of their customer base are materially different, implying that a one-size-fits-all approach will result in material asymmetry for some components of their customer base. Research in a South African set-up identified a dire need for better facilitating conditions through word of mouth, training and awareness, security, and access to data and smartphones (Kühn et al., 2015; Mhlanga, 2020; Thusi & Maduku, 2019; Van Tonder et al., 2018). Arguably, the current study's respondents appear to have no shortage of such types of facilitating conditions and they are, as a top-up benefit, able to explore technology as they have a higher propensity to innovation.

Facilitating conditions carry significant implications for retail banks, as they would need to ensure that investing in the technology for the mobile banking app is not enough to sway behaviour intentions. Other aspects of facilitating conditions, such as training, security conditions, and communication, are recommended as a priority by the service providers as a business model reconfiguration.

### **7.2.2 Moderating effect of service innovation**

Service innovation incorporated five sub-hypotheses to examine its moderating effect on the relationship between behaviour intentions and each of the following antecedents: performance expectancy, effort expectancy, social influence, facilitating conditions, and personal innovativeness. Of the five sub-hypotheses, one was not supported, which was related to social influence. The role of service innovation was particularly important, pointing directly to the efforts that the service provider should take to ensure that the mobile banking app can serve the needs of the consumer, given that it is a totally differentiated business operating model. A mobile banking app is a strategic innovation that seeks to make a bank accessible from anywhere and at any time. Consequently, banks are expected to place this at the forefront of their service and product offerings. The most prominent and successful payment platforms operating globally are Apple Pay, Samsung Pay, PayPal, WeChat, Alipay, and M-Pesa. Some of the common features of these platforms is that they are part of a successful ecosystem and are not confined to a narrow market segment as the South African mobile banking apps appear to be. Technology companies are mostly flexible in their digital offerings in things like interoperability of the payment platforms on any smartphones. An important consideration is that these payment platform service providers are not retail banks, nor are they owned

by retail banks. These products may have been successful due to a service innovation gap in banks as well as a more proactive service innovation gap in technology companies. Banks could fully monetise the mobile banking app to mitigate the risks of these players or they face losing more business to these technology players.

The hypotheses that service innovation has a moderating effect on the relationship between the antecedents and the behaviour intentions are helpful for banking service providers to improve behaviour intentions across the landscape of their customers. Importantly, through service innovation, banks should be on the front foot to ensure that the m-commerce operating space is taking full functionality of the mobile banking apps, especially given the potential of the app being a bank anywhere and at any time. Unless an approach changes, banks could continue to support legacy initiatives and invest in the mobile banking apps with overall poor financial returns. The efforts to make the mobile banking app successful depend on the service innovation from the banks, including transformation of their own business models.

Implications of service innovation as a moderating effect on performance expectancy include the need for the usefulness of the digital product to be communicated, illustrated, and enhanced. With respect to effort expectancy, the banks should play a role of hand-holding, steering customers towards the use of the product and service. For instance, at Apple Stores, experimentation is the main benefit for the visiting customers, but banks do not seem to have any such strategies, or at least not of the comparable scale. Personal innovativeness, as an added construct to the UTAUT model, could benefit from the assurances that banks may afford customers, particularly relating to risk perceptions. Personal innovativeness is akin to being less risk-averse (Agarwal & Prasad, 1998), but if more customers are educated about real versus perceived risks, their behaviour intentions may be different. Banks and fintech organisations could benefit from looking at facilitating conditions and service innovation in parallel if they are to optimise on the use of their resources. Underinvesting in facilitating conditions or service innovation could be detrimental to their businesses (Bolton et al., 2018).

In this study, the Johnson-Neyman technique was applied for the interacting effects of the moderation and highlighted a number of useful observations. In the case of performance expectancy, effort expectancy, and facilitating conditions, the conditional effect of their relationships with behaviour intentions was stronger when service innovation was lower; whereas the conditional effect of personal innovativeness on behaviour intentions was only present for a limited period (Figures 2–5). The practical

implication of these findings is the elasticity factor in service innovation, which requires a thorough consideration by many business managers, since generally legacy business are not agile in their approach, particularly regarding technology innovations (Mhlanga, 2020). Illustrating this point, one of the mobile banking apps' offerings is personalised services, which is where retail banks need to understand that such personalisation will need to be adjusted as the customers age and their lifestyles change. The banks need to be able to confirm that personalised service for 25-year-olds at the start of their careers will migrate with their progression to mid-career, possible marriage and family, and accumulation of assets later when they are aged 50.

