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**The perceptions of customer use on mobile applications
in the telecommunication industry of south africa**

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THE PERCEPTIONS OF CUSTOMER USE ON MOBILE APPLICATIONS IN THE TELECOMMUNICATION INDUSTRY OF SOUTH AFRICA

BY

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A thesis submitted in fulfilment of the requirements for the degree of

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**Research report submitted to the Faculty of Commerce, Law and Management,
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degree of Master of Management in the field of Digital Business**

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Abstract

In South Africa, mobile applications in telecommunications are constantly developing and introducing new products and features to the market. South Africa is following in the footsteps of other countries by investing in mobile applications to deliver products and services. Mobile applications are topical in boardrooms. Various models established by academia and practice have highlighted numerous factors that are necessary, but few exist on how mobile application factors occur in the telecommunications industry. The purpose of this study is to determine factors that influence the use of mobile application and to examine the extent to which customer satisfaction influences the use of mobile applications. As a result, this exploratory quantitative study investigates their relevance to the South African telecommunications industry.

An online survey was distributed to 300 South African users of mobile applications through emails. A total of 167 responses were received. The results were analysed using descriptive analysis, structural equation modelling to determine the contribution of different factors on the use of telecommunication mobile applications, Principal Components Analysis (CPA) was used to ensure that the data is convergent, different and a structural fit model was performed to determine model fit.

The findings revealed that general awareness, performance expectancy, effort expectancy, facilitating condition, system quality, individual innovation, and customer satisfaction are factors that influence the use of telecommunication mobile applications. Surprisingly, social influence has a negative impact on the use of telecommunications mobile applications. This study reveals that social influence does not influence the use of telecommunication mobile applications. Furthermore, respondents of this study strongly agree that customer satisfaction is critical for motivating use of telecommunication mobile applications.

This report has made a number of contributions, a theoretical contribution has been made by developing and testing an extended Unified Theory of Acceptance and Use of Technology (UTAUT) model for mobile applications in the telecommunications industry of South Africa context. The model includes factors such as system quality, individual innovation, general awareness, customer satisfaction. This research's contextual contribution assists the South African telecommunications industry in more

effective ways, guiding them toward the usage of mobile applications. The practical contribution indicates that the telecommunications industry should concentrate its resources and investments on increasing customer awareness of mobile applications, providing products and features on mobile applications that are simple to use and appropriate for the task at hand, maintaining a low failure rate, and maintaining an environment that promotes the use of mobile applications.

Keywords: mobile applications, smartphone, telecommunications, general awareness, performance expectancy, effort expectancy, facilitating conditions, social influence, system quality, individual innovation, and customer satisfaction

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Declaration

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

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Signature: _____



Signed at Midrand

On the 30th day of June 2023

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List of acronyms

Acronym	Meaning
3G	3rd Generation
AMOS	Analysis of Moment Structures
ATM	Automated Teller Machine
AVE	Average Variance Extracted
BU	Behavioural Use
B2B	Business 2 Business
B2C	Business 2 Consumer
CFI	Comparative Fit Index
CC	Competition Commission
CFA	Confirmatory Factor Analysis
CS	Customer Satisfaction
EE	Effort Expectancy
EFA	Exploratory Factor Analysis
FC	Facilitating Conditions
GA	General Awareness
GFI	Goodness-of-Fit
IFI	Incremental fit index
ICASA	Independent Communications Authority of South Africa
II	Individual Innovation
IVR	interactive Voice Response
KMO	Kaiser-Meyer-Olkin
App	Mobile Application
M-Banking	Mobile Banking
MNO	Mobile Network Operators
NFI	Normed fit index
PE	Performance Expectancy
PC	Personal Computer
PCA	Principal Components Analysis
RFI	Relative Fit Index
SI	Social Influence
SA	South Africa
SPSS	Statistical Package for the Social Sciences
SEM	Structural Equation Model
SQ	System Quality
TLI	Tucker-Lewis Index
UTAUT	Unified Theory of Acceptance and Use of Technology

Chapter 1: Introduction

1.1 Introduction

This chapter provides the study's purpose and context by outlining the research problem and objectives, as well as discussing the relevance, limitations, and terminology utilised within the scope of this research study.

1.2 Purpose of the study

This research aims to understand perceptions on mobile applications use in the telecommunications industry of South Africa.

The introduction of mobile applications has had an influence on the telecommunications sector. Mobile applications are popular because they require minimal effort to purchase and are available 24 hours a day, seven days a week from a smartphone. Customers use mobile applications to monitor their accounts, pay bills, buy airtime, and report problems.

Several mobile application studies (Chao, 2019; Salo & Frank, 2015; Hwang et al., 2016) investigated factors that influence mobile application adoption, however these studies overlooked individual innovation and system quality. Individual innovation refers to how consumers perceive and embrace new technology, which influences their attitudes toward mobile applications (Lin, 2019). System quality is the availability, responsiveness, and dependability of the information system in use Delone and Mclean (2003). These factors are significant in describing factors impacting mobile application use and contribute to evaluating customer satisfaction (Kim et al, 2021).

Studies by (Jutel & Lupton, 2015; Chmielarz, 2020; Huang et al., 2019) reveal that customers who are aware of mobile applications and their benefits are more likely to use them. Several studies (Xu et al., 2017; Lee, 2018; Chen et al., 2017) discovered a weak relationship between general awareness and mobile application use; their findings suggest that other factors such as mobile app performance "fast" and availability of mobile app downtime "error free" are more influential in app use. Because the findings on general awareness as a factor in the adoption of mobile applications have been inconsistent, additional research is required.

Companies are investing in mobile applications (Kumar, 2020), with the goal of gaining an advantage over competitors through the deployment of mobile applications (Chambers, 2018). Mobile application evaluation is beneficial to businesses because it can provide information on user performance, usage, income earned by the mobile application, and customer perception of the mobile application (Moumane et al., 2016). The insights acquired could be used to improve the mobile application further and justify the investments made by companies in mobile applications.

The conceptual research model of this research was developed by extending the Unified Theory of Acceptance and Use of Technology (UTAUT), as developed by Venkatesh et al. (2003) and introduced new variables, such as general awareness, individual innovation, system quality and customer satisfaction. The model is then tested using data collected through an online survey administered to a sample of customers who use mobile applications in South Africa in the telecommunications industry.

The UTAUT model has been extensively tested at explaining factors influencing individual-level use and customer satisfaction, however, the focus has been on banking, government, education, and marketing environments where individual users are not Information Technology professionals but domain users (Saccomani, 2022; Humbani & Wiese, 2017). Therefore, the UTAUT model may also be relevant in the telecommunications context where individual customers represent the community of users of mobile application (Lin, 2019), therefore this study seeks to understand perceptions of customer use of mobile applications in a telecommunication industry in South Africa.

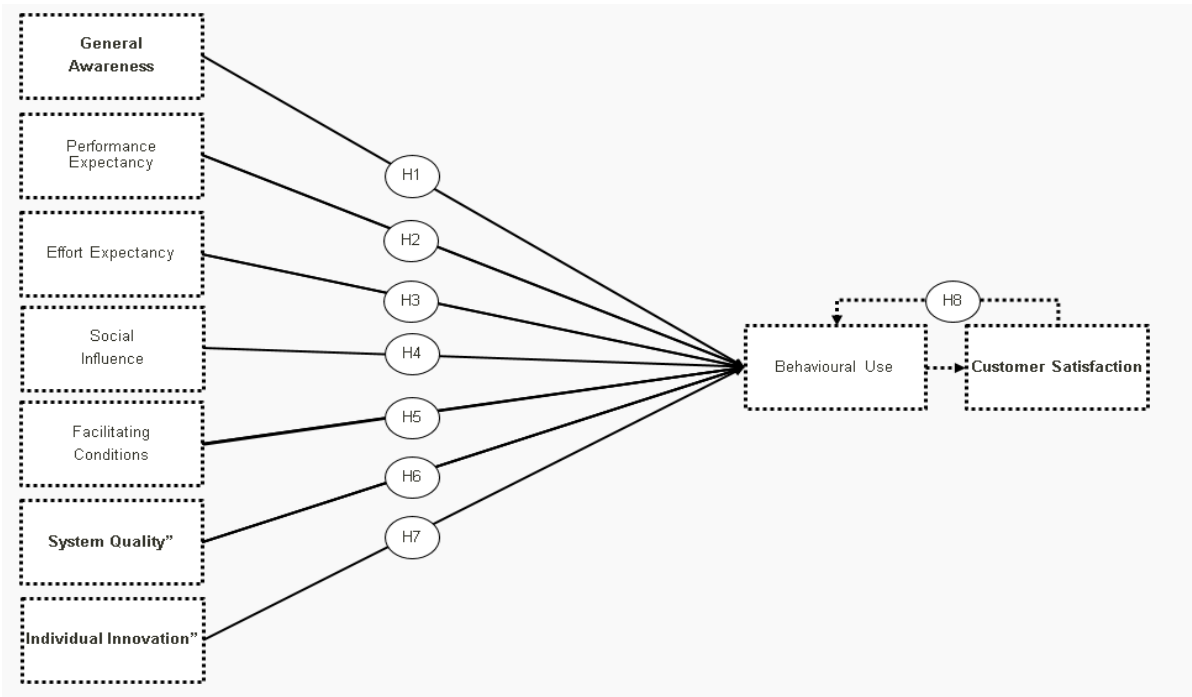


Figure 1: Researcher's own work

Source: Adopted from UTAUT, Venkatesh et al. (2003)

1.3 Background of the study

South Africa has one of the most robust economies on the African continent. Historically one of the world's leading producers and exporters of gold and platinum, the "Rainbow Nation" has transformed a significant portion of its natural wealth into a rapidly expanding service economy. With a population approaching 60 million and some of the highest smartphone penetration rates in Africa, South Africa is now one of the most intriguing participants in the African mobile application market (Mhlanga & Moloi, 2020).

South Africa has four main telecommunications organisations, which account for over 98% of the R190 billion market capitalisation (Veitch, 2019). Telecommunications service providers are critical components in allowing smartphone adoption via internet access (Mhlanga & Moloi, 2020). Because of its mobile applications, smartphones have changed how individuals interact with technology (Chen-Ying, Tsao, & Wan-Chuan, 2015). Smartphones include built-in apps, known as mobile applications, that give users with similar capabilities such as internet surfing, video calls, and internet connectivity to those found on a personal computer (PC). Mobile applications are

intended to engage users directly and provide quick, practical access to information, goods, and services (Jain & Viswanathan, 2015). Smartphone adoption has been aided by mobile applications (Arora, Malik, & Chawla, 2020).

Mobile applications are small programmes that run on your smartphone and allow you to access limited and isolated functionality, such as mobile web browsing, multitasking, and purchasing products and services (Jain & Viswanathan, 2015). Mobile applications have grown in popularity due to their ease of use for both commercial and individual users (Curry, 2022). Mobile applications are popular because they need little effort to obtain and are available 24 hours a day, seven days a week from a smartphone. Customers can use mobile applications to check accounts, pay bills, buy airtime, and log inquiries. More importantly, the introduction of mobile applications has had an impact on the telecommunications business.

Telecommunications is a dynamic industry, and its business model requires transformation in order to survive and remain relevant (Deloitte, 2018). The introduction of mobile applications allows the organisation to be customer focused as customers can transact without visiting a physical store (Yu & Lee, 2018). Companies are investing in developing mobile applications in order to benefit from cheaper operating costs, direct access to clients, and insightful customer data (Marinkovic & Kalinic, 2017; Palmere, 2019; Sinicki, 2019). Furthermore, customer experience may be enhanced because customers can evaluate products and services at any time of day (Frost & Sullivan, 2014; Cleavy, 2018). The business benefits gained from mobile applications may help organisations gain a competitive advantage by better understanding customer behaviour through real-time analysis of customer transitions using information obtained from mobile applications (Stocchi et al., 2021). Despite the installation of mobile applications, some customers continue to use shops to access services that they may access via mobile applications (Vries, 2022). Understanding the factors that influence the adoption of mobile applications is a research gap that needs to be filled (Alalwan et al., 2017).

Prior studies (Shapiro, 2017; Vega-Ramírez et al., 2020; Birkhoff & Smeltzer, 2017) have used the UTAUT model to understand factors that may influence the use of mobile applications. The UTAUT model explains use phenomena through factors that influence the intention to use technology and the subsequent usage behaviour with

usage behaviour as the dependent variable (Venkatesh et al., 2003). The model employs four main factors: (i) performance expectancy, which measures how much a person believes that utilising a technology could improve their ability to execute their job, (ii) effort expectation describes how simple a system is to operate and how user-friendly the technology is (Cimperman et al., 2016), (iii) social influence is the factor that supports a person's use of a new system because it is influenced by the positive reinforcement of the people and environment around them (Brawijaya et al., 2018), (iv) facilitating conditions refers to a person's perception of the availability of the organisational and technological infrastructures needed to use the planned system is referred to as their perception of the facilitating conditions (Ghalandari, 2012). The model was popularised by its ability to include the demographics like age, gender and experience as control variables (Venkatesh et al., 2003). The control variables enabled researchers to particularly identify the relationship between independent and dependent factors (Fedorko et al., 2021). Dwivedi et al. (2017) and Chikondi (2019) argue that UTAUTs attributes may not be sufficient or applicable to all contexts and some of the relationships that are important may be omitted. Therefore, the amendment of the UTAUT model is important in understanding factors influencing the use of mobile applications. The UTAUT model falls short in evaluating System Quality and Individual Innovation. System Quality is the measure of the desirable characteristics of an information system (Ojo, 2017). Information System defines system quality as a measure for perceived response time, system flexibility and system reliability (Urbach & Müller, 2012). In this study, system quality refers to system availability time, and whether the mobile application is always working or it has downtime. Mobile application delivers instant gratification, users of mobile application expect immediate results when performing a transaction. A mobile application that has high downtime may have an impact on the individual users and this may lead to users of the mobile application using other service channels (Zgrabljic et al., 2021). The business may lose an opportunity of making sales, lose productivity, erode customer confidence and may damage the reputation of an organisation (Villanueva, 2015). Therefore, an evaluation that includes system quality is important in identifying factors that influence the use of mobile applications.

Individual innovation is the effect that users' attitudes and willingness to try new technology and new ideas have on their willingness to try mobile applications (Lin,

2019). Assuming that users are open to new technology, the level of innovation may affect how much users accept mobile applications (Yi et al., 2006). Prior studies (Thakur, 2018; Ali & Warraich, 2020; Odede, 2021) identify personal innovation as one of the key attributes affecting customer satisfaction using mobile application, however in the telecommunications industry there is limited research on factors influencing customer satisfaction regarding the use of mobile applications (Du Preez, 2020).

The importance of evaluating user's attitude towards new technology and measuring response time and reliability is crucial, therefore this research extends the UTAUT model by adding the three new independent factors - general awareness, system quality and individual innovation. Both system quality and individual innovation may help to explain customer attitude towards the mobile application.

Customer satisfaction has been popularised by its ability to positively affect a firm's profitability (Sun & Kim, 2013). Prior studies (Sun & Kim, 2013; Anderson et al., 2008; Strategic Direction, 2018) define customer satisfaction as the customer's feelings or attitudes towards a product, a firm or a service provided by a company. Customer satisfaction is an important factor towards explaining mobile applications use. Mobile applications were implemented with the aim of improving customer satisfaction, however this may not be the case as some customers are still continuing using other traditional channels (i.e., stores) to obtain services that they can get from mobile application (Bhatiasevi, 2015, Grewal & Levy, 2017). The benefits that could be obtained from customer satisfaction through mobile application are (i) more loyal customers (Fuchs, 2022), (ii) telecommunication to have business performance lead amongst competitors (Pei et al., 2020) (iii) ability to increase sales through mobile applications' unlimited operating times (Hannie et al., 2020), (iv) reduced marketing expenditure (Sulaiman & Musnadi, 2018). Customer satisfaction may be crucial for a business' survival because a customer's opinion of a product or service may affect their likelihood of repurchasing or utilising mobile application in the near future (Kamran-Disfani et al., 2017)

Prior studies (Shapiro, 2017; Vega-Ramírez et al., 2020; Birkhoff & Smeltzer, 2017; Marinković et al., 2019) have been performed measuring customer satisfaction using mobile applications, the studies revealed that customer satisfaction was a contributing factor on use of mobile applications.

Other reviewed studies (Stone & Baker Eveleth, 2020; Shin et al., 2019; Tep Sandrine et al., 2020) evaluated mobile applications' use through customer satisfaction, they identify customer satisfaction does not lead to mobile application use.

Therefore, the mixed results identify a research gap and this study seeks to identify factors that hinder or propel use of mobile applications.

Companies are investing in mobile application (Kumar, 2020), the aim of the investment is to gain competitive advantage through the use of mobile applications (Chambers, 2018). Evaluation of mobile applications is good for business as it could inform the business on user's performance, behaviour, revenue that is generated by the mobile application and customer perception of the mobile application (Moumane et al., 2016). The insights gained could be used to further improve the mobile application and justify the investments that organisations are making on mobile applications.

1.4 Research Problem

The study investigates two main problems.

The first research problem is to understand factors that influence the use of mobile application in a telecommunication industry in South Africa. The Unified Theory of Technology Acceptance and use of technology (Venkatesh et al., 2003; Venkatesh, Davis, and Morris, 2007) is a comprehensive model for measuring technology acceptability and utilisation. The model's robustness, significant theoretical and methodological shortcomings remain unaddressed (Venkatesh et al., 2003; Venkatesh, Davis, and Morris, 2007). UTAUT received criticism for failing to explain behavioural intention in a variety of contexts (Marikyan & Papagiannidis, 2022). Dwivedi et al. (2019) suggested including system quality may aid in understanding the impact on technology utilization, the focus in his study was on literature review, furthermore he suggested that this variable be evaluated to justify the model's inclusion using empirical data.

Businesses develop mobile applications to increase customer touchpoints, reduce contact support, and raise awareness of the brand (Ramokgopa et al., 2023). South Africa is amongst the highest rates of mobile application adoption in the African market

(Mhlanga & Moloi, 2020). In Q1 2020 and Q1 2021 African mobile application market rose significantly, in South Africa, Nigeria, and Kenya with overall installations increasing by 41%. Nigeria had the highest rate of growth (43%), followed by South Africa (37%), and Kenya (29%). Notably, in South Africa, nearly half of customers (47%), 70% of Millennials, and 69% of parents with children use a phone application multiple times per week or more, most frequently to save time (Geisler, 2022). South Africa has a low use of mobile applications in comparison to developed countries (Ramokgopa et al., 2023). In the research of (Okonkwo et al. 2019), socioeconomic settings influence mobile application adoption, namely awareness of the benefits provided by the mobile application. An investigation is required to understand the low uptake of mobile application in South Africa compared to other African countries particularly awareness as a factor influencing use. Understanding the use of mobile applications in South African telecommunications could therefore assist the telecommunications industry in justifying the investment made in mobile applications and direct resources to create more awareness on benefits of mobile applications. Customers who are aware of mobile applications and their benefits are more likely to use them, according to their research (Jutel & Lupton, 2015; Chmielarz, 2020; Huang et al., 2019). Studies by (Jutel & Lupton, 2015; Chmielarz, 2020; Huang et al., 2019) determined general awareness as a factor that influences the use of mobile applications. Several studies (Xu et al., 2017; Lee, 2018; Chen et al., 2017) discovered a weak relationship between general awareness and mobile application use; their findings indicate that other factors such as mobile application performance "fast" and availability of mobile application downtime "error free" are more influential in mobile application use. There has been inconsistencies in general awareness as a factor influencing mobile application use, thus a further research is required to settle the inconsistencies. Furthermore, DeLone and McLean (2003) also identified system quality as a significant element in system use. The availability of mobile applications may have an impact on their use (Roca et al., 2019).

System quality is described by (DeLone and McLean 1992) as the attributes that indicate the system's technological level in terms of information creation. Tajuddin et al. (2013) discovered a positive association between system quality and mobile application use. According to (Roca et al., 2019), system quality enhances use and adoption by encouraging consumers to use mobile applications. As a result, system

quality is a significant element related with the use of mobile applications. Previous research (Almukhlifi, Deng, & Kam, 2018; Deng et al., 2018) found that many users rely on mobile applications with mistakes, slow reaction times, and low information relevancy due to a lack of alternatives in mobile applications. System quality was determined to be insignificant in the adoption and use of mobile applications by Almukhlifi, Deng, and Kam (2018;). The discrepancy of these studies necessitates additional research.

The second research question is to examine the influence that mobile applications have on customer satisfaction. The availability and use of smartphone mobile devices has increased significantly in South Africa. According to a survey conducted in Colombia, India, Jordan, Kenya, Lebanon, Mexico, the Philippines, South Africa, Tunisia, Venezuela, and Vietnam, a median of 53% of the collective population had access to a mobile device capable of accessing the internet and running mobile applications (Silver et al., 2019: 4). According to (Christino et al. 2021), despite a worldwide boom in mobile applications, many businesses, particularly those in less developed countries, have low usage of mobile application. Furthermore, there is currently a scarcity of research on customer satisfaction and mobile applications, particularly in the developing-country telecommunication business (Deng et al., 2018). While many studies have focused on advanced nations, more study in developing nations such as South Africa is needed to see whether the consequences are the same (Okonkwo 2019). Telecommunications is a competitive industry (Meena & Geng, 2022). Customer satisfaction is important for a mobile application to ensure prosperity in the market (Grewal & Levy, 2017), studies (Vega-Ramírez et al., 2020; Birkhoff & Smeltzer, 2017; Marinković et al., 2019) reveal that customer satisfaction leads to the use of mobile applications, consequently if customer satisfaction is achieved on mobile applications, organisations flourish in the market (Grewal & Levy, 2017).

Customers who are dissatisfied may result in customer avoiding the mobile application leading to loss of revenue and customer interaction (Amadea et al., 2021). It is crucial for businesses to monitor customer satisfaction levels (Oh & Kim, 2022). Several studies (Stone & Baker Eveleth, 2020; Shin et al., 2019; Tep Sandrine et al., 2020) reveal that customer satisfaction does not lead to the use of mobile applications.

Literature is inconsistent on customer satisfactions as a factor influencing the use of mobile applications. The implications of the inconsistency in literature could misdirect effort for organisations and complicate investment decisions on mobile applications (Nair et al., 2022). This could mean organisations could lose the benefits of reduced cost of operation, increased reach of customers and market, always-on 24/7 service for their customers (Xu et al., 2015). This study aims to solve this research problem by putting an end to the inconsistency that had been found.

1.5 Research Objectives

The objectives of this study are:

- To examine factors influencing the use of mobile applications in a telecommunication industry in South Africa.
- To examine the influence that mobile applications have on customer satisfaction.

1.6 Rationale

This study aims to make an original contribution in three ways, namely empirical, contextual and practical.

First, an empirical contribution is made by integrating general awareness, individual innovation, and system quality and customer satisfaction into the UTAUT model as a basis for exploring mobile application users' perception. This study further focuses on customer satisfaction therefore customer satisfaction is added in the dependent elements of this study.

Second, a contextual contribution is made by examining customer perception factors that affect the use of mobile applications in the mobile application industry within the South African context. Within the South African context there is limited academic research conducted around the customer perception of mobile applications. Research into mobile applications occurs in sectors. For example, Cullen and Kabanda (2018) explore the role of demographics (individuals' characteristics) and motivational factors on mobile commerce usage activities from the South African perspective.

Marinkovic and Kalinic (2017) explore significant drivers of customer satisfaction in mobile applications and assert trust, perceived usefulness, mobility, and perceived

enjoyment were found to be significant drivers of customer satisfaction. Within the South African context, there is a clear need to determine which factors are most important for mobile applications use in the telecommunication industry.

Table 1: Mobile Applications use studies

Country	Topic	Author/s	Framework	Most Influential factors
Serbia	Antecedents of customer satisfaction in mobile commerce	(Marinkovic & Kalinic, 2017)	UTAUT with four additional factors: Mobility, Perceived usefulness, Perceived enjoyment and customisation	Trust, perceived usefulness, mobility, and perceived enjoyment
Bangladesh	Understanding the Service Quality and Customer Satisfaction of mobile Banking in Bangladesh: Using a Structural Equation Model	(Khan, Lima, & Mahmud, 2021)	SERVQUAL model, Tangibility, reliability, responsiveness, assurance and empathy	Responsiveness and reliability
United States of America	Investigating the effectiveness of retailers' mobile applications in determining customer satisfaction and repatronage intentions? A congruency perspective	(Iyer, Davari, & Mukherjee, 2018)	Customer Value framework with two additional factors: hedonic value and congruency	Functional value, and hedonic value

Currently, there are limited studies that have been undertaken in the telecommunications industry in South Africa. Additionally, the studies indicated in Table1 do not take into consideration general awareness, individual innovation, system quality and customer satisfaction.

Third, this study aims to make a practical contribution by providing useful insights in the South African telecommunication industry and obtaining a clear view on the factors influencing mobile applications' use and could enable appropriate interventions. The telecommunications will need to determine the inhibitors within customers and facilitating condition. In addition, this research may assist in formulating strategies using existing and new technologies which could impact the industry

1.7 Delimitation of the study

The proposed research study has the following delimitations:

- This study is limited to a South African context and students based in South Africa.
- The focuses on the top four (Vodacom, MTN, Cell C and Telkom) mobile networks in South Africa.
- A quantitative research method was utilised, due to its merit of being used to provide more depth and breadth to the proposed topic.
- This study focuses only on smartphone users.
- The study uses UTAUT (Unified Theory of Acceptance and Use of Technology) framework; it adds System Quality, Individual Innovation and Customer satisfaction

1.8 Definition of Terms

E-Service – As a subset of e-commerce, it is any service whose delivery is enabled by a website and incorporates a large self-service component, i.e., where consumers co-produce the service outcome through their interaction with the website (Mou & Cohen, 2015).

E-Commerce – It is the ability of buyers to purchase products and services online using Internet technologies and associated infrastructure (Pavlou, 2003).

Mobile Application - Mobile applications are a type of software designed to run on a mobile phone, like a smartphone or tablet PC. Most of the time, mobile applications give users the same services they can get on their computers. Mobile applications are usually small pieces of software that enable the smartphone to preform advanced features (Magnets, 2022).

Mobile Commerce (m-Commerce) – Buying or selling goods or services over an electronic network through a wireless handheld device (UNCTAD, 2002).

ICASA - Independent Communications Authority of South Africa is the official regulator of the South African communications, broadcasting and postal services sect (ICASA, 1999)

MNO- Mobile Network Operator (MNO) is a telecommunications entity that provides wireless voice and data services to mobile phone subscribers.

Omnichannel retail is an integrated approach that delivers a seamless consumer experience engaging multiple shopping channels and fulfilment options (Ishfaq & Saghiri, 2018).

UTAUT- Model is Unified Theory of Acceptance and Use of Technology model. The UTAUT model, performance expectancy, effort expectancy, social influence, and facilitating conditions are the four potential factors to explain user perception and acceptance behaviour (Venkatesh, Morris, & Davis, 2003)

Performance Expectancy (PE) - The degree to which an individual believes that using a computerised system will assist him or her in increasing his or her job performance (Venkatesh, 2003)

Effort Expectancy - is also a factor of the UTAUT model that measures the level of ease of use associated with the use of an information technology. (Venkatesh et al. 2003)

Social influence is a part of the Unified Theory of Acceptance and Use of Technology (UTAUT). It means that a person thinks it is important that other people think he or she should use a new system (Venkatesh et al., 2003).

Facilitating Conditions as a factor in UTAUT refers to the extent to which an individual perceives that organisational and technical infrastructures required to use the intended system are available (Ghalandari, 2012)

1.9 Assumptions

The following assumptions are made

Assumption 1: All respondents own a smartphone which has an telecommunication mobile application

- **Assumption 2:** All respondents interact with the telecommunications through mobile application and physical stores
- **Assumption 3:** All respondents have used their mobile application in the past year

1.10 Chapter Outline

Chapter 1: explains the purpose of the study and gives an overview of the setting in which the study is done. After that, it describes the research problem and the research goals that are used to guide the study. It talks about how important the study is and what its limits are. It then discusses the assumptions that support the study and defines some key terms.

Chapter 2: explains what a mobile application is and what it does. It discusses the various factors that are used on the research model. At the end of each section are the hypotheses that are tested in this study. Then, the framework for the theory is built.

Chapter 3: gives an overview of the study's research design and the method used to do the research. This is followed by a description of how the data were collected and how the sampling framework was used. It outlines the research tool that was used and how the data are analysed and interpreted. The chapter then refers to the study's limitations and considerations to ensure the research is done in an ethical manner.

Chapter 4: focuses on showing the results. It starts by giving a profile of the respondents, which includes their demographics and how they use the site. The next step is to show the results of the measurement scale. This is where the results of the validity and reliability tests are shown. Then, the results of the correlation and regression analyses are shown.

Chapter 5: provides a detailed discussion of the results. The results are discussed for each of the factors: performance expectancy, effort expectancy, social influence, facilitating conditions, individual innovation and system quality. The discussion covers the main findings emanating from the research and how these findings compare to past literature, providing a conclusion and a recommendation for each of the factors.

Chapter 6: delivers the research and gives suggestions for the next steps to take. This chapter starts by giving a brief profile of the respondents. Then, it draws conclusions and how they relate to the study's research goals. After that, there are some suggestions for key stakeholders and an overview of what this study could add to the research on mobile application. Lastly, the chapter ends with ideas for more research and a general summary.

Chapter 2: Literature review and theoretical frameworks

2.1 Introduction

Chapter 1 presented the research by providing the background to the study and the research problem. This chapter reviews the literature and theoretical framework that shapes this study. It begins by reviewing telecommunication in South Africa, mobile applications and customer satisfaction. From the review of literature, a discussion of mobile application use theories follows. Thereafter, the chapter then presents the theory that was adopted as a lens to understanding the use of mobile applications. Lastly, the chapter gives a contextualisation of the conceptual research framework.

2.2 Approach to the Literature review

Several sources were used to prepare the literature review, including the Google Scholar search engine, Science Direct, Emerald, and other online academic databases. To carry out the review, search phrases were developed using the following key terms: customer satisfaction, mobile applications, telecommunications, system quality, individual innovation, UTAUT, general awareness, performance expectancy, effort expectancy, social influence, facilitating conditions and behavioral use.

Studies were considered if they were available in full text, in English, from peer-reviewed journals, and covered the topics of "mobile applications" or "telecommunication" or "customer satisfaction" or "individual innovation" or "system quality" or "user" or "satisfaction." The search was narrowed down to empirical research that used survey, experiment, field study, and correlation.

A structured approach, similar to what would be used in a systematic review, was used to gather articles for the goal of providing a concept-centric narrative review, as suggested by Webster and Watson (2002). The strategy to searching for publications was intended to be complete and comprehensive, with quality factors guiding the selection of sources for inclusion in the review (Pare et al., 2015).

2.3 Mobile Telecommunications

Mobile telecommunications was established in South Africa in 1993, the South African government firstly licenced Vodacom in 1993 and in 1994, licenced MTN to be a second mobile operator, in 2001 Cell C was the third mobile operator to be licenced and in 2010 Telkom a state owned entity was licenced to operate as a mobile telecommunication provider (Horwitz & Currie, 2007).

These are the current top four mobile operating companies in South Africa with a combined market share of 98%. Telecommunication has benefits like empowering participation, people in remote areas can communicate and participate with other remote participants, it can boost economic performance, it enables businesses like e-commerce prosper, mobile learning students using their cell phones to study and it has the ability to transform the business world, companies can be operationally efficient through mobile communication (Scott, 2019).

The telecommunications business is an evolving business through its products like data or voice prices, handset offering like the latest smartphones, number of customers and customer satisfaction, their level, network coverage and speed of network are key (Howell & Potgieter, 2022), some telecommunication offer credit and insurance and other financial services.

In 2008, the telecommunications industry introduced smartphones which operated with mobile applications (Wright, 2021). Mobile applications are generally small, individual software units with specific functions (Bähr, 2017). Mobile applications have played a key role in increasing smartphone adoption (Arora, Malik & Chawla, 2020). Mobile applications are popular because they offer greater value, require minimal effort to access and are available 24/7 from a smartphone. Telecommunications mobile applications allow customers to check balances, pay bills, buy airtime and log enquiries.

Mobile applications benefits for users are (i) convenience, the mobile applications are accessible on your smartphone 24/7, (ii) personalised products and offerings, due to the rich data from mobile applications and businesses gain the ability to provide personalised products (iii) the instant gratification when transacting provided by mobile applications, users are instantly gratified when using mobile application (Chopdar & Balakrishnan, 2020)

Mobile applications provide benefits to business, these benefits vary (i) valuable customer insights, business can gauge through digital data factors that influence use of mobile application (Tarute et al., 2017), this means should customers not use or use a product business can modify due to low performance and due to use, business can grow the product (Rîndaşu, 2021), (ii) loyalty, loyal customers of mobile applications can bring in significant amounts of income and cut service costs due to their comfort with the brand (Gani & Maung, 2019), therefore the use of mobile application can be a cost saving instrument for businesses (Nzabirinda, 2019), (iii) higher customer satisfaction, the ability of the business to delight users of the mobile application by meeting their expectations, therefore when the customer is delighted, it could lead to word of mouth that could be good for business (Hohenberg & Taylor, 2021). Therefore, usage of mobile application could position the organisation at a competitive advantage (Stocchi et al., 2021).

2.4 Benefits of mobile applications

McLean et al. (2020) verify the impact of the ease of use and usefulness of the mobile application in convincing the user's attitude towards the application during the initial adoption phase. Shareef et al. (2018) note that user's awareness of the availability of the mobile application, the quality of information and trust towards the brand and mobile applications are significant factors that influence the initial adoption of mobile application. Trachuk and Linder's (2017) study validates that convenience and reliability are two of the most important factors influencing adoption of mobile application. Previous studies (McLean et al., 2020; Shareef et al., 2018; Trachuk & Linder, 2017) verify the different factors required for the adoption of mobile applications, the challenge with the adoption of mobile applications does not fully recognise the continued use of the mobile application which will ensure telecommunication business benefits yields as it is intended for a long term results (Malik et al., 2017). To put this into context, a single use by a single customer qualifies as adoption whereas multiple use by a single customer is perceived as a higher degree or is often called continued use of mobile application.

Khan (2020) highlight that customisation becomes more significant in influencing positive customer attitudes. Customers learn how to use the customisation tools within the mobile application and utilise the ability to store personal details over time,

customers are likely to experience increased efficiency and reduced effort during use (McLean et al., 2020). Wu et al. (2022) found that positive antecedents positively affect continued usage. Kang (2014) found that the friendliness of the mobile application, the quality of the content, the perceived cost effectiveness and familiarity with the mobile application are key factors for continued use. Telecommunications invest large sums on money and resources on mobile applications (Kot, 2022), the realisation of the investments is obtained through continued usage of the mobile application (Grodén-Morrison, 2017), and therefore continued use of mobile applications is more beneficial than adoption. Prior studies (Martin & Shilton, 2017, Gani & Maung, 2019; Khan, 2020) emphasise the importance of customer satisfaction, Dovalienė et al. (2016) reveal that positive customer satisfaction could lead to mobile application reuse and repurchase.

Table 2: Mobile applications benefits

Benefits	Source
24/7 access to customers	(Zhang et al., 2021; Sinicki, 2019)
Improved customer experience	(Choi et al., 2008; Marinkovic & Kalinic, 2017)
Increased product discovery	(Borràs, 2019; Johnson, 2017)
Wider reach of audience	(Mroczkowska, 2021; Palmere, 2019)
Lower operational costs vs physical stores	Marinkovic & Kalinic, 2017; Borràs, 2019)
Insightful Data Analytics	(Cleavy, 2018)

Source: Researchers own compilation

2.5 Original Conceptual Research Framework

Unified Theory of Acceptance and Use of Technology (UTAUT), this model was previously adopted from Technology Acceptance Model (TAM) (Shachak et al., 2019). The model aims to further understand access why users accept and reject technology and how the user acceptance can be used to deliver an improved technology (Ammenwerth, 2019). The models makes use of four major constructs (i) performance expectancy, refers to the degree to which individual perceives that using a system will help in attaining a gain in job performance (Venkatesh et al, 2003), (ii) effort expectancy, refers to the degree ease associated with the use of the system, the ease of use of the technology, Cimperman et al. (2016), (iii) social influence, refers to the

supporting factor in the use of new system by a person because it is influenced by encouragement of the people and situation around them (Brawijaya et al., 2018); (iv) facilitating conditions, refers to the extent to which an individual perceives that organizational and technical infrastructures required to use the intended system are available (Ghalandari, 2012).

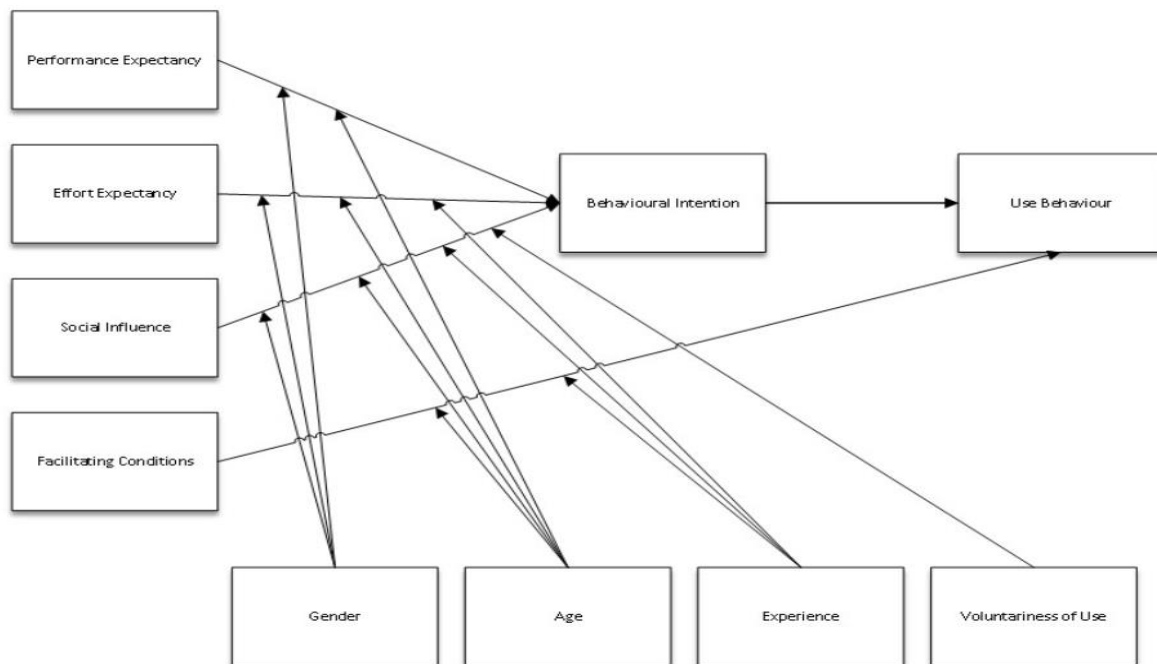


Figure 1: Unified Theory of Acceptance and Use of Technology (UTAUT)

Source: from UTAUT, Venkatesh et al. (2003)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a frequently used research framework (Ammenwerth; 2019). UTAUT has also been criticized for being excessively simplified approach and for adopting a narrow perspective that focuses solely on individual adopters' ideas, perceptions, and usage intentions (Shachak et al., 2019). Furthermore, after thousands of investigations, their contribution to knowledge has reached a plateau (Brawijaya et al., 2018). While the original UTAUT model explained a significant amount of variation in behavioural intention and usage behaviour, it proposed some relationships that may not be applicable in all contexts, omitted some potentially important relationships, and excluded some constructs that may be critical for explaining IS/IT acceptance and use (Dwivedi et al., 2017)

In order to advance theory and provide research direction, we have modified the original UTAUT with additional factors namely general awareness, system quality, individual innovation and customer satisfaction. This will enable the research to critically analyse factors that impact use of mobile application in the South African context.

2.6 Conceptual Research Framework

This research studies the factors of customer perceptions regarding the adoption of mobile application in a telecommunication industry in South Africa. In this study, we say that the Unified Theory of Acceptance and Use of Technology explains how people use mobile applications. It is suggested that the fit between behavioural use and customer or user satisfaction may drive use decisions, thus UTAUT was most suited to evaluate factors that drive mobile application usage.