The support and training offered to customers are different. The customer contact points for technology companies are experimentations on the use of service offerings, as well as several independent online and printed support on new updates and offerings on the digital products. This is not the case with banking products; therefore, the customer behaviour intentions are not enhanced on a regular enough basis.

### **7.2.3 Covariates impacting behaviour intentions**

Gender was proposed and tested as a covariate impacting behaviour intentions, although the insights are non-significant. The finding is that behaviour intentions are not influenced by gender, but they are influenced by the antecedents tested in the study. There is an opportunity to always seek to understand gender differentiation in various research topics, especially as the equality disparities remain relevant in modern society. The fact that South Africa does not have as many gender-focused studies on digital banking is in itself a key insight that requires ongoing focus.

Furthermore, age was proposed and tested as a covariate impacting behaviour intentions. Whilst the sample population's ages ranged from 23 to 84, it was found that the age category where there was an impact on behaviour intentions was for the 48–61 cohort. Splitting the ages into three groups was done for detailed, rather than statistical analysis. This important and unusual finding highlights the need to test similar types of data on categorised ages, rather than the common grouping of young and elderly, noting the life stage changes.



### **7.3 Contributions to the study**

This study is crucial for various stakeholders, namely retail banks, fintech management teams, and players in the e-commerce and m-commerce landscapes. The theoretical contribution of this research is that personal innovativeness was added as a fifth construct and service innovation was added as a moderating effect. These inclusions constitute another perspective in the application of the UTAUT, adding to the other ideas where the UTAUT is applied, integrated or expanded (Dwivedi et al., 2019; Momani, 2020; Venkatesh et al., 2012). In practice, this implies that banks would need to think broadly about the likely factors that could impact behaviour intentions for their customer base, noting specific idiosyncrasies in each market and organisation.

The retail banking executives are alert regarding the accelerating changes in the landscape, hence the large number of investments being placed transforming how banking is provided. This study seeks to draw attention to these executives to their potential loss of revenue, since fintech businesses identify agile solutions to consumers' banking needs and sell the idea to anyone prepared to monetise. Thus far, such efforts have not been taken up by the banks, resulting in fintech organisations offering to share their banking relationships with other players, such as WeChat, Apple Pay, and M-Pesa. The banks have a significant risk of erosion of profitability as the customers' share of the wallet is potentially reduced.

Customers' persistently low enthusiasm in using digital products in banking is a cause for concern. Whilst it is acknowledged that the physical infrastructure in banks is being reduced or anticipated to further reduce, the long-tail effect of what appears to be failure to fully monetise each of the digital stages is a great concern (Fenu & Pau, 2015). This study identified that ATMs did not reduce use of cash until now, EFT transactions conducted through Internet banking did not remove cheques as they are still available in some markets, and m-payments did not replace credit cards. As banks invest in mobile banking apps, they also need to continue supporting the legacy of digital and non-digital products whilst customers continue to migrate to technology companies. The financial effects of this complex dilemma of maintaining the legacy and investing in the future are likely to impact banks' profitability.

Mobile banking apps in developed and developing economies have completely different challenges and contexts. Some of the key considerations are the smartphone penetration, cost of data, and other infrastructure that is not within the control of the retail

bank. Trust or security concerns still feature strongly in the usage of mobile platforms, illustrated by the reduced appetite to fully transact on mobile phones even in markets where phone penetration is strong, such as in Finland and Singapore. In developing economies like South Africa, security features and the lag in legislation would need to be considered when banks seek to make significant investments into mobile banking apps.

Mobile banking apps are online applications offered to provide a combination of concierge services for all banking enquiries and day-to-day transacting activities. However, most of the transactions cannot be completed only using the mobile app and the customer must still carry a credit card and may need to annex a signature on several transactions. The concept m-contracting incorporating biometrics and the use of artificial intelligence to support the consumer transacting decisions are amongst the pain points that make up the ideal of a bank from the palm of the hand to be unrealisable, at least in the short term. Management teams and fintech firms should consider an appropriate pace of change to ensure that customer needs are supported at all times. Added to this, it is important to understand the lack of congruence between empirical findings from the banks and the findings from their customers in most studies.