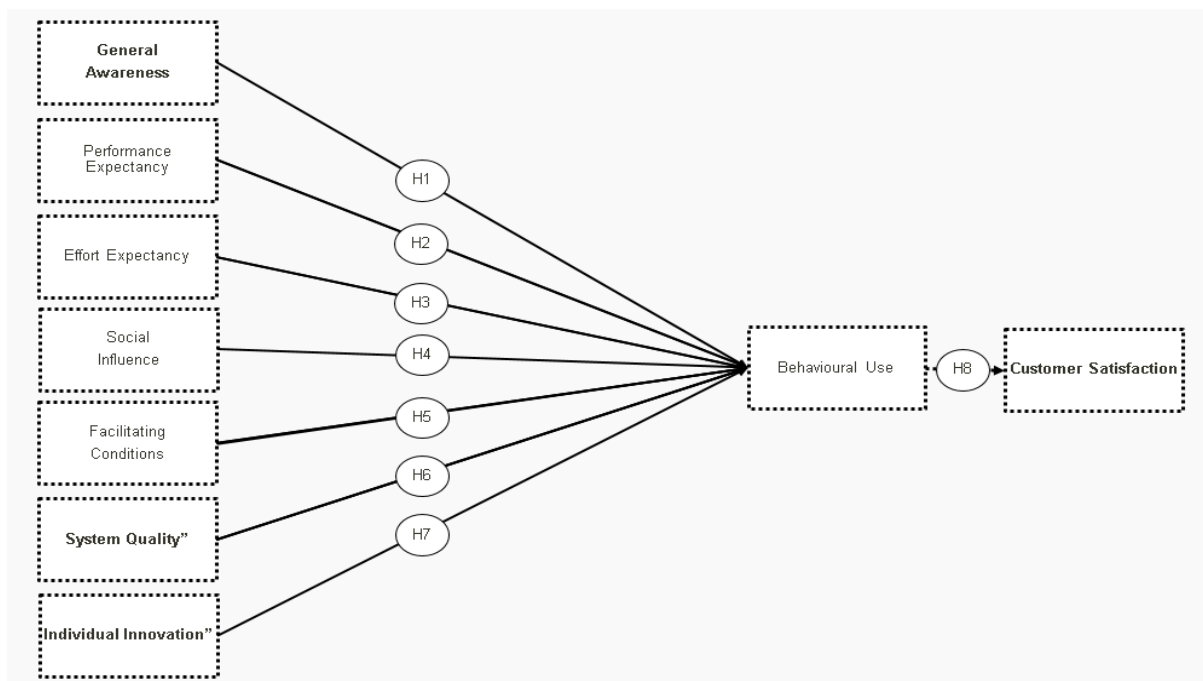


Figure 3: Researchers own work

Source: adapted from UTAUT, Venkatesh et al. (2003)

2.7 System Quality

System quality is the desirable characteristics of an information system. For example ease of use, system flexibility, system reliability ,ease of learning, intuitiveness , sophistication and response time. Ease of use is the degree to which the users perceived that by using mobile applications they need less effort to use the system (Al-Mamary et al., 2014). System quality in the mobile application context is the measurement of the desired characteristics of the mobile application, its measures of usability, flexibility, accessibility and response time (Delone & Mclean, 2003). Mobile applications are expected to respond within 2-3 seconds, if the mobile application users find your mobile application slow, they will users simply move on to something else that meets their expectation, resulting to a loss of customer or interaction (DeCapua, 2020). Mobile application usability refers to how easy and quickly users can reach their goals within the mobile application. If the mobile application is hard to use, even if it has a modern and attractive design, the overall impression will be negative (Dakic, 2022). Therefore, it is important to ensure customers are satisfied with the mobile application (Gorla et al., 2010).

2.8 Individual Innovation

Individual innovation is the effect that users' attitudes and willingness to try new technology and new ideas have on their willingness to try mobile applications. Assuming that users are open to new technology, the level of innovation will affect how much users accept mobile applications (Yi et al., 2006). In the context of telecommunications mobile applications, individual innovation, as a measure, can determine if customers have an appetite to use mobile application, if not what can be done to influence use. This will inform the business to continue to invest in building mobile applications or redirected investment into other customer wanted technology

The telecommunications business devote its resources to teaching customers about the advantages of mobile applications (Min et al., 2021; Chmielarz, 2020; Huang et al., 2019). The business benefits of utilising mobile application are time savings, convenience, and the benefits of customised discounts (Keith et al., 2015; Kim & Baek, 2018; Zhou et al., 2020). Because the telecommunications industry invests enormous sums of money in developing mobile applications, advise on how and what features to develop shapes and pushes the return on investment (Kot, 2022).

2.9 General Awareness

General awareness refers to users' perceptions of how mobile applications can simplify their engagement with telecommunications service providers. It determines whether users are aware that mobile applications can save them time by using features such as purchasing airtime, logging queries and service provider information via the mobile application (Hubert et al., 2017; Stanciu & Rîndaşu, 2021).

There has been inconsistencies in general awareness as a factor influencing mobile application use. The studies by (Jutel & Lupton, 2015; Chmielarz, 2020; Huang et al., 2019) suggest general awareness as a factor that influences the use of mobile applications. Their research finds that customers who are aware of mobile applications and their benefits are more likely to utilise them (Jutel & Lupton, 2015; Chmielarz, 2020; Huang et al., 2019). Studies by various authors (Xu et al., 2017; Lee, 2018; Chen et al., 2017) discovered a weak relationship between general awareness and mobile application use; their studies show that other factors such as mobile application performance "fast", and availability of mobile application downtime "error free", are more influential in mobile application use. The results of this research clarify the inconsistency, the results suggest that general awareness is an important factor in the usage of mobile applications. This is due to the telecommunications industry marketing efforts and mobile application exclusive offerings "cheaper bundles if purchased on mobile application.

2.10 Customer Satisfaction

Schiffman et al. (2014) define customer satisfaction as the review made by the customer regarding the experience, compared to the expectation. Telecommunication is a competitive industry, quality of service supplied to customers is an important determining factor that can affect market share and customer perception of the brand (Meena & Geng, 2022). Customer satisfaction is important for a mobile application to ensure prosperity in the market (Grewal & Levy, 2017), therefore the customers should be satisfied with the service, if not they may switch to another telecommunication provider or switch the mobile application, resulting to loss of revenue and loss of customer. Customer satisfaction in the mobile application can be measured using (i) security, do customers feel the mobile application is secured enough to transact, is the information submitted in the mobile application stored in a secured environment that

will not be accessible by cyber criminals (Chell et al., 2015), (ii) ease of use, is the design of the mobile application intuitive enough for customers to understand their interactive process (Ohk et al., 2015), (iii) trust, customer need to trust the mobile application (Chu & Yao-bin, 2009), in the telecommunication context trust means customers must be comfortable with their airtime, balances and other non-monetary features available on the mobile application (Chopdar & Balakrishnan, 2020).

Table 3: Benefits of positive customer satisfaction

Benefits	Source
More loyal customers	(Fuchs, 2022)
Competitive Advantage	(Saeidi et al., 2015; Pei et al., 2020)
Increased sales	(Bennett & Rundle-Thiele, 2004; Hannie et al., 2020)
Increased awareness	(Arumsari & Ariyanti, 2017; Miswanto & Angelia, 2018)
Reduced marketing expenditure	(Sulaiman & Musnadi, 2018)
Less price sensitive customers	(Low et al., 2013)
Reduced cost of recruiting customers	(Arumsari & Ariyanti, 2017; Fuchs, 2022)

Source: Researcher's own compilation

2.11 Interrelationships between mobile application and customer satisfaction

Customer retention is founded on the idea of attracting customers for future mobile applications use intentions, this is enabled by the non-stop approach of greater returns and effective long-lasting relationship benefits (Gani & Maung, 2019), therefore the ability to retain a customer means their satisfaction levels must be met. The quality of mobile applications may be highly influenced by the return of the customer, if the customer is dissatisfied, their decision may result in customers avoiding the mobile application (Amadea et al., 2021), leading to loss of revenue and transactions. The purpose of mobile applications is to reduce cost, increase reach of customers and market, always-on 24/7 service and enable the business to have a competitive advantage (Xu et al., 2015), and thus, it is crucial for businesses to monitor customer satisfaction levels (Oh & Kim, 2022). A study was done using the Delone

and McLean model, it revealed that after information quality as a measurement of continued use, system performance ranked as the second most influencing factors for determining mobile application use (Montesdioca & Macada, 2015).

2.11.1 Contextualisation of the conceptual research framework elements

This section gives a description on the contextualisation of the core elements on the research framework in this study. UTAUT theory has two dependent elements, behavioural intention and use behaviour. Technology's Unified Theory Acceptance and use of technology is a comprehensive methodology for measuring technological acceptance and utilization (Venkatesh et al., 2003; Venkatesh, Davis, and Morris, 2007). The robustness of the model, as well as important theoretical and methodological flaws, remain unsolved (Venkatesh et al., 2003; Venkatesh, Davis, and Morris, 2007). UTAUT was chastised for failing to describe behavioural intention in a range of scenarios (Marikyan & Papagiannidis, 2022). Dwivedi et al. (2019) proposed that integrating system quality may benefit in understanding the impact on technology use. His study focused on a literature review, and he also advised that this variable be reviewed to validate the model's inclusion using empirical data. This study further focuses on customer satisfaction therefore, customer satisfaction is added in the dependent elements of this study. The independent factors such as performance expectancy, effort expectancy, social influence and facilitating conditions are extended by including general awareness, system quality and individual innovation.

2.11.2 The independent factors are further contextualised

General Awareness

General Awareness is intended to obtain awareness information on the use of mobile applications, the belief that mobile applications can help users to be more efficient, trust in the information provided by the mobile application, feel comfortable using the mobile application, and provide a better interaction with the mobile application (Hubert et al., 2017; Stanciu & Rîndaşu, 2021).

H1: General awareness will positively impact behavioural use of consumers to use mobile applications

Performance Expectancy

Performance expectations are mostly based on items like how useful the application is seen to be, how motivated the user is both inside and outside of work, how well the app fits the job, how much of an advantage it has, and what the user hopes to get out of it (Wu et al., 2012). In the context of this study, performance expectancy addresses the features, products and services provided by the mobile application. Mobile applications of telecommunications provide account or airtime balances, purchase of voice minutes or bundles and data bundles. In the context of using mobile application, when users see value in the mobile application in terms of saving time, cheaper products and convenience, Alalwan et al. (2017) note that the customer's view of the benefits of using the mobile application has a direct impact in repeat use and can drive behavioural use. Yeo et al. (2017) further point out that usefulness is a similar factor to performance expectancy.

H2: Performance expectancy will positively impact behavioural use of consumers to use mobile applications

Effort Expectancy

The level of how easy the system is to use is called "effort expectancy." It measures how easy it is to use, how easy it is to interact with, and how important it is to use. (Venkatesh, et al., 2012). In our context of mobile application in telecommunications, effort expectancy is the way products and services are presented through the ease of use on user experience, Fedorko et al. (2021) further emphasise the importance on effort expectancy, they assert that user experience must be relatable, easy to navigate and be in synchrony with customers' expectation. Similarly, Zhuo (2011) highlights that ease of use improves customer's satisfaction with mobile payment application.

H3: Effort expectancy will positively impact behavioural use of consumers to use mobile applications.

Social Influence

Social influence is the degree to which an individual perceives others believe they should use the new system. In the world of telecommunications, social influence is important. In everyday life, it could be the consumer's family, friends, or influential co-workers who are using the mobile application and persuading them to use it (AlFahl, 2018). Fedorko et al. (2021) highlight that social influence has a greater impact on an

inexperienced individual than on experienced potential users of these technologies, furthermore, customer's levels of satisfaction are highly influenced by their social circle when using mobile applications. Verkijika (2018) comments that customer use of mobile applications is driven by social influence which provides peace of mind to users through buying, checking balances and logging queries online.

H4: Social Influence will positively impact behavioural use of consumers to use mobile applications

Facilitating Condition

Facilitating conditions are how much a person thinks there is a technical and organisational infrastructure in place to help them use the system. It checks if the system is available, if people know how to use it, and if it fits well with the company's culture (Venkatesh et al., 2012). In the context of telecommunications, facilitating conditions explain customers' ability to download the mobile application, access to smart phones and customer support. To use the mobile application, you need a phone or tablet, a way to connect to the Internet, and the ability to download and install mobile applications. You also need to know about telecommunications and security.

Due to the direct relation and significant influence of facilitating conditions, it can be suggested that the appropriate level of human support and related infrastructure is required to ensure customers have a seamless and easy user experience of mobile application which will relate to high customer satisfaction. Therefore, we think that users will be more likely to adopt and use mobile applications if they have a positive view of conditions that make it easier to use, like getting help from others and getting support.

H5: Facilitating Conditions will positively impact behavioural use of consumers to use mobile applications

System Quality

This is the measure of the desirable characteristics of an information system (Ojo, 2017). The characteristics are perceived as ease of use, system features, response time, system flexibility and system reliability (Urbach & Müller 2012). In our context of this research, system quality refers to system availability time, is the mobile application always working or it has errors and downtime. Mobile applications deliver the instant

gratification that users of mobile application expect when performing transactions like buying or checking balances, results must be immediate (Tam & Oliveira, 2016). Therefore, to increase the adoption level of mobile application it might be necessary to include improved application layouts to be more attractive, provide interactive services and two-way communication, optimise the response time, and improve information and system quality (Alshehri, 2018)

System Quality might have a positive and significant effect on user satisfaction (Aditya et al., 2020). System Quality is more likely to have a positive impact on performance if the end-user feels satisfaction and uses the system (Tam & Oliveira, 2016). System quality can be illustrated in the results as a decisive factor predicting satisfaction and usage (Wang & Chen, 2010).

H6: System quality will positively impact behavioural use of consumers to use mobile applications

Individual Innovation

Individual innovation is the effect of users' attitudes and willingness to try mobile applications. Assuming that users are creative in how they accept new technology, the level of innovation will affect how much users accept mobile applications. (Yi et al., 2006). Individual innovation also means does the user or intended user like to experience new technology first, is the user someone good at discovering new technology (Lin, 2019)

H7: Individual Innovation will positively impact behavioural use of consumers to use mobile applications

Customer Satisfaction

Customer satisfaction in the mobile application can be defined as (i) security, do customers believe the mobile application is secure enough to transact, is the information submitted in the mobile application stored in a secure environment that will not be accessible by cyber criminals (Chell et al., 2015), (ii) ease of use, is the design of the mobile application intuitive enough for customers to understand their interactive process (Ohk et al., 2015), (iii) trust, is the mobile application secure enough to transact.

H8: Customer Satisfaction will positively impact behavioural use of consumers to use mobile application

2.12 Conclusion

This chapter presented the theoretical framework of this study. The chapter started by reviewing literature in relation to telecommunications using mobile applications and customer satisfaction. From the reviewed literature, popular theories of technology of use and adoption were presented and consideration of their appropriateness for this study was discussed. Thereafter, the theoretical framework section presented the theory underpinning the study. In closing the chapter, elements of the conceptual research framework were contextualised for studying mobile applications in the telecommunications industry. The next chapter discusses the research paradigm and methods used in the study.

Chapter 3: Research methodology

3.1 Introduction

The previous chapter reviewed prior literature on customer satisfaction, research framework, and the literature on the use of mobile applications. This chapter covers the research paradigm and the quantitative research approach literature. The research design, data collection methods, population, sampling, the research instrument, data analysis, and interpretation are then presented. Because the study needed to gain an overview of telecommunication mobile application users, which required a significant number of replies, and because the UTAUT model was employed to test the hypothesis, a quantitative research approach was adopted. Finally, the research limitations and threats to validity, reliability, and the study's ethical consideration are reviewed.

3.2 Research Focus

This study examines factors influencing customer perspectives on the use of mobile applications in a telecommunication industry in South Africa.

3.2.1 *The study of mobile applications at a customer level*

Prior studies that evaluated mobile application use promoted the use of the UTAUT model for predicting use behaviour due to its simplicity and robustness (Slade et al., 2015; Tarhini et al., 2016; Rahi et al., 2019). However, these studies fall short of measuring users' appetite for using mobile applications and do not include system downtime or inaccessibility of a mobile application as a factor influencing use. This study considers general awareness, customer satisfaction, individual innovation, and system quality to be independent factors that can be measured as a factor impacting usage research gaps.

Customer satisfaction as a factor for the use of mobile applications shows that the results of these studies are not very consistent. This means that we still do not know enough about how customer satisfaction affects use of mobile applications, especially for people in South Africa's telecommunications industry. The lack of literature that tells organisations how much customer satisfaction affects whether or not they use mobile technology makes it hard for them to decide whether or not to invest in mobile applications. This study tries to solve this research problem by identifying a coherent understanding on factors that may impact use of mobile applications. This research's objective are

- To examine factors influencing the use of mobile application in a telecommunication industry in South Africa.
- To examine the influence that mobile applications have on customer satisfaction.

3.3 Research Design and Approach

Research paradigm is one's view of the world including beliefs, perception, and awareness (Cohen et al., 2007). Research paradigms may vary in their fundamental ontology, which refers to their views on the nature of reality and in epistemology. Cameron and Price (2009) refer to knowledge considered valid and how the researcher should relate to the research under investigation. This study uses a method of research called "deductive." Deductive research makes it possible to build conceptual and theoretical frameworks that can be tested with real-world observations (Saunders et al., 2009). When there is a lot of literature that can be used to build a theoretical framework from which hypotheses can be made, it is best to use a

deductive method (Evans, 2015). In this method, the researcher starts with theory and then moves on to data to prove the framework (Collis & Hussey, 2009).

The goal of this research is to gather data that can be used to identify factors that influence the use of mobile applications and the impact of mobile application have towards customer satisfaction.

The use of qualitative or quantitative approaches is a further consideration. Quantitative and qualitative methods complement their respective approaches. Typically, the use of a quantitative approach is justified by the similarity between social and natural phenomena, implying that similar methodologies can be used to study both. Some, such as (Ponterotto 2005), argue that the researcher should not be limited to either quantitative or qualitative approaches, but should instead evaluate the merits of each method based on their characteristics and suitability to the research objectives.

Table 4: Qualitative and Quantitative Research Methods

Characteristics	Qualitative	Quantitative
Research Objectives	“Unearthing and identification of new ideas”, “thoughts”, “feelings”; “preliminary insights on and understanding of ideas and objects”.	“Validation of facts”, “estimates”, “relationships”, “predictions”.
Type of Research	“Normally exploratory designs”.	“Descriptive and causal designs”.
Type of Questions	“Open-ended”, “semi-structured”, “unstructured”, “deep probing”.	“Mostly structured”.
Type of Execution	“Relatively short time frames”.	“Usually significantly longer time frames”.
Representativeness	“Small samples limited to the sampled respondents”.	“Large samples”, “normally good representation of target populations”.
Type of Analyses	“Debriefing”, “subjective”, “content”, “interpretive”, “semiotic analyses”.	“Statistical”, “descriptive”, “causal predictions and relationships”.

This research uses quantitative research due to its ability to emphasise the computation of data collection (Bryman, 2012). The analysis of quantitative research is a scientific model of the research process which is objective and deductive (Bryman, 2012) and emphasis is placed on testing theories based on assumptions and is capable of generalising and replicating findings (Klob, 2008). The data is used to explain social dynamics and to determine the relationship between variables of cause

and effect. The key benefits of following the quantitative research approach is that it allows for a quick process, based on statistical evidence whereby the results are independent of the researcher's perspective (Creswell, 2009).

In this study, facts are used to find the links between customer satisfaction and their plans to use mobile applications, which lead to wider use of mobile applications in the telecommunications industry. The UTAUT model, as developed by Venkatesh et al. (2003), was used to explain the factors that may influence mobile application use and customer satisfaction. This quantitative model has been used to explain factors influencing the use of information systems and the impact on individual users.

3.3.1 Research Design

Research designs include the following types, descriptive, relational, experimental, and meta-analytical (Creswell, 2014). This study follows a relational, i.e., correlational, research design. It is a formal study using a non-experimental quantitative and cross-sectional approach. Field (2009) asserts that surveys are the best and most used research strategy for quantitative studies. Key advantage of surveys is that they are cost effective, allow the researcher to collect primary data quickly in real time and data can be statistically analysed immediately (Connolly, 2007). In this study, a cross-sectional survey is used (Bryman, 2012). A cross-sectional study is a type of research design in which data from many different people are collected at the same time. In cross-sectional research, you look at variables without affecting them (Thomas, 2022).

The first section asks questions about their demographics so that the findings can be analysed based on how the UTAUT factors are categorised. The second section attempts to elicit information about respondents' trust, privacy concerns, attitude, and comprehension of telecommunication mobile applications. The UTAUT model is utilised in the third section to identify factors that may influence the adoption of telecommunication mobile applications. In the final section, respondents are asked open-ended questions to identify the top issues that restrict or promote the use of telecommunication mobile applications.

By using a quantitative survey, the data can be kept anonymous. This ensures that the data is honest and reliable, and the results can be used to find out how mobile applications can be used in the telecommunications industry. Participants can fill out the survey anywhere and at any time, depending on their schedules (Dawson, 2017)

3.4 Data Collection Methods

This study makes use of online survey, an online survey is a structured questionnaire that the target audience fills out over the internet, usually by filling out a form (Gad, 2013). The benefits of an online survey for this study are cost effectiveness, ease of gathering the data, ability to create flexible questionnaires and ability to automate data input and handling (Sincero, 2012).

The data was gathered from the sample using an online self-completion questionnaire with close-ended questions. Field (2009) says that questionnaires are the most common way for quantitative behavioural researchers to get information. To make sure of the quality and design of a questionnaire survey, there are three standard questions to be addressed: (1) what questions should be asked, (2) how reliable the questions are, and (3) how valid the questions are (Zickmund et al., 2013). The above listed standard questions are in-line with the overall goals of the research, be clear, and avoid biases. A pilot study was done to make sure that the questions are easy to understand and that respondents could finish them as quickly as possible. Pre-testing questionnaires with experts in the field were used to assess content validity. Face validity was used to identify pilot testing, in which the researcher determined which questionnaire items were easy to comprehend and meaningful from the perspective of the public.

3.5 Population Sample

3.5.1 Population

South Africans aged 16 and up were included in this study. Users were mobile application consumers who were capable of and had utilised mobile applications in telecommunications. To obtain the needed number of replies, convenience sampling techniques were used. The researchers' acquaintance network, social media contacts, and university contacts who matched the inclusion requirements constituted the target group. There are a few research projects that attempt to determine what factors influence people's use of mobile applications for telecommunication, particularly in South Africa. This study and population were created to fill that research gap.

3.5.2 Sample and Sampling Method

Sampling is the process of choosing a small group of people from a large group to learn about the whole group (Cooper et al., 2006). In quantitative research, there are two sampling methods: probability and non-probability. With probability, each participant has an equal chance of being chosen at random. With non-probability, each participant has a low chance of being chosen at random (Bryman, 2012).

First, purposeful sampling is the deliberate selection of informants based on their ability to explain a certain theme, concept, or phenomenon (Robinson, 2014). A convenience sample of the acquaintance network linked to the researcher was chosen and telecommunication mobile application users retrieved from a database sourcing organisation are included in the convenience sample. The chosen acquaintance networks and database sourced users needed to have access to mobile applications and this was used as a selection criteria. Purposive sampling is a popular way for researchers to gather data because it takes less time and costs less money than other methods.

Secondly, snowball sampling is a non-probability method that lets the researcher find variables with rare characteristics. It is also called "chain-referral sampling." Here, the researcher identifies suitable primary data sources as per specification and uses them to find similar variables for the study (Zach, 2021). The researcher identified the suitable primary sources data and enable the first respondents to forward the survey to their network.

The two methods aims to get a large sample size to make up for a low response rate, missing data, or data that could not be used. The sample size should be big enough to perform statistical and multivariate analysis. It is therefore required that minimum sample sizes be obtained for statistical procedures, such as factor analysis and multiple regression analysis that were utilised. Field (2009) advises that bigger sample sizes increase statistical power to allow researchers to conclude on the statistical significance of observed relationships. The sampling method adopted for the study allows for a sample of 300 to be targeted across network acquaintances and sourced database from the sourcing organisations. South Africa has a population of 58.56 million (Worldometer, 2022), there are about 20 to 22 million people in South Africa using a smartphone, which accounts for about one third of the country's population

(Statista, 2022). 90% of the smartphone users are within MTN, Vodacom, Telkom and Cell C (Gilbert, 2022), these users fit the required sample.

Table 5: Examples of previous studies

Scope of Study	Sample used	Data Analyst	Authors
Understanding factors affecting the use on mobile application Fujian, China	300 (response rate 81%)	SEM	(Chen Li, 2019)
A quality management perspective on customer service in the South African mobile telecommunication industry	300 (59% response rate)	SEM	(Du Preez, 2020)
Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM	250 (39% response rate)	SEM	(Oliveira et al., 2014)
Exploring factors affecting academics' adoption of emerging mobile application an extended UTAUT perspective	355 (67% response rate)	SEM	(Hu et al., 2020)

Even though the previous studies (Oliveira et al., 2014; Hu et al., 2020; Du Preez, 2020) were used to figure out the sampling size, the following were also taken into account: "the number of groups within the sample," "the value of the information and the accuracy required of the results," "the cost of sampling and the variability of the population," and "the number of groups within the sample" (Collis & Hussey, 2009). Therefore, the 300 samples used in this study are the same as those used in other studies, as shown in Table 4.

3.6 The Research Instrument

The research instrument used in the study is an online self-completion questionnaire (also referred to as self-administered questionnaire). This method lets the researcher get answers from multiple questionnaires at the same time, since an interviewer is not needed (Bryman, 2012). It also allows for objectivity, privacy, and less social desirability since people will read the questions and write down their own answers. Stokes (2012) advises that online questionnaires are quick and efficient and allow for a broader geographical reach. The survey had a mix of unique questions that are based on the UTAUT frameworks and methods (Venkatesh et al., 2003).

The research instrument was split into four sections; Section A required participants to fill in their demographic information, Section B related to factors of influencing use of mobile application experience in terms of telecommunications. Section C required participants to complete information regarding respondent's factors that hinder or propel the use of telecommunication mobile applications. The demographic data and general information collected assisted in providing a correlation between the sample and the general population, these questions were closed-ended providing the participant with a choice of a selection of predetermined answers. A 7-point Likert scale for Section A and B was utilised as it is an easy factor to use to evaluate both independent and dependant variables on a scale of strongly disagree (1) to strongly agree (7). The survey was pre-tested by academic experts and piloted on 10 individuals to improve content validity. The researcher's framework has the following factors that were used to identify factors that hinder or propel use of mobile applications.

General Awareness (GA): Independent factor, the extent to which a person is aware that use of mobile applications can make their lives easy (Stanciu & Rîndaşu, 2021).

Performance Expectancy (**PE**): Independent factor, The extent to which a person thinks that using a computerised system will help him or her do his or her job better (Venkatesh, 2003)

Effort Expectancy (**EE**): Independent factor, is another part of the UTAUT model that measures how easy it is to use a piece of information technology (Venkatesh et al. 2003)

Facilitating Conditions (**FC**): Independent factor, as a factor in UTAUT, it means how much a person thinks that the organisational and technical infrastructures needed to use the planned system are available (Ghalandari, 2012)

Social Influence (**SI**): Independent factor, is how much a person thinks that other people think they should use the new system (Venkatesh et al., 2003).

System Quality (**SQ**): Independent factor, system quality refers to system availability time, is the mobile application always working or it has errors and downtime (Urbach & Müller 2012).

Individual Innovation (**II**): Independent factor, refers to the influence of users' attitudes and acceptance of new technology like mobile applications and new concepts on their attitudes towards trying mobile application (Yi et al., 2006).

Customer Satisfaction (**CS**): Independent factor, refers to the customer observations after using mobile application

The following table shows the factors and examples of survey question that were used in this study. Some of the factors are derived from Venkatesh et al. (2003) and some were identified from the research gap by the researcher. See table 5 for the researcher's example on research question

Table 6: Examples of research questions

Factors	Question #	Survey Question	Reference
General Awareness (GA)	GA 1	I believe that mobile application can simplify transaction with my telecommunication service provider	(Stanciu & Rîndașu, 2021). (Onaolapo & Oyewole, 2018)
Performance Expectancy (PE)	PE 1	Using mobile application enables me to accomplish my transactions more quickly	
Effort Expectancy (EE)	EE 1	I do not require much technical expertise to effectively use mobile application for telecommunication	
Facilitating Conditions (FC)	FC 1	I have the skills and abilities to use mobile applications for telecommunication	
Social Influence (SI)	SI 1	People around me make use of mobile applications	
System Quality (SQ1)	SQ 1	My mobile application is always accessible?	
Individual Innovation (II 1)	II 1	I enjoy testing or trying new technology like mobile applications	(Koellinger, 2008)

Customer Satisfaction	CS 1	Rate your level of agreement with the statement "I'm satisfied with the use of mobile applications"	(Meena & Geng, 2022).
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The questions were based on the researcher's framework, an extension of the UTAUT framework with general awareness, system quality, individual innovation and customer satisfaction. The research questions aim to find out how these independent and dependent factors are connected and how they will affect the use of mobile applications.

3.6.1 Pre-testing and Pilot testing of the questionnaire

During pre-testing, the content validity of a questionnaire was considered. Hilton (2015) says that pre-testing is a way to make sure that questions have the desired effect and are clear enough for participants to understand. During pre-testing, an electronic questionnaire was sent to academic experts, who were asked to review and evaluate to see if it made sense and was acceptable. The experts provided helpful suggestions, which led to the addition of "variety seeking" or a longer list of questions about experience, more questions about what kind of performance was expected, and shorter, clearer questions, in general. Changes were made based on the comments and suggestions. Further, Cooper and Schindler (2011) say that a pilot study could help researchers find flaws in the way data is collected, the average amount of time it takes to finish, and any other problems. Based on the observation and feedback received, modifications were made.

3.7 Procedure for data collection

Qualtrics, an online survey tool, was used to run the survey. Qualtrics helped with planning, distributing, collecting, and summing up the research data (Sage, 2020). The researcher sent out an initial set of surveys to their LinkedIn network. Reminders were sent to people who had not responded. LinkedIn was used to distribute the online survey and emails were sent.

3.8 Data analysis and screening

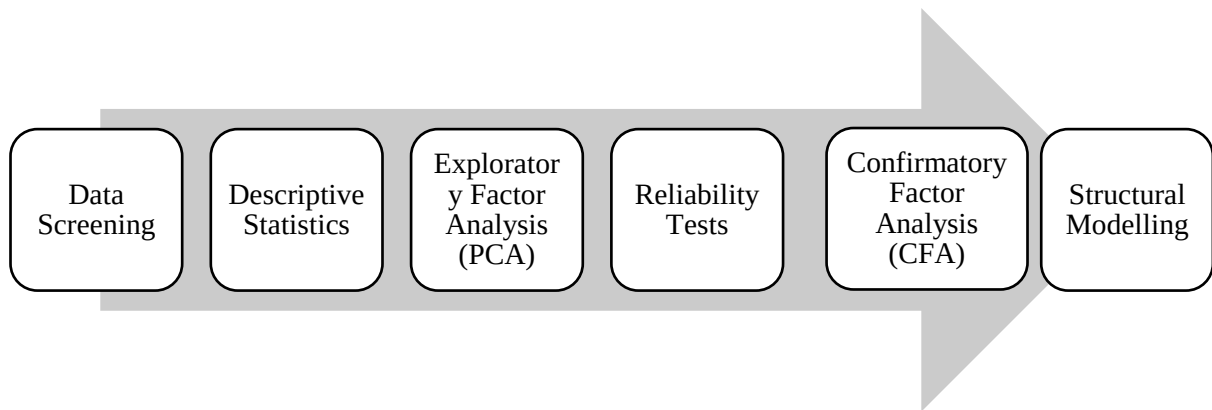


Figure 4: Data analysis and interpretation

Data Screening Quantitative data can be analysed in many ways, from simple (i.e., univariate) to complex (i.e., multivariate), such as factor analysis, cluster analysis, and multiple linear regression (Babbie, 2013). Once the data was captured from Qualtrics, it was cleaned to ensure data integrity where the data was cleaned, validated and edited to ensure coding is accurate. Field (2013) says that missing data during the data collection process could be caused by things like long questionnaires, limited time, people exercising their right not to answer, or questions that were too personal to answer.

Descriptive statistics was used to illustrate the central tendency and distribution of the data. The multiple linear regression analysis method was used because the UTAUT model looks at the relationship between the independent ideas and variables and the dependent variable (Behavioural Use) (Creswell, 2014).

Validity and reliability was verified in order for statistical techniques to be used for hypothesis testing. Specifically, principal components analysis was carried out along with tests of internal consistency reliability through Cronbach's alpha.

Principal Components Analysis (CPA) was used to make sure that the data is convergent and different (Miller, Acton, Fullerton, & Maltby, 2002). Convergent validity means that the items on a research instrument are related to what they are meant to measure. This was done by having a high correlation between items on a research instrument that are meant to measure the same factor (Bhattacharjee, 2012).

Reliability is the consistency of a concept that is being measured and gives the same results when it is tested again and again (Neuendorf, 2002). In research, reliability is the ability of an instrument to measure how often the same research results are found and produce results (Cooper et al., 2006). Internal consistency reliability was used for this study because it is a more common way to measure the consistency of research instruments used to collect data on factors in quantitative research (Drost, 2011). For the internal reliability analysis of a survey with more than one question, Cronbach's alpha was used to get a number for how consistent the questions are with each other. This method was used to make sure that items measured in the same structure will give the same results in the research that will be done later. Cronbach's alpha says a score cannot be lower than 0.7. Once scales have been proven to be reliable, composite scores were made and used in future hypothesis testing.

Hypothesis testing uses what has been seen to figure out if the ideas in this paper could be supported or disproved by what has been seen (Bhattacharjee, 2012).

After cleaning the data and making sure it is correct and reliable, inferential statistics were used to test the study's hypothesis about the relationship between independent variables and dependent variables. Correlation analysis was used to look at how two different things relate to each other. Sub-group analysis was used to see if age and gender make a difference. Multiple regression analysis were done to give us more information about how the UTAUT factors affect the behavioural use.

3.9 Measurement and Structural Model

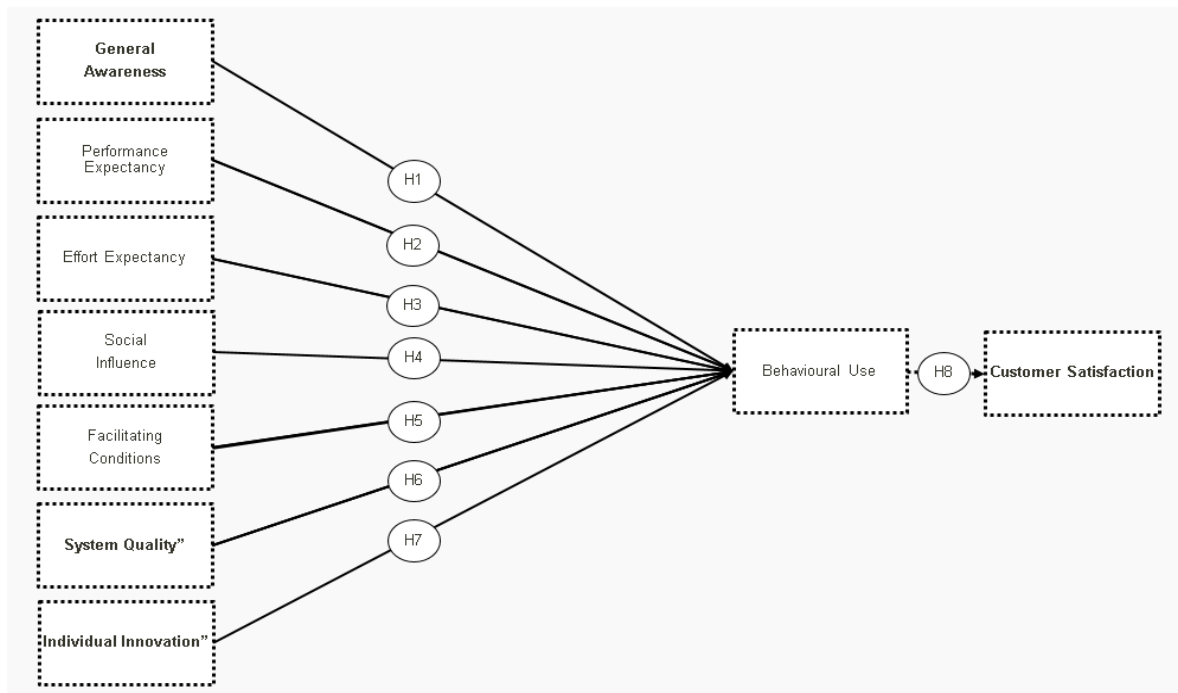


Figure 5: Researcher's Own Model

3.10 Structural Fit Model

SEM requires that model fit must be examined of an estimated model to determine how well it models the data. The fit statistics such as “Chi-square (X^2)”, “Root Mean Square of Error Approximation (RMSEA)”, “Goodness of Fit Index (GFI)”, “Adjusted Goodness of Fit Index (AGFI)”, “Comparative Fit Index (CFI)”, “Tucker-Lewis Index (TLI)”, “Normed Fit Index (NFI)”, and “Chi-square degree of freedom” were examined to confirm the factor structure and indicate if the models and theories were acceptable or not (Barrett, 2007; Fan & Sivo, 2005). Table 6 describes different model fit criteria and acceptable levels.

Table 7: Model Fit Criteria and Acceptable Fit Level

Model Fit Criteria	Description	Acceptable level	Source
"Goodness-of-fit (GFI)"	"The GFI is the degree of fit between the hypothesised model and the observed covariance matrix".	0 (no fit) to 1 (perfect fit)	(Barrett, 2007)
"Normed fit index (NFI)"	"The NFI evaluates the discrepancy between the chi-squared value of the hypothesised model and the chi-squared value of the null model".	Value must exceed 0.9	(Fan & Sivo, 2005) (Byrne, 2013)
"Comparative fit index (CFI)"	"The CFI assumes that all latent variables are uncorrelated and compares the sample covariance matrix with the null model".	Value must exceed 0.9	(Fan & Sivo, 2005)
"Incremental fit index (IFI)"	"The IFI's purpose is to correct the issue of parsimony and sample size related to NFI".	Value must exceed 0.9	(Byrne, 2013) (Hoe, 2008).
"Root mean square error of approximation (RMSEA)"	"Informs how well the model, with indefinite but optimally selected parameter estimates, would fit the population's covariance matrix".	Value must be <0.05	(Cheung & Rensvold, 2002)
"Chi-square (χ^2 /DF)"	"To assess the magnitude of discrepancy between the sample and fitted covariance matrices".	Value must be below 3	(Cheung & Rensvold, 2002)

Model Fit Criteria	Description	Acceptable level	Source
	The estimation process is dependent on the sample data		
"Tucker-Lewis Index (TLI)"	"The TLC utilises simpler models and is known to address the issue of sample size associated with NFI".	Value must exceed 0.9	(Hoe, 2008).
"Relative Fit Index (RFI)"	"The RFI compares the chi-square for the hypothesised model to one from a "null", or "baseline" model".	Value must exceed 0.9	(Byrne, 2013)

All of the proposed models for this study were tested in the same way. For each model test, SEM goodness-of-fit indices were used to see if the pattern of variances and covariance's in the data matched each proposed theoretical model (Awang, Afthanorhan & Asri, 2015).

The root mean square error of approximation (RMSEA) was used to evaluate the model's covariance structure. It reduces the challenges and inconsistencies that are frequent when testing models using large sample sizes. As a result, it has evolved into a valuable tool for directing difficult decisions about the usefulness of models, rather than a replacement for such decisions (Hoe, 2008). For a good model fit, RMSEA should be less than or equal to 0.5. χ^2 and other goodness of fit indices are also reported and compared to recommended acceptable values.

3.11 Possible limitations and challenges of the study

Validity and reliability have to do with knowing how the measurement scales work and how accurate they are (Wilkins, 2010). Factor validity, in the form of convergent and discriminant validity, was established using the Principal Component Analysis (PCA)

technique. PCA is a way to reduce the number of dimensions in these datasets, making them easier to understand while losing as little information as possible.

Scale reliability was established using the internal consistency approach described above. Internal validity is about how well the research tool was made (Field, 2009). Cooper et al. (2006) say that this type of measurement focuses on whether the tool always measures what it is supposed to measure when it is used more than once. Thomas (2004) says that asking questions as a way to collect data could be hard because different people could have different ideas about what the questions mean.

The instrument has not been tested for language problems that people in the population sample might have. Surveys could also have problems like acquiescence bias, which is when people tend to agree with statements, and a social desirability bias. As the study was done online, there is no way to check that the data was entered by the participant. The researcher therefore relies on the participants' honesty and credibility.

It is important to note, though, that because this study is cross-sectional, the data lacks temporal precedence. This means that causal inferences cannot be made from the data alone. Instead, causal inferences (like "performance expectancy makes people more likely to use mobile application") were made by referring to the theory that is used to develop the hypotheses. So, the fact that we cannot control all of the confounding factors is another item that could hurt the study's internal validity.

Cooper et al. (2006) say that external validity is about how research results could be applied to the whole population, and Weiner (2007) says that it is about making sure that the results from the sample could be used in real life. Since convenience and snowball sampling were used, the result may not be a true reflection of the sample. For instance, most of the participants would live in the area around Johannesburg, so, it would be harder to apply the results to other cities in the country.

Surveys often have low response rates, which could cause a non-response bias and make it harder to use the results in other places. But the intended target population was made up of people of different ages, genders, employment statuses, annual incomes, and levels of education. This was the consumer group for telecommunications mobile applications, and the results were useful even if they do not represent the whole consumer population.

3.12 Quality Assurance

The UTAUT model is based on theories that have been around for a long time, such as TAM and TPB. It has been used and adopted by a number of researchers over the years, which shows that the model is reliable and valid. Even though the concepts are linked and used together, they describe different things about the measuring device. Validity is about how accurate a measure is, while reliability is about how consistent it is. A measuring tool can be accurate even if it is not valid, but it is more likely to be accurate if it is valid, claim Sürücü and Maslakci (2020).

3.12.1 Validity

The UTAUT model is a popular framework that has been used in a number of studies to find out how new technologies are used. This model has been tested by a number of consumers with different jobs, backgrounds, organisations, experiences, and ways of thinking. The questionnaire was set up so that it makes sense in the context of a mobile application. This ensures that everyone who answers the questions gets the same idea from them. The survey used the same concepts and variables as other studies. The only difference was that it was written in terms of how mobile application users feel about telecommunication mobile applications.

Cooper and Schindler (2011) also say that a pilot study helps researchers find flaws in the way data is collected; a pilot study was performed to test reliability and validity of the concepts.

This was done with a small group of people who use telecommunication mobile applications to ensure the questionnaire was easy to find and understand. The results were scrutinised, and all important elements were fixed, such as making the questionnaire understandable. The survey was sent out once it was clear and the content was understood, the link to the questionnaire was working, and the data was ready to be analysed.

The researcher additionally worked under supervision to ensure that the competence was practiced.