This study is different as it highlights a view that is helpful in understanding this challenge of behaviour intentions in banking digital innovations. The data that was collected (section 5.2) focused on individuals already registered and using a mobile banking app. This research did not seek to address financial inclusion, but rather the behaviour intentions of those using the apps (section 4.3.1). The data in this study is not a proxy of the majority of banking customers in South Africa and in most emerging markets – some of the stand-out features were, that of the respondents, 84% had a higher education, 74% lived with a partner, 50% used English as a home language, and 63% were male. It is most likely that the banks' stated successes in mobile banking apps are applicable to the population similar to that covered in this study, and yet a larger number of their customers are poor, speak local African languages, do not have higher education, and are the likely respondents in the numerous studies covered by other scholars (Maduku, 2014a; Ramavhona & Mokwena, 2016; Redlinghuis & Rensleigh, 2010; Van Tonder et al., 2018). Whilst this study is complimentary of what the banks may have achieved with the top-end of their customer base, these customers represent a small fraction of the banks' customers.

## **7.4 Limitations**

In addition to the methodology limitations stated in section 4.4, the limitations outlined in the sections that follow are applicable to the entire study.

### **7.4.1 Time period for the study**

The study took place during the Covid-19 pandemic between May and December 2020, whilst the world economies and people adjusted their ways of communications and transacting to be more digital (Pantano, Pizzi, Scarpi, & Dennis, 2020). The respondents' mindset might have been influenced by the day-to-day context at the time of completing the survey, given that using digital platforms had inherent increased hedonic and utilitarian benefits. This is particularly critical as the study investigates behaviour intentions that can be changed by context (De la Sablonnière, 2017). Although there are sufficient mitigating factors, such as the qualifying criteria that the respondents were using a mobile banking app for longer than six months (section 4.3.1), a context bias is still possible.

### **7.4.2 Lack of differentiation of banks**

The questionnaire did not collect information on which banking institution the customers were using, as the aim was to understand the behaviour intentions in a broader South African context. However, it is stated in the UTAUT model that performance expectancy, effort expectancy, and facilitating conditions may be influenced by factors like the features and usefulness of the mobile banking app and the support from the service provider (Kapoor & Vij, 2020; Shaikh et al., 2018; Venkatesh et al., 2012). Although data was collected through random sampling (section 4.3.3), it is possible that the respondents may have had a bias towards particular banking service providers.

### **7.4.3 Demographics of the respondents**

The demographics of the respondents were affluent individuals based on their levels of education, home language, and job and family status. The affluent group represents less than 5% of the population in South Africa (Statistics South Africa, 2020). Therefore, the findings of this research must be understood within that context.

#### **7.4.4 UTAUT model**

The UTAUT model can be expanded, integrated, and applied in various contexts. In this case, the researcher has applied personal judgement of how this could be utilised to gain some knowledge of behaviour intentions in the study's context. It is quite conceivable that applying the UTAUT differently may yield different outcomes from the current observations. The differences could be in the form of differentiating the constructs, moderating effects, and covariates.

#### **7.5 Recommendations for future research**

The study found that  $H_1$  (performance expectancy) was not supported, despite very strong theoretical foundations for this influencing behaviour intentions (Momani, 2020; Venkatesh et al., 2012). Moreover, Venkatesh et al. (2003, 2012) indicated that effort expectancy can be a predictor of performance expectancy, although in situations where these constructs are not presenting strong presence, facilitating conditions prevail as the main catalyst for behaviour intentions. This study presented similar outcomes, given that the hypotheses for effort expectancy and facilitating conditions were supported, whereas performance expectancy was not supported. Future studies could investigate what the specific facilitating conditions were that could be advised to the service providers to address other market segments where user behaviour intentions illustrate concerns from the customers (Thusi & Maduku, 2019; Van Tonder et al., 2018). If conducted, this research focus could articulate whether such facilitating conditions incorporate service innovation or not, as part of the facilitating conditions and all service innovation aspects are provided by the service provider, yet their success is determined by the customers' responses (Dal Bó et al., 2018; Hollebeek et al., 2018).