3.12.2 Reliability

The UTAUT model has been used for many years in many different industries and technologies, and researchers still use it to find out if users are likely to use new or

emerging technologies. So, the research could be repeated to look for trends and find new areas to study. This model has been used before, which is the main reason why it is being used in this study. The Cronbach Alpha coefficient method was used to test how well this model worked. Since there is not a lot of information about this study in South Africa, it may be hard to be sure of how accurate the results are in this situation, but the results were checked against the results from using the conceptual UTAUT model.

3.13 Ethical Considerations

The study was conducted with no intention of causing harm or infringing on the respondents' rights. To protect the rights of all responders, all ethical standards were followed. The study safeguarded all respondents' privacy, anonymity, and confidentiality. All responders expressed a desire to participate. There was no information exchanged with the university or any other person or entity that might be used to identify the respondent. The final report contains only data insights and features; no personal information was included. Data was stored on a password-protected computer and will be erased ten years after the research findings are public. Participation was entirely voluntary, with no incentives utilised to encourage it. The study's purpose and limitations were conveyed clearly and publicly from the start, utilising a cover page or disclaimer attached to all methods of survey dissemination. This was done to ensure that responders understood the purpose of the study. The ethical protocol number assigned for this study is WBS/DB478138/393

3.14 Conclusion

This chapter examined the research methods employed in this study, including the research design and strategy, demographic and sample approach, method of data collecting, including the research instrument, and pre-testing and pilot testing. After data analysis and interpretation for reliability and validity, ethical considerations were taken into account.

Chapter 4: Presentation of results and findings

4.1 Empirical Results

In Chapter 3, the research methodology was discussed. This chapter analyses the data collected from the empirical study. A survey was conducted by the distribution of questionnaires to obtain opinions from individual users of mobile application in the telecommunication industry in South Africa. The data collected from mobile applications users was used to put the hypothesised model to the test. The first sections discusses sample size, respondent demographics, data screening, and sample outliers. Further, the next sections present descriptive statistics, an assessment of normality, and sample adequacy for the empirical data analysed. Importantly, before analysing the results of the tested model, the principal component analysis, reliability and validity, and correlation matrix are performed. Finally, the results of the model are discussed, and conclusions are presented.

4.1.1 Sample Size

A total of 300 mobile application users were invited to participate in the study (refer Chapter 3.4.1). A total of 157 (response rate = 52%) telecommunication mobile application users participated in the study. This relatively high response rate aids in reducing threats to the validity of conclusions caused by non-response bias. However, 47 responses were eliminated because many data items were missing and some were incomplete responses. The final usable sample thus consisted of 110, resulting a 36.67% response rate.

4.1.2 Demographics

Before using the collected data to test the SEM model, "descriptive statistics" are presented to provide an overview of the sample under study. The demographic profile of the respondents is presented in the below figures. Demographic information was provided by all 110 usable respondents.

4.1.2.1 Age

The results in figure 5 indicate the respondents who are aged between 41 and 45 years old (25.5%) and less than 25 years old (25.5%) were the highest category of groups, followed by respondents who are aged between 36 and 40 years old as well

as more than 46 years old account for 15.5%. Therefore, the majority (56 participants representing 51%) of respondents were between age of 41 and 45 years old and below 25 years.

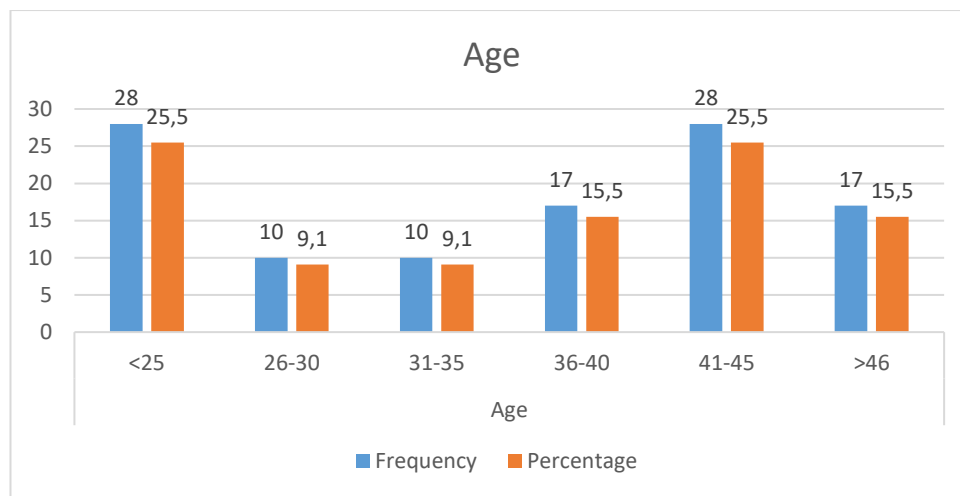


Figure 6: Age

4.1.2.2 Education

Most of respondents had a good education, with 34 (30.9%) having obtained a bachelor's degree, 23 (20.9%) respondents had an honours degree while 21 (19.1%) were in possession of a diploma, and 19 (17.3%) were below matriculation. There were 13 (11.8%) respondents who had a master's degree. This implied that the respondents were well qualified to participate in this study.

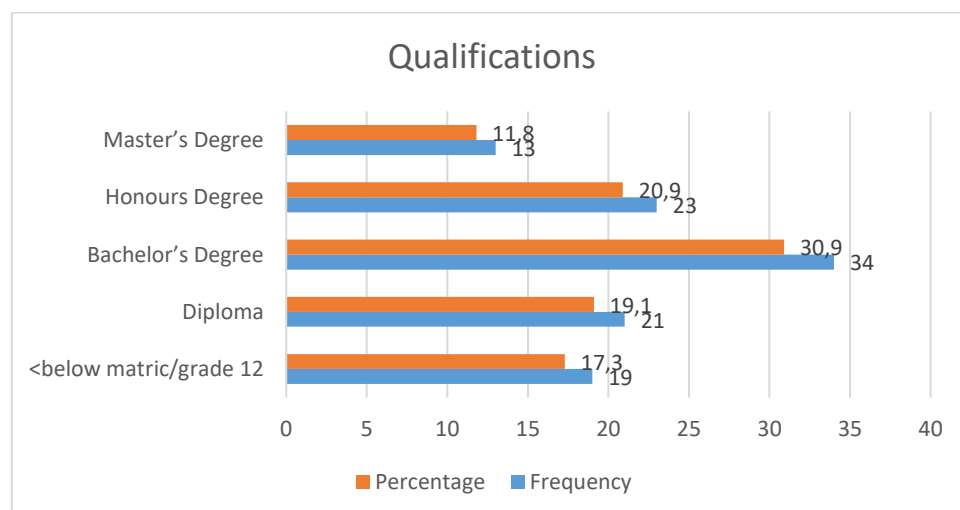


Figure 7: Qualifications

4.1.2.3 Mobile Network

The respondents comprised a wide spread of mobile network users in South Africa. 74 (67.3%) users were respondents subscribed to Vodacom as a service provider, 15 (13.6%) respondents were subscribed to MTN and 15 (13.6%) for Telkom. Cell C had 6 (5.5%) respondents who were subscribed to this network.

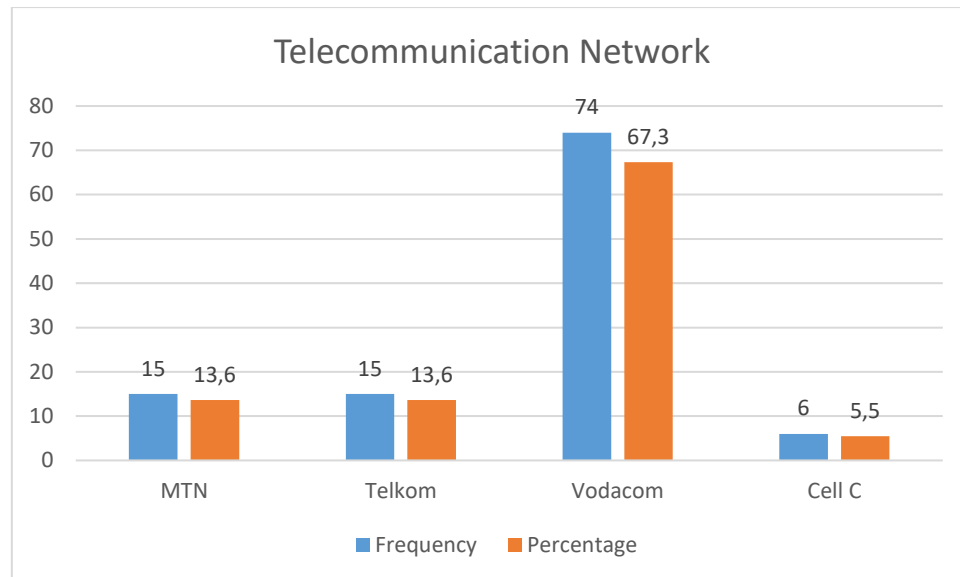


Figure 8: Telecommunication Network

4.1.2.4 Smartphone Ownership

Results further indicate that most respondents are using smartphones 109 (99.1%), with the exception of 1 (0.9%) respondent who is using other devices with the feature of smartphones (e.g. Mobile smartphones and tablets)

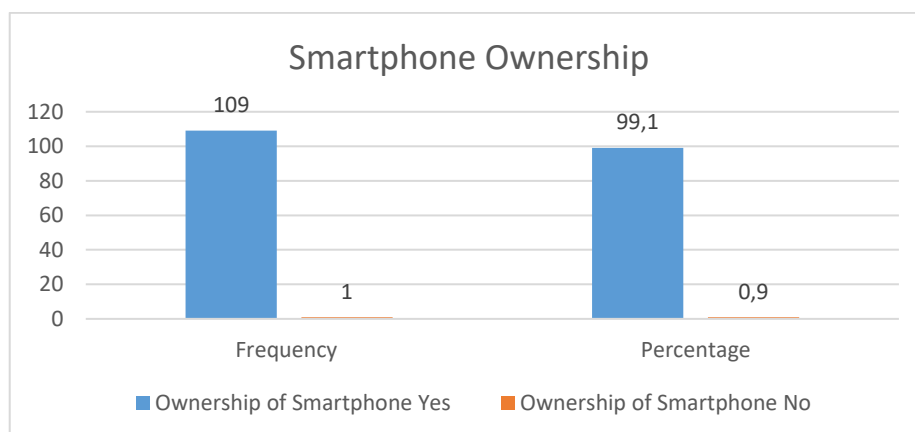


Figure 9: Ownership of Smartphone

4.1.2.5 Experience in using Mobile Application

There were 46 (41.8%) respondents who had more than six (6) years' experience in using Mobile Applications. Twenty-four (21.8%) respondents had less than two years in using mobile applications. 23 (20.9%) respondents have been using mobile applications for a period between 2 – 4 years. Seventeen (15.5%) respondents have been using mobile applications for a period between 4 – 6 years.

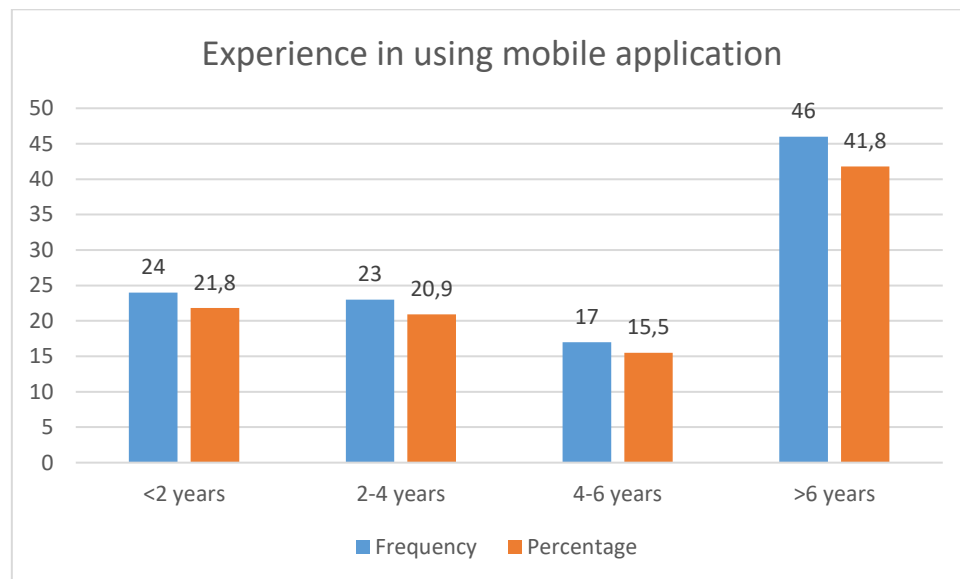


Figure 10: Experience in using smartphone

4.1.2.6 Residential Province

The majority of respondents were based in Gauteng - 70 (63.6%) and 29 (26.4%) were from Eastern Cape, while Western Cape has 5 (4.5%) respondents and Limpopo 1 (1%).

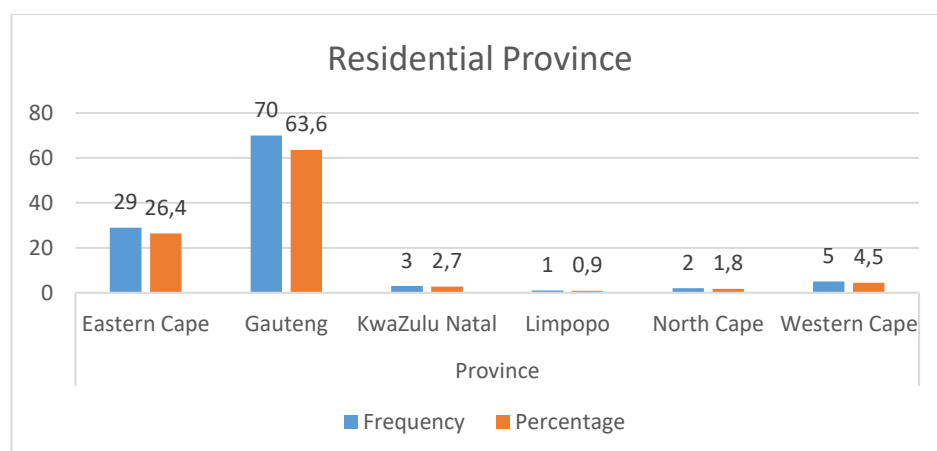


Figure 11: Residential Province

4.1.2.7 Average spent on their smartphone bill

The majority of respondents, 25 (22.7%), spend, monthly, between R601 and R1000, with the second largest group being 24 (21.8%) respondents who spend more than R1000. Twenty-three (20.9%) smartphone purchases range between R301 and R600. The least amount of money spent on a smartphone was R4 (3.6%) less than R30.

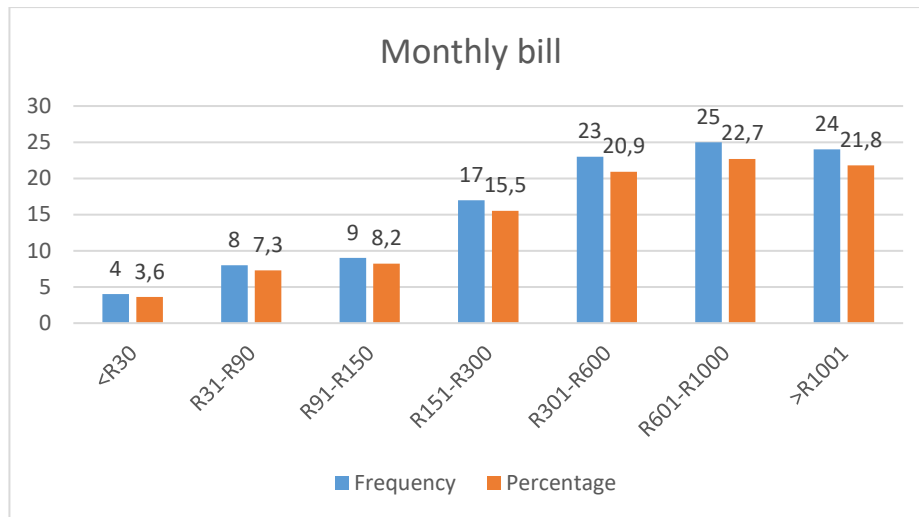


Figure 12: Monthly Bill

4.1.2.8 Understanding of Smartphones

The respondents are familiar users of smartphones, mostly they were average to very good in terms of smartphones use. Most of the users indicated themselves as very good users of smartphones - 40 (36.4%). While the next group indicated themselves as good users of smartphones - 35 (31.8%) and the last of the majority group indicated themselves as average users of smartphones - 27 (24.5%) and very few users indicated that they were very poor in using the smartphones - 3 (2.7%).

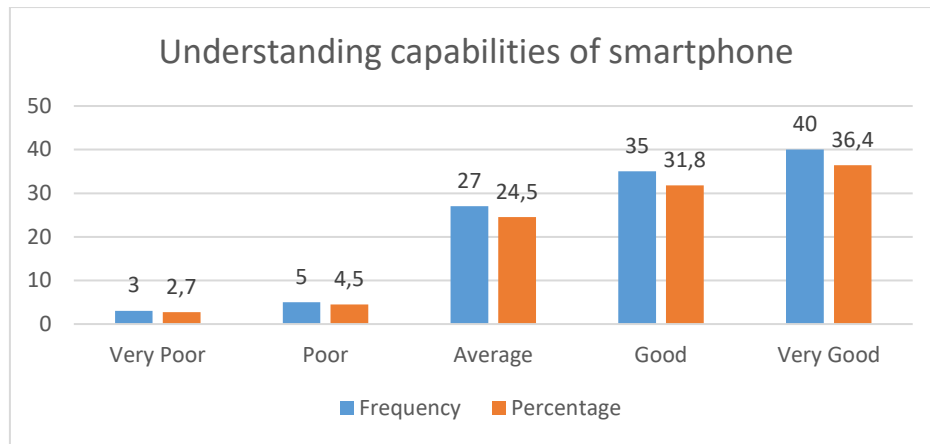


Figure 13: Understanding capabilities of smartphone

4.1.2.9 Service Preference

The majority of the respondents has preference of using their smartphones to serve. Seventy-three (66.4%) preferred smartphone interaction only with their telecommunication service provider. Thirty-one (28.4%) preferred to use their smartphones and visit cellular shops. The least, 6 (5.5%), preferred to use Cellular Shops and ATMs

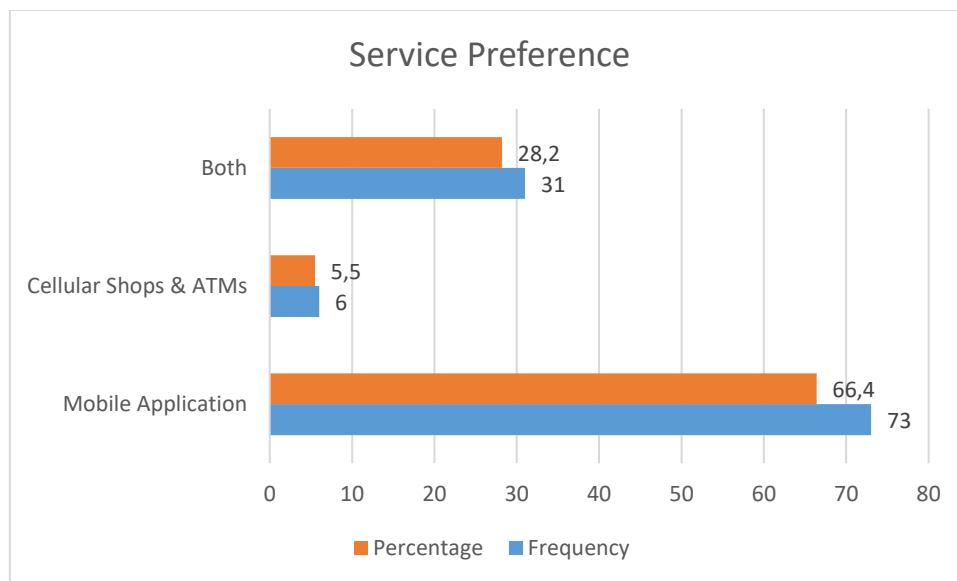


Figure 14: Service Preference

4.1.3 Conclusion

Overall, the demographic data suggests that respondents have a wide range in age, have smartphone experience, and are representative of users of mobile applications with sufficient years of experience. The respondents are deemed suitable for testing

the model on customer usage of mobile applications in the telecommunications industry in South Africa.

4.1.4 Data Screening

The collected data was analysed with the Statistical Package for the Social Sciences (SPSS) Version 25 and screened for missing data. One hundred and fifty-seven responses were received, one hundred and ten responses were usable and six respondents were missing information in data performance expectancy, facilitating conditions, individual innovation and effort expectancy (Table 7). The median of nearby point's method was used to handle missing data. The median of nearby point's method computes the average of nearby surrounding values (Byrne, 2013). These numbers are calculated using a span of nearby point's option in the SPSS programme. The median is calculated by taking into account all of the values of the item factor data from the upper and lower bounds, and the calculated value is used to replace the missing value (Hair et al., 2010).