This study highlighted that, considering its psychological, sociological, and marketing focus, context plays an important part in the findings and contexts change (Amoako, Dzagbenuku, & Doe, 2016). A longitudinal study is recommended, where the same customers are tracked for their behaviour intentions towards using banking technology-driven products. Furthermore, this study illustrated that although the respondents are using mobile banking apps, they still use other banking technologies, despite the cannibalisation effect of the app (section 5.3). The banks' and the customers' intentions may be misaligned, where the customers require choice, but the banks need a better streamlined and more customer-centric service model, failing which their financial objectives will not be achieved (PwC, 2019).

As stated in the CEOs' responses in the PwC (2019) annual banking survey, banks require shifts in their business strategies and models. It is recommended that future research be conducted to establish whether mobile banking apps are the master strategy and business model or a stepping stone towards such transformational journey. This is an imperative question for the banking institutions, the other actors in the ecosystem, and the customers.

## **7.6 Conclusion**

Chapter 7 was able to connect the narrative from Chapters 1 to 6, in which the research questions, literature review, conceptual model, and hypotheses were the critical foundations of this study. From this research, it can be concluded that behaviour intentions are impacted by psychometric features identified through the antecedents. Since the study focused on customers who are already mature banking customers, it is highly likely that the key elements of mobile banking apps and the digital banking strategies of the banks are aligned to the needs of the affluent customers. Nevertheless, considering that the customer profile is comprised largely of less sophisticated customers, the banks will need to consider if they are running a risk of product asymmetry with their customer base.

This study's findings are helpful in understanding why previous studies in emerging markets or less affluent communities have mostly indicated low user acceptance and unfavourable behaviour intentions towards the digital innovation. Future research must continue to assess the market on the basis of a more distinct segmentation and, similarly, banks must consider developing training and support strategies that will enhance and create direct service innovation to all their customers.

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## ANNEXURE A: COVERING LETTER FOR THE SURVEY QUESTIONNAIRE

### CUSTOMER EXPERIENCES OF SERVICES OFFERED BY BANKS

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I am conducting research on users' technology acceptance of a mobile banking app and I am trying to find out more about users' perceptions of service innovation as a factor that influences higher or lower acceptance of the technology. My request to have a questionnaire completed is to gather data that will assist me to gain knowledge of user perceptions towards technology usage, specifically relating to mobile banking apps. Your participation is voluntary and you can withdraw at any time without penalty. All data will be stored and reported without identifiers.

If you have any concerns, please contact my supervisor or me. Our details are provided below:

Researcher name: Raisibe Morathi

Email: 19407671@mygibs.co.za

Phone: 083 327 0290

Signature:

Date:

Researcher supervisor: Prof. D. Petzer

Email: PetzerD@gibs.co.za

Phone: 011 771 4000

Signature:

Date:

Your co-operation is appreciated.

When evaluating a question, please answer the question from your own perspective. Place an "X" in the appropriate box or complete where required. Select only ONE option for each question.

**YES    NO**

Are you 18 years or older?

Do you have your own personal bank account?

Have you registered for a mobile banking app?

Have you been using the mobile banking app for at least six months?

**If you answered "Yes" to all of the questions, please complete the questionnaire. If you answered "No" to any one of the questions, you do not have to complete the questionnaire.**

## ANNEXURE B: SELF-ADMINISTERED QUESTIONNAIRE

### SECTION A – DEMOGRAPHIC INFORMATION

In which year were you born? |

What is your highest level of education?

Some primary school	
Primary school completed	
Some high school	
Matric/Grade 12 completed	
Diploma/Degree completed	
Postgraduate diploma/degree completed	
Other	

What is your gender?

Male	
Female	
Other	

What is your home language (select only one option)?

Afrikaans	
English	
Sepedi	
Sesotho	
Setswana	
SiSwati	
Tshivenda	
isiNdebele	
isiXhosa	
isiZulu	
isiTsonga	
Other, please specify:	

Which ONE of the following options describes your employment status the best?

Self-employed	
Full-time employed by an organisation	
Part-time employed by an organisation	
Full-time student	
Housewife or house husband	
Retired	
Unemployed	
Other, please specify:	

What is your marital status?

Single (living alone)	
Married or living with a partner	
Living with parents	
Divorced or separated	

## SECTION B – PATRONAGE BEHAVIOUR

Select the methods that you often use in conducting your banking needs? You can select more than one option.

ATM	
Electronic funds transfer (EFT)	
Credit card payments	
Money transfer	
Mobile banking app	
Other, please specify:	

How long have you been with your bank?