Table 8: Missing responses description

Item	Number of missing responses
Facilitating Condition	1
Performance Expectancy	2
Individual Innovation	2
Effort Expectancy	1

4.1.5 Sample Outliers

Outliers are data points that differ significantly from the rest of the observations (Hair et al., 2010). Responses with unusually high or unusually low values were screened for outliers (Tarka, 2018). Extreme responses may indicate that the respondents do not share the same demographic. An extreme response is one that is more than three standard deviations above or below the sample mean (Hair et al., 2010). The standardised score of an item represents the number of standard deviations from the mean. The standardised scores of each respondent on each questionnaire item were examined, and no outliers were discovered, given that all of the questionnaire items were graded on a single scale.

4.2 Descriptive Statistics

A single scale was used to measure the factors under investigation in this study. Firstly, the factors such as performance expectancy, system quality, individual innovation, effort expectancy, customer satisfaction, facilitating conditions were measured on a seven-point Likert scale where the value of 1 corresponds to "Strongly disagree" and the value of 7 corresponds to "Strongly Agree". As a result, "3.5" is the midpoint of the seven-point Likert scale. This means that when the mean values were less than 3.5, the majority of respondents agreed with the statements. Values ranging from 3.5 to 4.5 indicate that respondents tended to be more neutral. When the means are greater than 4.5, the majority of respondents tend to agree or strongly agree with the statements. Table 8 shows the mean, standard deviation, skewness, and kurtosis of composites

Table 9: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
GA	110	1,4	6,8	5,10727	1,60748	-1,23491	0,23045	0,10057
PE	110	1,4	6,6	5,46000	1,27806	-1,90606	0,23045	2,73979
EE	110	1,6	6,6	5,45273	1,31851	-1,44934	0,23045	0,68789
SI	110	1,6	6,6	4,96000	1,46364	-1,08527	0,23045	-0,10257
FC	110	1,6	6,6	5,60182	1,08721	-2,27263	0,23045	4,93749
BU	110	1,5	6,75	5,91591	1,23048	-2,47724	0,23045	5,39474
II	110	1,4	6,6	5,11091	1,30337	-1,29777	0,23045	0,99989
SQ	110	1,3	6,7	5,36667	1,08361	-1,29053	0,23045	2,17915
CS	110	1,5	6,5	5,00000	1,37682	-1,23383	0,23045	0,36101
Valid N (list wise)	110							

* Composite scores for each factor calculated as the arithmetic average of its original scale items weighted equally

4.2.1 General Awareness

General Awareness is intended to obtain experience information on the use of mobile applications, the belief that mobile applications can help them to be more efficient, trust in the information provided by the mobile application, feel comfortable using the mobile application, and provide a better interaction with the mobile application. As shown in Table 9, the overall mean is 5.1 and the standard deviation is 1.7. This suggests that most respondents agree that mobile applications help them to be more efficient and save time.

Table 10: Descriptive Statistics for General Awareness

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
GA1	110	1	7	5,1273	1,8330
GA2	110	1	7	4,9364	1,8187
GA3	110	1	7	5,0818	1,7823
GA4	110	1	7	5,0364	1,6751
GA5	110	1	7	5,3545	1,7483

4.2.2 Performance Expectancy

Performance Expectancy is intended to gather information on the use of telecommunication mobile applications, as well as beliefs that mobile applications could help them become more efficient, save time while performing other tasks, and better manage monthly bills, thereby improving their performance. As shown in Table 10, the overall mean is 4.66 and the standard deviation is 1.9 this suggests that the majority of respondents agree that mobile applications help them be more efficient and save time. Five items were adopted from prior work related to attributes of mobile application use (Venkatesh et al., 2003) and "measured using a 7-point Likert scale". Table 10 shows that the mean of the items ranges between 4.50 (1.938) and 4.92. (1.924). This indicates that respondents tend to agree with statements reflecting performance expectations in a telecommunication mobile application.

Table 11: Descriptive Statistics for Performance Expectancy

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
PE1	110	1	7	4,6636	1,9921
PE2	110	1	7	4,5000	1,9383
PE3	110	1	7	4,6727	2,0946
PE4	110	1	7	4,9273	1,9238
PE5	110	1	7	4,5364	2,0304

4.2.3 Effort Expectancy

Effort Expectancy is designed to extract information on the use of telecommunication mobile applications, beliefs about how user-friendly mobile applications are, and respondents' ability to navigate mobile applications. As shown in Table 11, the overall

mean is 5.4 and the standard deviation is 1.5. This suggests that the majority of respondents agree that mobile applications are simple to use and do not require any special knowledge to operate. Five items were adopted from prior work related to attributes of mobile application use (Venkatesh et al., 2003) and "measured using a 7-point Likert scale". As shown in Table 11, the mean of the items ranges between 5.22 (1.530) and 5.75. (1.563). This suggests that respondents tend to agree with statements expressing effort expectations in telecommunication mobile applications.

Table 12: Descriptive Statistics for Effort Expectancy

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
EE1	110	1	7	5,4636	1,4942
EE2	110	1	7	5,2273	1,5305
EE3	110	2	7	5,2455	1,4154
EE4	110	1	7	5,7545	1,5633
EE5	110	1	7	5,5727	1,5472

4.2.4 Social influence

Social Influence is designed to extract information on users of telecommunication mobile applications beliefs that the use of mobile applications improves social status amongst peers. As shown in Table 12 below, the overall mean is 4.96 and the standard deviation is 1.6. This suggest that most of respondents tend to agree that the mobile applications elevate their social status. Five items were adopted from prior work related to attributes of mobile application use (Venkatesh et al., 2003) and "measured using a 7-point Likert scale". As shown in Table 12, the mean of the items ranges between 4.62 (1.754) and 5.263. (1.548). This indicates that respondents tend to agree with the social influence brought use of telecommunication mobile applications.

Table 13: Descriptive Statistics for Social Influence

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
SI1	110	1	7	5,2636	1,5485
SI2	110	1	7	5,1636	1,4369
SI3	110	1	7	4,9545	1,6445
SI4	110	1	7	4,7909	1,8329
SI5	110	1	7	4,6273	1,7550

4.2.5 Facilitating Conditions

Facilitating Conditions is designed to extract information on the users of mobile telecommunications applications beliefs that the necessary infrastructure and tools to support the use of mobile applications exists (3G or higher network). As shown in Table 13 below, the overall mean is 5.6 and the standard deviation is 1.3. This indicates that most respondents strongly agree that the mobile applications are properly supported by existing infrastructure. Five items were adopted from prior work related to attributes of mobile application use (Venkatesh et al. 2003) and "measured using a 7-point Likert scale". As shown in Table 13, the mean of the items ranges between 5.41 (1.251) and 5.900. (1.347). This implies that respondents strongly agree with facilitating conditions that are prevalent in telecommunication mobile applications.

Table 14: Descriptive Statistics for Facilitating Conditions

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
FC1	110	1	7	5,6364	1,3595
FC2	110	1	7	5,6000	1,3423
FC3	110	1	7	5,9000	1,3474
FC4	110	1	7	5,4545	1,2825
FC5	110	2	7	5,4182	1,2517

4.2.6 Behavioural Use

Behavioural Use is designed to extract information on the use of telecommunication mobile applications, beliefs that mobile applications are a usable technology, and preferred point of contact. As shown in Table 14, the overall mean is 5.91 and the standard deviation is 1.4. This suggests that the majority of respondents agree that mobile applications are their preferred method of contact. Four items were adopted from prior work related to attributes of mobile application use (Venkatesh et al., 2003) and "measured using a 7-point Likert scale". As shown in Table 14, the mean of the items ranges between 5.89 (1.370) and 6.081. (1.440). This indicates that respondents agree with the statement that telecommunications mobile applications are preferred service touchpoints.

Table 15: Descriptive Statistics for Behavioural Use

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
BU1	110	1	7	6,0818	1,4408
BU2	110	1	7	5,6909	1,4255
BU3	110	1	7	6,0000	1,5325
BU4	110	1	7	5,8909	1,3704

4.2.7 Individual Innovation

Individual innovation is built to extract information on the use of telecommunication mobile applications, beliefs that mobile applications are a technology that improves the users' lives by allowing them to interact with their telecommunication service provider. As shown in Table 15, the overall mean is 5.11 and the standard deviation is 1.5. This indicates that the majority of respondents believe that mobile applications improve the user's interaction with the service provider. Five items were adopted from prior work related to attributes of mobile application use (Venkatesh et al., 2003) and "measured using a 7-point Likert scale". As shown in Table 15, the mean of the items ranges between 4.70 (1.461) and 5.33. (1.389). This indicates that respondents agree with statements about how telecommunication mobile applications improve their interactions with telecommunication service providers.

Table 16: Descriptive Statistics for individual Innovation

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
II1	110	1	7	5,0273	1,5293
II2	110	1	7	5,3364	1,3899
II3	110	1	7	5,1636	1,5055
II4	110	1	7	4,7091	1,4611
II5	110	1	7	5,3182	1,6251

4.2.8 System Quality

System Quality is designed to extract information on the use of telecommunication mobile applications, beliefs that mobile application information is accurate, and mobile application performance that is fast and reliable. As shown in Table 16, the overall mean is 5.36 and the standard deviation is 1.22. This suggests that the majority of respondents believe mobile applications performance is fast and accurate. Three items were adopted from prior work related to attributes of mobile applications use (Delone & McLean, 1992, 2003), and "measured using a 7-point Likert scale". As shown in Table 16, the mean of the items ranges between 5.13 (1.176) and 5.61. (1.125). This indicates that respondents agree with the statement that performance meets customer expectations.

Table 17: Descriptive Statistics for System Quality

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
SQ1	110	1	7	5,6182	1,1250
SQ2	110	1	7	5,3455	1,3710
SQ3	110	1	7	5,1364	1,1768

4.2.9 Customer Satisfaction

Customer Satisfaction is designed to extract information on the use of telecommunication mobile applications, user beliefs that are pleased will result in reuse, and it meets the customer expectation. As shown in Table 17, the overall mean

is 5.00 and the standard deviation is 1.57. This suggests that the majority of respondents are pleased with the mobile application. Four items were adopted from previous work related to attributes of mobile application use (Angelova & Zekiri, 2011) and "measured using a 7-point Likert scale". The mean of the items, as shown in Table 17, ranges between 4.645 (1.530) and 5.3000. (1.493). This indicates that respondents agree with the statement that mobile application users are satisfied with it.

Table 18: Descriptive Statistics for Customer Satisfaction

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
CS1	110	1	7	5,2091	1,6033
CS2	110	1	7	5,3000	1,4934
CS3	110	1	7	4,8455	1,6711
CS4	110	1	7	4,6455	1,5300

4.2.10 Assessment of Normality

Table 19 shows the "skewness and kurtosis coefficients" of all the factors in the model. A "skewness and kurtosis" value of -2 to +2 is considered an acceptable indication of normality (George & Mallery, 2010). Table 18 summarises the results, which show that most kurtosis and skewness values are between -2 and +2, except for behavioural use and there are two items that are abnormal at 4.9. The central limit theorem, on the other hand, states that deviation from normality has little effect on data for large sample sizes greater than 100 (Muzaffar, 2016). This means that abnormal kurtosis of variables items or factors exceeding the -2 and + 2 thresholds will not affect the overall results. We can confidently use principal component analysis to check if the items are loading with the latent factors because normality is not an issue.

Table 19: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
GA	110	1,4	6,8	5,10727	1,60748	-1,23491	0,23045	0,10057
PE	110	1,4	6,6	5,46000	1,27806	-1,90606	0,23045	2,73979
EE	110	1,6	6,6	5,45273	1,31851	-1,44934	0,23045	0,68789
SI	110	1,6	6,6	4,96000	1,46364	-1,08527	0,23045	-0,10257
FC	110	1,6	6,6	5,60182	1,08721	-2,27263	0,23045	4,93749
BI	110	1,5	6,75	5,91591	1,23048	-2,47724	0,23045	5,39474

II	110	1,4	6,6	5,11091	1,30337	-1,29777	0,23045	0,99989
SQ	110	1,3	6,7	5,36667	1,08361	-1,29053	0,23045	2,17915
CS	110	1,5	6,5	5,00000	1,37682	-1,23383	0,23045	0,36101
Valid N (list wise)	110							

* Composite scores for each construct calculated as the arithmetic average of its original scale items weighted equally

4.2.11 Sample adequacy

Prior to conducting a "principal component analysis (PCA)" to confirm the validity of the multi-item scales, sample adequacy must first be established. The Kaiser-Meyer-Olkin (KMO)" test as developed by Kaiser and Rice, is used to determine the "adequacy of the sample". KMO is defined as the "ratio of the squared correlation between variables to the squared partial correlation between variables (Field, 2009). Correlation patterns range from 0 to 1, and if the value of the correlation is close to 1, the correlations should produce reliable factors (Field, 2009). Values between 0.5 and 0.7 are poor, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are excellent, and values above 0.9 are excellent (George & Mallery, 2010). The findings of this study are depicted in Table 19, where the KMO value is 0.84151. The KMO results show that the sampling adequacy is within an acceptable range.

This indicates that the sample size is sufficient to produce the reliable factors.

Table 20: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,84151
Bartlett's Test of Sphericity	Approx. Chi-Square	4024,605
	df	780
	Sig.	0.000

The strength of the relationship between variables is indicated by this test. The findings on this study's show, the Chi-square is 4024.12 and its significance is less than 0.001. This indicates that the data can be usefully analysed using PCA.

4.2.12 Principal Components Analysis (PCA)

The orthogonal rotation (Varimax) method was used for factor analysis (principal component). The method was chosen because it essentially captures and organises

the components with high eigenvalues in order of importance (Hair et al., 2011). Factor analysis is based on the assumption that observable and measurable variance can be reduced to a few latent variables with shared variance (Vonglao, 2017). This is known as dimensionality reduction. Unobserved factors are not directly measured, but they are critical in a hypothetical model. The first step in developing scales is to use Exploratory Factor Analysis (EFA) (Hair et al., 2011). In the early stages of developing the scale, EFA is regarded as a useful first step prior to any Confirmatory Factor Analysis (CFA). EFA allows a researcher to investigate the main dimension in order to develop a theory or model from latent factors represented by sets of items (Sangthong, 2020).

According to Hair et al. (2010), for a construct to be labelled a factor, it must have at least three variables (i.e., scale items), but this can also depend on how the study was designed. The number of factors generated is determined by whether the variable has a relationship with more than one factor (Murray, 2013). A rotation matrix is used to maximise high item loadings while minimising low item loadings. This results in a more understandable and simplified solution. SPSS allows you to rotate data using five different methods, including varimax, quartimax, equamax, direct oblimin, and promax (Sangthong, 2020). To maximise high item loadings, this study chose varimax rotation. Furthermore, in the scores menu, a factor score coefficient matrix was chosen, and in the settings menu, list wise exclusion, sorting by size, and suppression of absolute values less than 0.40 were selected. The suppression of absolute values less than 0.40 makes visual interpretation of the loadings easier. This study received 110 responses. Items with loadings of less than 0.50 were removed from the analysis. Table 20 displays the results of the factor analysis on the set of items. The principal component analysis, 10 factors were extracted from 38 items. The total explained variance is 81%.

Table 21: Rotated Component Matrix

Rotated Component Matrix									
	Component								
	1	2	3	4	5	6	7	8	10
GA1		0,860							
GA2		0,872							
GA3		0,797							
GA4		0,824							

GA5		0,847							
PE1	0,901								
PE2	0,881								
PE3	0,908								
PE4	0,863								
PE5	0,864								
EE1				0,813					
EE2				0,726					
EE3				0,784					
EE4				0,845					
EE5				0,849					
SI1			0,824						
SI2			0,825						
SI3			0,847						
SI4			0,910						
SI5			0,902						
FC1									0,758
FC3									0,753
FC4									0,655
BI1								0,758	
BI2								0,776	
BI3								0,729	
II1					0,744				
II2					0,769				
II3					0,769				
II4					0,734				
II5					0,808				
SQ1							0,693		
SQ2							0,838		
SQ3							0,825		
CS1						0,855			
CS2						0,849			
CS3						0,748			
CS4						0,759			
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalisation.									
a. Rotation converged in 10 iterations.									
Variance explained 81,229%									
Please note, variables excluded were removed due to low factor loading									

Table 20's factor loadings are well above the 0.50 threshold. No items were eliminated from the weighting scale. All factor loadings are substantial. All the items were associated with a component, according to the exploratory factor analysis results.

Five items were used to evaluate General Awareness (GA). Table 20, five items loaded highly onto the same factor without loading above 0.40 onto other factors. Therefore, no general awareness items required removal.

Five factors were utilised to assess Performance Expectation (PE). Table 20, five items loaded highly on the same factor but did not load above 0.40 on any other factor. Therefore, no performance expectation items needed to be eliminated.

There were five factors used to evaluate Effort Expectation (EE). Table 20, five items loaded highly on the same factor but did not load above 0.40 on any other factor. Consequently, no effort expectation items were required to be removed.

Five factors were used to assess Social Influence (SI). Table 20, five items loaded highly on the same factor but did not load above 0.40 on any other factor. Thus, no social influence items were required to be eliminated.

Five factors were employed to evaluate the Facilitating Condition (FC). Table 20, three items loaded highly on the same factor but did not load above 0.40 on any other factor and the other two items were removed. Thus, no social influence items were required to be eliminated.

Four factors were utilised to assess Behavioural Use (BU). Table 20, three items loaded highly on the same factor but did not load above 0.40 on any other factor and one item was removed. Thus, no behavioural use items were required to be eliminated.

Five criteria were used to evaluate the Individual Innovation (II). Table 20, five items loaded highly on the same factor but did not load above 0.40 on any other factor. Consequently, no Individual Innovation items were required to be removed.

Three factors were utilised to assess system quality (SQ). Table 20, three items loaded highly on the same factor but did not load above 0.40 on any other factor. Therefore, no system quality components needed to be eliminated.

Four factors were utilised to assess customer satisfaction (CS). Table 20, four items loaded highly on the same factor but did not load above 0.40 on any other factor. Therefore, no system quality components needed to be eliminated.

4.3 Reliability and Validity

It is self-evident that the scale must be reliable in order to be valid and useful (Byrne, 2013). The reliability of a scale is its ability to produce the same results when used under identical conditions and with the same objectives (Hair et al., 2010). In this study, the scale measured the proposed conceptual framework for research based on nine factors: system quality, individual innovation, effort expectancy, performance expectancy, social influence, behavioural use, facilitating condition, and customer satisfaction.

The results of Cronbach's alpha, Average Variance Extracted (AVE), and Composite Reliability (CR) are presented in Table 21. For measuring reliability, Cronbach's alpha was utilised. If "Cronbach's alpha" is at least 0.70, the scale is considered reliable (Hair et al., 2010). Table 21 indicates the range of "Cronbach's alpha" is 0.8570 to 0.9543, which is greater than the recommended value of 0.70. The CR ranges between 0.90 and 0.96, exceeding the minimum threshold of 0.70. In addition, the AVE was calculated for each factor. The minimum AVE value is 0.8570, which exceeds the recommended threshold of 0.50.

Table 22: Results of reliability and validity

Variables	Number of initial items	Cronbach's Alpha	"Average variance extracted (AVE)"	"Composite reliability (CR)"	Composite Scores	
					Mean	Standard Deviation
General Awareness	5	0,9461	0,8988	0,9400	5,107	1,6075
Performance Expectancy	5	0,9543	0,9066	0,9600	5,460	1,2781
Effort Expectancy	5	0,9217	0,8756	0,9369	5,453	1,3185
Social influence	5	0,9324	0,8858	0,9478	4,960	1,4636
Facilitating Conditions	3	0,8830	0,8388	0,9059	5,602	1,0872
Behavioural Use	3	0,8746	0,8309	0,9057	5,916	1,2305
Individual Innovation	5	0,9170	0,8712	0,9496	5,111	1,3034
System Quality	3	0,8570	0,8141	0,9118	5,367	1,0836
Customer Satisfaction	4	0,8966	0,8518	0,9284	5,000	1,3768

4.4 Correlation Matrix of Composite Scores

Convergent and discriminant validity can be used to achieve factor validity (Sangthong, 2020). The intercorrelation has been determined and is displayed in Table 22. The principle of discriminant validity stipulates that the measures of a factor must correlate more strongly with each other than with measures of other factors (Hair et al., 2010).

This principle can be examined by comparing inter-factor correlations to the AVE or square root of the AVE for each factor. Each factors' "square roots of AVE" are presented along the diagonal of Table 22. These are depicted as being greater than inter-factor correlations. Thus, the "discriminant validity" is confirmed, indicating that factors share more variance with their own items than with other factors in the model. Collectively, these results confirm the factors' dependability, convergent and discriminant validity. The model can then be evaluated in the section that follows.

Table 5: Correlations

		GA	PE	EE	SI	FC	BI	II	SQ	CS
GA	Pearson Correlation	0,9400								
PE	Pearson Correlation	0,3754**	0,9600							
EE	Pearson Correlation	0,4052**	0,2362**	0,9369						
SI	Pearson Correlation	0,1375*	0,2623**	0,3054**	0,9478					
FC	Pearson Correlation	0,4404**	0,3432**	0,5301**	0,2710**	0,9059				
BI	Pearson Correlation	0,4854**	0,3608**	0,4204**	0,2419**	0,4078**	0,9057			
II	Pearson Correlation	0,4556**	0,3761**	0,4326**	0,3450**	0,6014**	0,4933**	0,9496		
SQ	Pearson Correlation	0,3656**	0,2305**	0,3947* *	0,2210**	0,4438**	0,5933**	0,4906* *	0,9118	
CS	Pearson Correlation	0,3843**	0,1880*	0,4586**	0,0858*	0,5381**	0,4163 **	0,4683**	0,3269 **	0,9284
**. Correlation is significant at the 0.01 level (2-tailed).										
*. Correlation is significant at the 0.05 level (2-tailed).										

4.4.1 Results of Model Testing

This section uses the collected data to formally and exhaustively test the study's measurement and "structural model." Prior to testing the hypothesised structural model, it is advisable to conduct Confirmatory Factor Analysis (CFA) as a final test of the "measurement model" to determine whether or not all items load appropriately on the hypothesised factors in the model. The CFA was used to test the hypothesis

regarding the sources of variability accountable for the similarity of a set of scores. The CFA was utilised to confirm that the proposed factor structure fits the data well.

The second step was to test the hypotheses represented by the relationship between independent and dependent variables, i.e., the structural model, using "Structural Equation Modelling" (SEM). Version 25 of AMOS was used to conduct the SEM model. The path diagrams in AMOS are simplified in comparison to other software such as LISREL, STATA, etc. (Sangthong, 2020).

4.5 CFA Model Result

The CFA was utilised to evaluate the relationships between the various factors of the developed theoretical model and their respective measurement items. In evaluating the model, it is essential to evaluate the measurement model fit and the tested model's validity. There is no need to distinguish between exogenous and endogenous factors during the evaluation of the measurement model in the CFA. Only during model testing is it necessary to differentiate between exogenous and endogenous factors.

All variables are connected in Figure 14, and the measured variables (factors items) are depicted as rectangles. The covariance is depicted by two-headed arrows in Figure 14, while the causal relationship is represented by single-headed arrows. Figure 14 depicts a model containing only the main effects factors and measurement items.

Figure 14 depicts a model that emphasises system quality, social influence, behavioural use, individual innovation, customer satisfaction, performance expectations, and effort expectations.

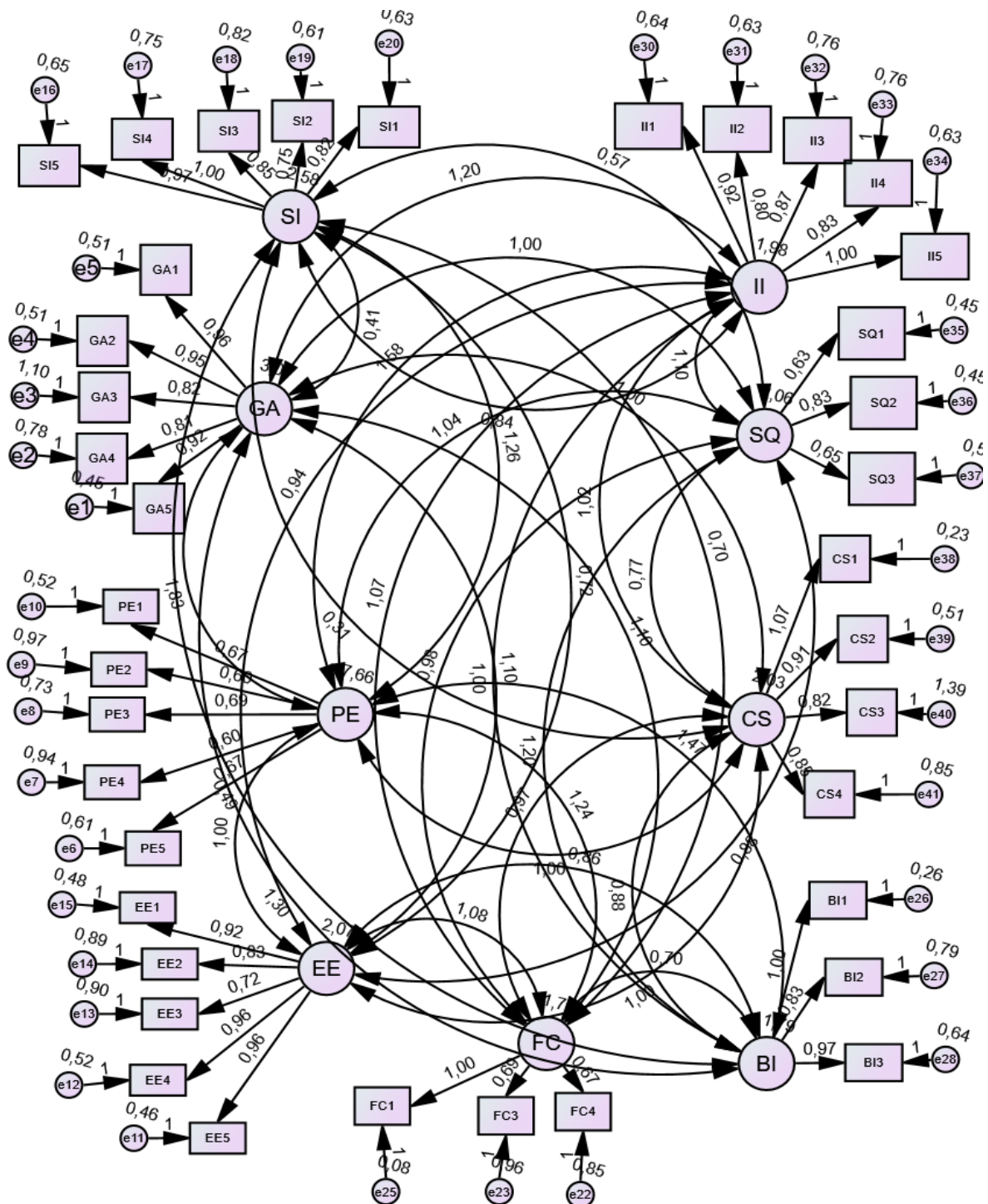


Figure 15: CFA Model Results

4.5.1 Goodness of Fit Indices

The model's parameters were estimated using the maximum-likelihood method, and all analyses were carried out on covariance matrices. When analysing the model's fit, there are model fit indices that must be considered. The first step is to calculate the Chi-square (χ^2) of the model being tested. The χ^2 was found to be high, and the $\chi^2 / DF=6$ ratio was found to be greater than the recommended three, indicating that the data does not fit the model. This test, however, may unnecessarily reject hypotheses (Hair et al., 2010), because even minor differences between the observed model and the good model fit may be found to be significant.

[GFI=0.730; NFI=0.791; CFI=0.924; IFI=0.925; RMSEA=0.063; DF=6; TLI=0.915 and RFI=0.766] were the fit indices. The CFA model's validity indicates that some model fit indices were not satisfactory. However, the primary goal of the CFA model was to determine whether all of the scale's items were loading on the model. The factor validity and factor loadings were confirmed using the CFA test (Serrano, et al, 2018). It was not intended to test hypotheses about the factors. The results show that all of the items are loading correctly and in accordance with theory. This model's factor loadings range from 0.63 as the lowest and 0.97 as the highest, which are greater than the prescribed threshold of 0.50. The following section put the hypothesised model to the test.

Table 24: Fit Indices

Fit Index	Recommended Value	CFA Results	Final Structural Model
Goodness-of-fit (GFI)	Less than 0.80 (No fit) Between [0.80-0.90] (acceptable) Above 0.90 (Perfect fit)	0.730	0.834
Normed fit index (NFI)	Less than .80 (poor) Between [0.80-0.90] (acceptable) Above 0.90 (good)	0.791	0.863
Comparative fit index (CFI)	Less than 0.90 (poor) Above 0.90 (good)	0.924	0.942
Incremental fit index (IFI)	Less than 0.90 (poor) Above 0.90 (good)	0.925	0.948
Root mean square error of approximation (RMSEA)	Less than 0.05 (good) Between [0.06-1] (acceptable) Above 1 (poor)	0.063	0.048
Chi-square (χ^2 /DF)	Less than 3 (good) Between [3-5] (acceptable) Above 5 (poor)	6	2
Tucker-Lewis Index (TLI)	Less than 0.80 (poor) Between [0.80-0.90] (acceptable) Above 0.90 (good)	0.915	0.978
Relative Fit Index (RFI)	Less than 0.80 (poor) Between [.80-.90] (acceptable) Above .90 (good)	0.766	0.901

4.5.2 Final Structural Model testing

The final model shows a $P=0.00$, which is not significant when compared to the default model, but the $X^2 / DF=2$ is acceptable because it is less than three. The results of model fit have improved compared to the initial CFA model, as shown in Table 23. The fit indices are as follows: [GFI=0.834; NFI=0.863; CFI=0.942; IFI=0.948; RMSEA=0.048; DF=2; TLI=0.978; RFI=0.901], with most of the indices indicating a good model fit. Table 23 indicates the path coefficients of the “hypothesised relationships within the proposed research model”.

Table 25: Final Model

Hypothesis		Estimate	S.E.	C.R.	P	Supported
Ha1	GA--->BU	0,158	0,065	2,431	***	Yes
Ha2	PE--->BU	0,185	0,083	2,229	0,001	Yes
Ha3	EE--->BU	0,123	0,064	1,922	0,032	Yes
Ha4	SI--->BU	0,104	0,181	0,575	0,856	Not supported
Ha5	FC--->BU	0,151	0,088	1,716	0,039	Yes
Ha6	II--->BU	0,12	0,071	1,690	0,045	Yes
Ha7	SQ--->BU	0,45	0,194	2,320	***	Yes
Ha8	BU--->CS	0,466	0,197	2,365	***	Yes
GA = General Awareness, BU = Behavioural Use, PE= Performance Expectancy, EE= Effort Expectancy, SI= Social Influence, FC = Facilitating Condition, II = Individual innovation, SQ = System Quality, CS = Customer Satisfaction						

Table 26: R-squared results

Variables	Estimate
BU	0,284
CS	0,320

As shown in Table 24, the model being tested directly supported seven of the eight hypotheses. The results of factors influencing the use {GA ($p < 0.001$); PE ($p < 0.001$); EE ($p < 0.05$); FC ($p < 0.05$); II ($p < 0.05$); SQ ($p < 0.001$)} of a mobile application were found to have a significant influence on behavioural use of the mobile applications. These results support Ha1, Ha2, Ha3, Ha5, Ha6 and Ha7. In addition, social influence ($p > 0.05$) was found to be not significant towards the behavioural use of mobile applications. Therefore, Ha4 was rejected. This means that users may have accepted mobile applications as part of their daily life. Mobile applications have become part of their daily life, all users have access to use the mobile applications and view this as a basic function. Behavioural use ($p < 0.001$) was found to have a significant positive influence on customer satisfactions. The results support Ha8. This means that the use of mobile applications improves customer satisfaction. This means that users who are not using mobile applications are often dissatisfied. If telecommunications want to improve customer satisfaction, they must encourage users to use mobile applications as compared to the traditional way of visiting stores to transact. Furthermore, it was

found that the results explain 32% variance of customer satisfaction (R^2), and 28.4% variance (R^2) of behavioural use.

4.6 Conclusion

The survey results were analysed and interpreted in this chapter. There were 157 responses in total. Following data cleansing (to remove missing values), 110 responses were retained and analysed. SEM was used to determine whether the estimated model's model fit suits the data.

Majority of the survey respondents were between the ages of 41 and 45 (25.5%) and under the age of 25 (25.5%). Respondents have a high level of education, with the majority holding a bachelor's degree (30.9%), an honours degree (20.9%), and diplomas (19.1%). Vodacom (67.3%) was the most popular telecommunications service provider among respondents, followed by a tie between MTN (13.3%) and Telkom (13.3%). The majority of respondents (99.1%) had smartphones, and their experience with smartphones ranged from more than six years (41.8%) to less than two years (21.8%). The majority of their provincial location was in Gauteng (63.6%), followed by the Eastern Cape (26.4%). The respondents' preferred service method is via mobile application (66.4%), while others prefer mobile application and physical shops (28.2%).

The Kaiser-Meyer-Olkin (KMO) test was used to determine the "adequacy of the sample." The information yielded nine factors: general awareness, performance expectancy, effort expectancy, facilitating conditions, social influence, system quality, individual innovation, behavioural use, and customer satisfactions. Cronbach's alpha was used to test reliability, and PCA validity and factor correlations were used to test validity. The Kaiser-Meyer-Olkin (KMO) test was used to assess the "adequacy of the sample." Nine factors emerged from the data: general awareness, performance expectancy, effort expectancy, facilitating conditions, social influence, system quality, individual innovation, behavioural use, and customer satisfactions. Cronbach's alpha and factor correlations were used to assess reliability, and PCA validity and factor correlations were used to assess validity. Prior to testing the hypothesised structural model, CFA was used to test the variability responsible for set score similarity. The hypothesis was tested in the second step using SEM. Fit Indices were also computed to determine the probability of distribution fits on the data set.

The final model showed a $P=0,000$ which is not significant when compared to the default model, but the $X^2 / DF=2$ is acceptable because it is less than three. The fit indices were as follows: [GFI=0.834; NFI=0.863; CFI=0.942; IFI=0.948; RMSEA=0.048; DF=2; TLI=0.978; RFI=0.901], with most of the indices indicating a good model fit. The data allowed us to proceed with testing the hypothesis.

Hypothesis Ha1, Ha2, Ha3, Ha5, Ha6, Ha7, Ha8, were supposed whilst Ha4 was not supported.

The results are summarised in Table 26 and show all the hypotheses tested and the key outcomes of each.

Table 27: Final hypothesis results

Hypothesis	Relationship	Result	Explanation
Ha1	GA--->BU	Yes	SPSS results show that General Awareness has influence in Behavioural Use
Ha2	PE--->BU	Yes	SPSS results show that Performance Expectancy has influence in Behavioural Use
Ha3	EE--->BU	Yes	SPSS results show that Effort Expectancy has influence in Behavioural Use
Ha4	SI--->BU	Not supported	SPSS results show that Social Influence has no correlation in Behavioural Use
Ha5	FC--->BU	Yes	SPSS results show that facilitating Conditions has influence in Behavioural Use
Ha6	II--->BU	Yes	SPSS results show that Individual innovation has influence in Behavioural Use
Ha7	SQ--->BU	Yes	SPSS results show that system quality has influence in Behavioural Use
Ha8	BU--->CS	Yes	SPSS results show that behavioural Use has influence in customer satisfaction
GA = General Awareness, BU = Behavioural Use, PE= Performance Expectancy, EE= Effort Expectancy, SI= Social Influence, FC = Facilitating Condition, II = Individual innovation, SQ = System Quality, CS = Customer Satisfaction			

The following chapter discusses these findings in light of the literature.

Chapter 5: Discussion of the results

5.1 Introduction

In chapter 4, the data was provided and analysed, and the study's hypotheses were concluded. Further, the hypothesised model on factors impacting consumer perception of mobile application use was tested. A survey was used to acquire South African mobile application users' perspectives on mobile application success elements.

The data reviewed were cross-sectional data acquired through a survey. This chapter responds to the objectives of this research. It addresses challenges regarding research objective 1, to examine factors that influence the use of mobile applications and research objective 2, the extent to which customer satisfaction influences the use of mobile applications.

This section discusses the findings regarding factors that influence the usage of mobile applications in the South African context. Table 27 indicates the summary of the hypothesised results.

The following outcomes summary is based on this study's research model, which used a modified UTAUT model, the most successful framework for analysing technological adoption. The UTAUT model has six primary variables: performance expectancy, effort expectancy, social influence, facilitating conditions, behavioural intention, and usage behaviour (Chao, 2019; Fernandez-Marcelo et al., 2021). It incorporates theories of human behaviour and allows for the analysis of subjects' perceptions with reference to a broader concept of innovation, this framework has been used to evaluate user expectations with reference to specific innovations, including organisational ones (Fernandez-Marcelo et al., 2021).

This study includes general awareness, individual innovation and system quality as independent variables and examines them as factors that influence telecommunication mobile applications use to fill the research gap. The factors that influence the use of mobile applications are not completely understood. Additionally, the influence of use on customer behaviour is not entirely established. This is the research gap that needs to be filled in order for the telecommunications industry to justify its investment in mobile applications. The original UTAUT model focuses on human behaviour, user expectations and technology environment and infrastructure

(Ghalandari, 2012), therefore our research modified the original UTAUT model to include general awareness of mobile application individual innovation and system quality. These factors further examine the technology performance and user perceptions in adoptions of new technology, namely, telecommunication mobile application (Yi et al., 2006) thereby filling the research gap.

Telecommunications mobile applications enable consumers to check balances, pay bills, purchase airtime, and log inquiries, and provide users with several advantages, including (i) convenience, as the mobile applications are available on your smartphone 24 hours a day, seven days a week. (ii) Personalised products and services, as a result of the rich data provided by mobile applications, businesses acquire the capacity to create personalised products. (iii) Instant gratification provided by mobile applications when transacting, customers are instantaneously delighted when using mobile applications (Chopdar & Balakrishnan, 2020). When businesses offer mobile applications, they gain the following advantages: (i) valuable customer insights, which businesses can gauge through digital data factors that influence mobile application use (Tarute et al., 2017), which means that if customers do not use or do use a product, businesses can modify their product range, due to low performance and due to use, businesses can grow the product (Rîndaşu, 2021), (ii) loyalty, loyal users of mobile applications can bring substantial amounts of revenue and lower costs to businesses, as a result, the use of mobile applications can be a cost-cutting tool for businesses (Nzabirinda, 2019), (iii) higher customer satisfaction, the ability of the business to delight users of the mobile application by meeting their expectations, and when the customer is delighted, it can lead to positive word of mouth (Hohenberg & Taylor, 2021). As a result, using a mobile application could give the organisation a competitive advantage (Stocchi et al., 2021).

Table 28: Hypothesis results summary

Hypothesis		Estimate	S.E.	C.R.	P	Supported
Ha1	GA--->BU	0,158	0,065	2,431	***	Yes
Ha2	PE--->BU	0,185	0,083	2,229	0,001	Yes
Ha3	EE--->BU	0,123	0,064	1,922	0,032	Yes
Ha4	SI--->BU	0,104	0,181	0,575	0,856	Not supported
Ha5	FC--->BU	0,151	0,088	1,716	0,039	Yes
Ha6	II--->BU	0,12	0,071	1,690	0,045	Yes
Ha7	SQ--->BU	0,45	0,194	2,320	***	Yes
Ha8	BU--->CS	0,466	0,197	2,365	***	Yes

5.2 Factors influencing the use of mobile application

General awareness (H1) was found to be one of the factors that influences the use of a telecommunication mobile application. The respondents of this study strongly agree that being aware of the mobile applications benefits influences use. The findings imply that the telecommunications industry should devote resources in educating users about the benefits and availability of mobile applications (Hubert et al., 2017; Stanciu & Rîndaşu, 2021). The benefits of employing mobile applications should be emphasised, such as time and cost savings, personalised experience and convenience "always available," and transactional cost savings.

General awareness refers to users' perceptions of how mobile applications can simplify their engagement with telecommunications service providers. It determines whether users are aware that mobile applications can save them time by using features such as purchasing airtime, logging queries and service provider information via the mobile application (Hubert et al., 2017; Stanciu & Rîndaşu, 2021).

This study makes a new contribution as most previous studies ignores general awareness (Venkatesh et al., 2012; Wiese, 2017; Saccomani, 2022) as an important factor that can influence the usage of mobile application.

There has been inconsistencies in general awareness as a factor influencing mobile application use. The studies by (Jutel & Lupton, 2015; Chmielarz, 2020; Huang et al., 2019), general awareness is a factor that influences the use of mobile applications. Their research finds that customers who are aware of mobile applications and their benefits are more likely to utilise them (Jutel & Lupton, 2015; Chmielarz, 2020; Huang

et al., 2019). Studies by various authors (Xu et al., 2017; Lee, 2018; Chen et al., 2017) discovered a weak relationship between general awareness and mobile application use; their studies show that other factors such as mobile application performance "fast", and availability of mobile application downtime "error free", are more influential in mobile application use. The results of this research clarify the inconsistency, the results suggest that general awareness is an important factor in the usage of mobile applications. This is due to the telecommunications industry marketing efforts and mobile application exclusive offerings "cheaper bundles if purchased on mobile application."

Performance Expectancy (H2) was found to be one of the factors that influences the use of telecommunication mobile application. This finding is significant in explaining the factors that influence mobile application usage behaviour. This study's respondents strongly agree that mobile applications with features and products that meet their needs have a big influence on their use of mobile applications. The meaning of these findings encourages the telecommunications industry to devote its resources to ensuring that mobile applications are task-fit, valuable to consumers, and provide essential features (Wu, Yu, & Weng 2012). The mobile application's customer-relevant features should be highlighted. The advantages of having user-relevant features and products would result in higher adoption and reuse of mobile applications (Faqih & Aradat, 2015; Liébana-Cabanillas et al., 2017).