_____ years and _____ months
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## SECTION C

Please answer the following questions, keeping in mind the bank where you hold your account or most of your accounts (as indicated in Section B). Indicate with an “X” on a scale of 1 to 7, where 1 is “strongly disagree” and 7 is “strongly agree”, the extent to which you agree with each of the following statements.

Statements	Strongly disagree →				Strongly agree			
	1	2	3	4	5	6	7	
<b>Performance</b>								
I find my mobile banking app useful in my daily life.	1	2	3	4	5	6	7	
Using the mobile banking app increases my chances of achieving things that are important to me.	1	2	3	4	5	6	7	
Using the mobile banking app helps me accomplish things more quickly.	1	2	3	4	5	6	7	
Using the mobile banking app increases my productivity.	1	2	3	4	5	6	7	
<b>Effort</b>								
Learning how to use the mobile banking app is easy for me.	1	2	3	4	5	6	7	
My interaction with the mobile banking app is clear and understandable.	1	2	3	4	5	6	7	
I find the mobile banking app easy to use.	1	2	3	4	5	6	7	
It is easy for me to become skilful at using the mobile banking app.	1	2	3	4	5	6	7	
<b>Influence</b>								
People who are important to me think that I should use the mobile banking app.	1	2	3	4	5	6	7	
People who influence my behaviour think that I should use the mobile banking app.	1	2	3	4	5	6	7	
People whose opinions I value prefer that I use the mobile banking app.	1	2	3	4	5	6	7	
<b>Facilitating conditions</b>								
I have the resources necessary to use the mobile banking app.	1	2	3	4	5	6	7	
I have the knowledge necessary to use the mobile banking app.	1	2	3	4	5	6	7	
The mobile banking app is compatible with other technologies I use.	1	2	3	4	5	6	7	
I can get help from others when I have difficulties using the mobile banking app.	1	2	3	4	5	6	7	
<b>Personal innovativeness</b>								
When I heard about the mobile banking app, I looked for ways to experiment with it.	1	2	3	4	5	6	7	
Among my peers, I am usually the first to explore new apps.	1	2	3	4	5	6	7	
I like to experiment with the mobile banking app.	1	2	3	4	5	6	7	
My bank's mobile banking app is consistent with the latest technological innovations in banking services.	1	2	3	4	5	6	7	

<b>Service innovation</b>							
My bank has significantly improved the functionalities of its mobile banking app.	1	2	3	4	5	6	7
My bank has significantly improved its mobile banking app.	1	2	3	4	5	6	7
My bank provides services quicker than before as a result of the innovative mobile banking app.	1	2	3	4	5	6	7
The time my bank takes to serve me has reduced drastically due to my use of the mobile banking app.	1	2	3	4	5	6	7
<b>Behaviour intentions</b>							
I intend to continue using the mobile banking app.	1	2	3	4	5	6	7
I will always try to use the mobile banking app in my daily life.	1	2	3	4	5	6	7
I plan to continue using the mobile banking app frequently.	1	2	3	4	5	6	7

***Thank you for taking the time to complete this survey!***

## ANNEXURE C: SOURCES OF THE SCALES FOR THE QUESTIONNAIRE

Question code	Questions	Source (reference)
	<b>Performance expectancy</b>	
PE1	I find my mobile banking app useful in my daily life.	Venkatesh et al. (2003)
PE2	Using the mobile banking app increases my chances of achieving things that are important to me.	
PE3	Using the mobile banking app helps me accomplish things more quickly.	
PE4	Using the mobile banking app increases my productivity.	
	<b>Effort expectancy</b>	
EE1	Learning how to use the mobile banking app is easy for me.	Venkatesh et al. (2003)
EE2	My interaction with the mobile banking app is clear and understandable.	
EE3	I find the mobile banking app easy to use.	
EE4	It is easy for me to become skilful at using the mobile banking app.	
	<b>Social influence</b>	
Sc1	People who are important to me think that I should use the mobile banking app.	Venkatesh et al. (2003)
Sc2	People who influence my behaviour think that I should use the mobile banking app.	
Sc3	People whose opinions I value prefer that I use the mobile banking app.	
	<b>Facilitating conditions</b>	
FC1	I have the resources necessary to use the mobile banking app.	Venkatesh et al. (2003)
FC2	I have the knowledge necessary to use the mobile banking app.	
FC3	The mobile banking app is compatible with other technologies I use.	
FC4	I can get help from others when I have difficulties using the mobile banking app.	
	<b>Personal innovativeness</b>	
PI1	When I heard about the mobile banking app, I looked for ways to experiment with it.	Slade et al. (2015)
PI2	Among my peers, I am usually the first to explore new apps.	
PI3	I like to experiment with the mobile banking app.	
	<b>Service innovation</b>	
Sv1	My bank's mobile banking app is consistent with the latest technological innovations in banking services.	Mahmoud et al. (2018)
Sv2	My bank has significantly improved the functionalities of its mobile banking app.	
Sv3	My bank has significantly improved its mobile banking app.	
Sv4	My bank provides services quicker than before as a result of the innovative mobile banking app.	
Sv5	The time my bank takes to serve me has reduced drastically due to my use of the mobile banking app.	
	<b>Behaviour intentions</b>	
BI1	I intend to continue using the mobile banking app.	Venkatesh et al. (2003)
BI2	I will always try to use the mobile banking app in my daily life.	
BI3	I plan to continue using the mobile banking app frequently.	

## ANNEXURE D: COMPREHENSIVE DESCRIPTIVE STATISTICA FOR INDIVIDUAL ITEMS

Item	Variable	N	Mean	Standard deviation	Variance
<b>Performance expectancy</b>					
PE1	I find my mobile banking app useful in my daily life.	287	6.23	1.242	1.543
PE2	Using the mobile banking app increases my chances of achieving things that are important to me.	287	5.62	1.577	2.488
PE3	Using the mobile banking app helps me accomplish things more quickly.	287	6.08	1.380	1.903
PE4	Using the mobile banking app increases my productivity.	287	5.78	1.566	2.452
<b>Effort expectancy</b>					
EE1	Learning how to use the mobile banking app is easy for me.	287	6.16	1.266	1.604
EE2	My interaction with the mobile banking app is clear and understandable.	287	6.14	1.248	1.556
EE3	I find the mobile banking app easy to use.	287	6.17	1.250	1.562
EE4	It is easy for me to become skilful at using the mobile banking app.	287	6.14	1.249	1.561
<b>Social influence</b>					
Sc1	People who are important to me think that I should use the mobile banking app.	287	4.75	1.961	3.844
Sc2	People who influence my behaviour think that I should use the mobile banking app.	287	4.57	2.018	4.071
Sc3	People whose opinions I value prefer that I use the mobile banking app.	287	4.64	2.057	4.231
<b>Facilitating conditions</b>					
FC1	I have the resources necessary to use the mobile banking app.	287	6.61	0.954	0.910
FC2	I have the knowledge necessary to use the mobile banking app.	287	6.47	1.027	1.054
FC3	Using the mobile banking app helps me accomplish things more quickly.	287	6.13	1.350	1.822
FC4	The mobile banking app is compatible with other technologies I use.	287	6.05	1.343	1.805
FC5	I can get help from others when I have difficulties using the mobile banking app.	287	5.04	1.947	3.792
<b>Personal innovativeness</b>					
PI1	When I heard about the mobile banking app, I looked for ways to experiment with it.	287	5.08	1.782	3.175
PI2	Among my peers, I am usually the first to explore new apps.	287	4.61	1.842	3.393
PI3	I like to experiment with the mobile banking app.	287	4.72	1.956	3.824
PI4	My bank's mobile banking app is consistent with the latest technological innovations in banking services.	287	5.93	1.273	1.621

<b>Service innovation</b>					
Svl1	My bank has significantly improved the functionalities of its mobile banking app.	287	5.92	1.396	1.948
Svl2	My bank has significantly improved its mobile banking app.	287	5.97	1.414	1.999
Svl3	My bank provides services quicker than before as a result of the innovative mobile banking app.	287	5.76	1.545	2.386
Svl4	The time my bank takes to serve me has reduced drastically due to my use of the mobile banking app.	287	5.76	1.533	2.351
<b>Behaviour intentions</b>					
BI1	I intend to continue using the mobile banking app.	287	6.48	1.112	1.237
BI2	I will always try to use the mobile banking app in my daily life.	287	6.02	1.514	2.293
BI3	I plan to continue using the mobile banking app frequently.	287	6.21	1.385	1.919

Source: Researcher's own findings