Respondents of this study said that mobile applications reduce the amount of time spent shopping and make it easier to keep track of monthly costs, so using mobile applications is advantageous. These findings are consistent with those of Faqih and Aradat (2015); Liébana-Cabanillas et al. (2017), who discovered a favourable link between performance expectancy and mobile application use.

The factor of performance expectancy in our study is defined as telecommunication customers' belief that using a mobile application will save time, and improve their interaction with their telecommunication service provider. The features and products offered by the mobile application are usefulness, intrinsic, task-fit and provide relevant information (Wu, Yu, & Weng, 2012). Users rely on telecommunications mobile applications to access information, such as remaining airtime balances, price reductions, and newly released products. The convenience of being able to complete

these transactions at the user's leisure is the primary source of value derived from this capability, which is a significant improvement over having to physically visit retail locations to complete the same kinds of transactions.

Previous studies (Liu et al., 2021; Tsai et al., 2020; Etinkaya & Kartal, 2015) indicated that performance expectations have little effect on a user's behavioural use to use or adopt mobile applications. Other researchers, on the other hand, discovered a link between performance expectancy and behavioural use to utilise mobile applications (Faqih & Aradat, 2015; Liébana-Cabanillas et al., 2017). Prior research produced conflicting findings. In order to justify the investments made by the telecommunications industry, it is necessary to thoroughly understand the reasons that may cause the variation in the use of mobile applications. This study's findings show, performance expectancy has a favourable link with the use of mobile applications. This finding is significant in explaining the elements that determine mobile application usage behaviour.

Effort expectancy (H3) was found to be one of the factors that support the use of mobile applications. The study's respondents firmly agree that mobile applications that are easy to use, offer search options, and current information about their service provider influence mobile application use positively. This means that customers who can search the mobile application, effortlessly learn new information, and enjoy using the mobile application are more likely to use mobile applications than customers who do not. The telecommunication service providers need to ensure that when building mobile applications, information is easy to understand, products and services are intuitive, information is easy to search and mobile applications are easy to learn (Xu et al., 2015, Amadea et al., 2021).

Effort expectation is a factor that examines mobile application navigation, skills required to operate mobile applications, and the simplicity of learning how to use a mobile application. The findings of this study show that effort expectancy has a positive influence on mobile application use. Customers have the ability to search for products, find current information, and enjoy using and learning the mobile application.

This study's findings support those of Oh and Kim (2022), who discovered that mobile applications with poor navigation, are difficult to use, and have cluttered information are less likely to be used or adopted by customers. One reason for effort expectancy

to be supported is that telecommunications service providers build mobile applications with customer involvement and focus groups that aim to seek customers' expectations (Amadea et al., 2021). The sequence of the steps in the mobile application and product information layout in most times is based on industry standards of user experience (Xu et al., 2015). This factor is supported by the findings of this study, as respondents stated that they found mobile applications to be very straightforward to use and learn, therefore the industry should continue with user experience based design and sourcing needs from customers.

Social Influence (H4) was found to be one of the factors that does not influence the use of mobile application, therefore (H4) was rejected. Respondents of this research strongly disagree on gaining higher status amongst peers when using mobile application. This means in South Africa, customers who use the mobile application have no higher status among their peers, while those who do not use the mobile application have no worse standing in the community. The findings of this study suggest that the telecommunications industry should place less emphasis on the social status of mobile application users.

Social influence is explained as the views and opinions of the user's family and friends, as well as the expectations from friends and family to use mobile applications, and whether or not using mobile applications gives the user a higher status amongst society.

Many studies have been conducted on social influence as a factor influencing the use of mobile applications. Sripalawat, et al. (2011) define social influence as an essential factor in the use of mobile applications. When it comes to new technology, for example, young people are more sensitive to other people's ideas and hence more aware of social influence (Venkatesh, 2000). Prior study (Abu-Al-Aish & Love, 2013), social influence has a considerable impact on behavioural intention to use mobile applications. The results from previous studies are mixed therefore this research sought to determine if social influence was a factor that influences use of mobile application.

The findings of this study reveal that social influence has no significant impact on the use of mobile applications. These findings are surprising because use of technology normally gives a higher status amongst peers. In South Africa, mobile applications are

preloaded on most smartphones; this feature ensures that the mobile applications are common and easily accessible to smartphone users; as a result, users of mobile applications do not receive a higher status due to the commonality of the mobile applications and participants in this study do not receive a higher status in their communities when using mobile applications.

Facilitating conditions (H5) was found to be one of the factors that influence the use of telecommunication mobile application. The implications of these findings in the telecommunications industry are to continue creating networks that enable mobile applications, to protect support systems for mobile application users, and to keep mobile applications free to use. Respondents of this research strongly agree that having data-free mobile applications, a telecommunications network that supports the use of mobile applications, and the availability of devices that enable mobile applications all positively contribute to the use of mobile applications.

This factor relates to the structure that is available for support when the mobile application is problematic, the effort from telecommunications service providers to ensure that all support and technical instruments are available to use mobile application, e.g., smartphones availability, data free when using service provider mobile application, and relevant network technology (3G, 4G signal) to use mobile applications.

The findings of this research reveal that facilitating conditions influence the use of mobile applications. This means that the accessibility of users to find help for malfunctioning mobile applications, the availability of handsets that support mobile applications, and zero-rated service provider platforms all have an impact on mobile application use. Individuals may be inhibited from adopting and utilising mobile applications due to a lack of assistance, timely support, insufficient knowledge, and limited resources such as Internet connectivity, types of handsets, and data connectivity pricing. Telecommunications mobile applications are free to use in South Africa, smartphones are easily purchased through shops and online stores, and the country has acceptable signal to use mobile applications. The meaning of these findings in the telecommunication industry is to sustain building networks that supports mobile application, preserve support structures for mobile application users and continue free to use of mobile application.

This study reveals that when challenges arise while using a telecommunications mobile application, users have support structures in place, network infrastructure to enable mobile application use, relevant skills, and relevant help is available, and the user's use and adoption of mobile applications is influenced.

System quality (H6) was discovered to be one of the factors influencing the use of mobile applications. The meaning of these findings is that the telecommunications sector needs to continue developing mobile applications with low faults and high system availability, which in turn, will motivate users to continue using mobile applications. Consumers' ability to use mobile applications that are error-free, constantly available, provide the correct information and are secure, influences their use of mobile applications.

System quality is a factor that examines the mobile application's system quality, specifically the extent to which a mobile application continues to function despite errors that do not affect the user (error tolerance) and the extent to which it remains operational despite hardware and software system failure. The findings of this study reveal that system quality influences behavioural use positively.

This is a new contribution provided by this study as most previous studies ignored system quality (Delone & Mclean, 2003; Chen et al., 2012) as an important factor that can influence the usage of mobile applications.

The results of this study demonstrate the need of mobile application security, accurate information and mobile application availability to be functional at all times and these elements should be critical in the development of new mobile applications.

Individual innovation (H7) was discovered to be one of the factors influencing the use of mobile applications. This means that the industry must devote resources to teaching customers about the advantages of mobile applications through marketing campaigns, highlighting the benefits of using mobile applications and placing them at the centre of self service. The respondents in this research firmly agree that enjoyment when using mobile applications, convenience of use, and quick access to mobile applications all have a positive influence on their use.

Individual innovation is related to enjoyment; simplicity of learning mobile applications and mobile applications that make lives easier by saving time when using mobile

applications due to the mobile application's 24/7 operational hours and comfort in managing users' bills (Keith et al., 2015; Kim & Baek, 2018; Zhou et al., 2020). The findings of this study reveal that individual innovation has a positive influence on mobile application use.

This is a new contribution provided by this study as most previous studies ignored system quality (Chen et al., 2017; Lee, 2018; Xu et al., 2017) as an important factor that can influence the usage of mobile applications.

The telecommunications business must devote resources to teaching customers about the advantages of mobile applications (Min et al., 2021; Chmielarz, 2020; Huang et al., 2019). The emphasis should be on the benefits of utilising mobile applications, which include time savings, convenience, and the benefits of customised discounts (Keith et al., 2015; Kim & Baek, 2018; Zhou et al., 2020). Because the telecommunications industry invests enormous sums of money in developing mobile applications, advise on how and what features to develop shapes and pushes the return on investment (Kot, 2022),

The finding of this study highlight that individual innovation is a factor that influences the use of mobile application. This means that consumers who can enjoy the mobile application and improve their lives by using it, are more likely to use it than consumers who lack this enjoyment and fulfilment.

The use of mobile applications was found to have a significant positive influence on customer satisfaction (H8). The findings of this study show us that consumers who are satisfied are more likely to use mobile applications, are more likely to tell their peers and are more likely to repeat their usage of mobile applications. Furthermore, respondents strongly agree that customer satisfaction is a critical aspect that influences the use of mobile applications. The effort on the telecommunication service provider to continue ensuring features and products are intuitive, users of mobile application are aware that it is secured and risk free, information used on the mobile application secured is important.

Customer satisfaction in the mobile application can be defined as (i) security, do customers feel the mobile application is secure enough to use to transact, is the information submitted in the mobile application stored in a secure environment that will not be accessible by cyber criminals (ii) ease of use, is the design of the mobile

application intuitive enough for customers to understand their interactive process (iii) trust, is the mobile application secure enough to transact (Ohk et al., 2015).

There have been studies that examined customer satisfactions with inconsistent results (Fuchs, 2022; Saeidi et al., 2015; Pei et al., 2020) but they agree that customer satisfaction influences mobile application use, they found that customers who are happy with the use of mobile applications are most likely to repeat this use. Other research by Arumsari and Ariyanti (2017); Miswanto and Angelia (2018) reveal that there are other factors that encourage use of mobile applications, customer awareness, relevance of features and products, and customer loyalty. The outcomes of this study support various findings (Amadea et al., 2021, Xu et al., 2015, Oh & Kim, 2022) who discovered that customer satisfaction leads to repeat use.

This indicates that customer satisfaction is essential for both mobile application users and mobile application service providers.

5.3 Conclusion

This chapter settles our research questions, RQ1 and RO1 "To investigate factors influencing the use of mobile applications in the South African telecommunications industry." While the RQ2 and RO2 "To investigate the impact of mobile applications on customer satisfaction".

In this chapter, the research findings were discussed and contrasted with existing literature. Each hypothesis was thoroughly discussed, previous literature was examined to see how it related to the findings of this study, and finally, possible practical implications of the findings were discussed. General awareness, performance expectancy, effort expectancy, facilitating conditions, individual innovation, system quality, and customer satisfaction were found to have a significant correlation with behavioural use. Further, social influence had little effect on behavioural use. The final chapter of the study discusses the study's objectives, contributions, recommendations, limitations, and future research.

Chapter 6: Conclusions & recommendations

6.1 Introduction

This chapter brings the study to a close. The research is summarised first, followed by its contributions to the literature. The study's limitations are then discussed. Following that, recommendations for practice and future research are presented. Finally, the investigation is completed.

6.2 Summary of the research

The study introduced research problems and the motivation for conducting the study in Chapter 1. The study investigated two research issues. The study's first problem was to investigate the factors influencing the use of mobile applications in South African telecommunications. There was also a need to conduct additional research into the impact of customer satisfaction on the use of telecommunication mobile applications. However, some prior studies have revealed that customer satisfaction influences mobile application use, whereas other studies disagree.

As a result, factors influencing use are not well understood. The second issue investigated is whether individual innovation and system quality influence the use of mobile applications. Understanding these factors can aid in directing mobile application resource focus within organisations and ensuring the application's performance, such as downtime, information quality, and response time, is up to the expected standard of users.

In chapter 2, through the literature review, the study introduced mobile applications and their components in the telecommunication industry and the benefits of mobile applications. The benefits were further deliberated, along with challenges and shortcomings. The literature review further deliberated about customer satisfaction and the benefits of telecommunications mobile applications. The literature review highlighted previous research that was conducted, indicating that individual innovation and system quality were lacking in previous research. The chapter discussed models of technology acceptance and comprehensively compared the models that led to UTAUT being the best model to use in this research. The review of the literature highlighted the shortcomings of inconclusive studies on customer satisfaction in mobile applications. The findings of this study increased the importance of the study

and will help organisations justify investments and resource allocation in mobile applications in the telecommunications industry.

In Chapter 3, the research methodology used to test customer use of mobile applications in South Africa's telecommunications industry is described. An online survey was used as the research instrument. The survey was sent to South Africans between the ages of 16 and over and was shared by 300 South Africans. The participants of the research were anonymised and were made up of family, friends and acquaintances. Participants were allowed to participate once they agreed to the terms and conditions. The research was a quantitative research using descriptive statistics. All factors in the research models were measured using multi-item scales that were subjected to tests of validity and reliability. SEM techniques were used to test the models. SPSS AMOS version statistical software was used to analyse the data.

In Chapter 4, data was used to test the model developed to understand the factors influencing the use of mobile applications in telecommunications and their implications in the South African context. In order to answer RQ1 and RQ2, this chapter provided a detailed interpretation of the structural model's key findings on mobile application use in the telecommunications industry. The chapter found, through analysis of responses, that the factors influencing the use of mobile applications are general awareness, system quality, individual innovations, performance expectancy, effort expectancy and facilitating conditions. The findings of this study show, social influence has no effect on the use of mobile applications. It was discovered that social approval does not motivate mobile applications users to use or adopt the telecommunications mobile applications. Customer satisfaction was also demonstrated in the chapter as a motivating factor in the use of mobile applications. Further, by introducing individual innovation, system quality, general awareness, the chapter has extended the UTAUT model successfully by taking into account the various needs of mobile application users. Individual innovation, general awareness and system quality were found to be factors that motivate the use and adoption of mobile applications in the study. Effort expectancy was the most contributing factor on the use of mobile applications, this further proved that mobile applications should be easy to use and this action will motivate users.

Finally, chapter 5 provided a detailed interpretation of the structural model's key findings, hypothesising the effects of mobile application use on RQ1 and RQ2. This study confirmed that the factors that motivate "the use of mobile applications in telecommunication" are "general awareness, performance expectancy, effort expectancy, social influence, facilitating conditions, system quality, and individual innovation". The findings of this study show, customer satisfaction is crucial to the use of mobile applications. This study resolves the inconsistency of customer satisfaction as a factor in the use of telecommunications mobile applications. This study confirms that the use of mobile applications in telecommunications can be regarded as a tool for customer engagement, and that customers can use mobile applications to interact with the telecommunication service provider. The main tools regarded by research participants as a factor driving mobile application use were effort expectation, ease of use.

6.3 Contributions of the study

This study contributes to research on the use of telecommunications mobile applications in a variety of ways that are relevant to telecommunications service providers, mobile application designers, users, and potential users of telecommunications mobile applications. As a result, the report has made several theoretical, contextual, methodological, and practical contributions.

6.3.1 Empirical Contributions

First, an empirical contribution was made by extending the UTAUT model to create a telecommunication mobile application success model that focuses on general awareness, system quality, individual innovation, customer satisfaction and use of mobile applications. The original UTAUT model considers performance expectancy, effort expectancy, facilitation conditions, and social influence to be the only factors influencing mobile application use and adoption. The UTAUT model was expanded in this study by including general awareness, customer satisfaction, system quality and individual innovation as new attributes. Further, given the emphasis on telecommunication mobile application users, their most used transactions are to check their balance, retrieve the latest information (discount prices and new product launches) from their telecommunication service provider, and their benefit is value based on having the information accessible 24/7 and purchasing products at

discounts, obtaining value for money. System Quality refers to the quality of information provided by the mobile application, such as the mobile application's service up-time, accuracy of information, response speed, and security. Individual innovation refers to the joy and innovativeness obtained when using the mobile application by users of mobile applications. Mobile applications provide similar services as going to a physical retail store, so the distinct ability of using the mobile application promotes using the mobile application rather than going to shops physically. Individual innovation and system quality individually, or combined, have not been sufficiently investigated in mobile applications.

Second, Customer satisfaction as a factor influencing the use of mobile applications is a subject of debate in the literature. The consequences of inconsistency in the literature could misdirect organisational effort and complicate investment decisions in mobile applications (Nair et al., 2022). This may result in organisations losing the benefits of lower operating costs, increased customer and market reach, and always-on 24/7 service for their customers (Xu et al., 2015). Customer satisfaction does not lead to the use of mobile applications, the findings of the following studies show (Stone & Baker Eveleth, 2020; Shin et al., 2019; Tep Sandrine et al., 2020). However, Customer satisfaction leads to the use of mobile applications, other prior studies (Vega-Ramrez et al., 2020; Birkhoff & Smeltzer, 2017; Marinkovi et al., 2019); thus, if customer satisfaction is achieved on mobile applications, organisations thrive in the market (Grewal & Levy, 2017). As a result, research that seeks to comprehend customer satisfaction in mobile applications as a factor of use and adopt is critical to commission.

6.3.2 Contextual Contributions

The contextual contribution of this research helps South African telecommunication service providers in more effective ways, guiding them in achieving the use of mobile applications. The findings of this study show that effort expectancy is a much more effective factor to consider when developing mobile applications for telecommunications in South Africa. In addition, this study discovered that customer satisfaction is a motivator for mobile application use. These insights have an impact on investment, resources, and focus in the mobile application space. This study also found that performance expectancy, effort expectancy, facilitating conditions,

individual innovation, and system quality are all factors that influence mobile application use and adoption. Customer satisfaction has been shown to influence the use and adoption of mobile applications. Social influence has been shown to have little influence on the use and adoption of mobile applications. This research is now able to advise telecommunications service providers in South Africa on the factors influencing the use and adoption of mobile applications.

6.3.3 Methodological Contributions

The research also helped to validate the unified theory of acceptance and use of technology (UTAUT) in the context of telecommunication mobile applications. Many researchers have modified the unified theory of acceptance and use of technology (UTAUT) with various variables; this study contributed to the modification of UTAUT by including variables of general awareness, individual innovation, system quality and customer satisfaction. The study also contributed by testing the variables of general awareness, system quality, individual innovation and customer satisfaction on mobile application use.

6.3.4 Practical Contributions

The results of this study demonstrate the need of having an holistic business perspective while implementing mobile applications. The path to using a mobile application includes infrastructure, design standards, user awareness, and all time system availability.

Mobile application users are critical to the success of a mobile application. The results of this study have demonstrated that users and non-users of mobile applications must be aware of the benefits of using mobile applications, so businesses must constantly market and advocate for mobile application adoption. This could be accomplished through specialised mobile application-only products and promotions aiming at increasing awareness of mobile application. Users of mobile applications may be incentivised to utilise them, and service support may be limited to mobile use exclusively, diverting customers to use mobile applications.

Customers of telecommunications must participate in the development of new features by identifying their problem areas and mobile application feature expectations. These focus groups could mould feature availability to be based on customer requirements,

and the design of the mobile application could be led by the consumer's logical interpretation of information, thus enhancing the design standard. The findings of this study demonstrate greater attention should be made on building goods and features that are simple to use, error-free, and simple to understand. The telecommunications industry could focus on developing mobile applications with minimum effort and high performance expectations.

A mobile application-compliant network must be built and maintained by the business. The availability of smartphones in remote areas could be improved by allowing shops in remote areas to sell smartphones, and the cost of entry smartphones could be lowered to be affordable to many and extended by offering payment plans for long-term purchases. Shops should strengthen their smartphone application support by making service the centre of support, such as logging shop queries through the smartphone application, buying on the mobile application and collection in store. Customers could be notified about data security, ensuring that data handled on the mobile application is secure and inaccessible.

The findings of this study show that customer satisfaction is essential for ensuring use of mobile applications. Customer satisfaction in the telecommunications industry could be measured using measures, such as Net Promoter Score NPS, in which a client is surveyed at the end of their encounter with the mobile application. This tool can determine whether or not the encounter with the mobile application was pleasurable. NPS could be a widespread goal in the organisation for teams in charge of mobile applications. Customer satisfaction is crucial for mobile application utilisation because dissatisfied consumers do not return (Amadea et al., 2021, Xu et al., 2015, Oh & Kim, 2022).

6.4 Limitations and suggestions for further research

6.4.1 Limitations

The study had some limitations, including limited sample size. The majority of respondents were young adults under the age of 30, who may behave differently than people of different ages when it comes to technology acceptance. The study was also limited to quantitative data, so the results may have missed important qualitative findings that could have been obtained through qualitative research.

This study was a cross-sectional study that does not show changes in the attitudes of research participants over time (Al-Debei et al., 2015). The study was also limited to people in South Africa, with the majority of respondents based in Gauteng and the Eastern Cape, and the responses and behaviours of people in these provinces may differ from those in other provinces, or worse, outside of South Africa. Individual responses and behaviours in South Africa regarding acceptance of online shopping may differ from those in other provinces. This means that this study cannot be used to generalise the behaviour of all South Africans or individuals from developing countries in terms of mobile application use and adoption.

The researcher added general awareness (GA), customer satisfaction (CS), system quality (SQ), and individual innovation (II) to the unified theory of technology acceptance and use (UTAUT). In the study's modified version of the UTAUT model, gender and user voluntariness, both of which are UTAUT moderating factors, were omitted from the model. However, given that the UTAUT gender and user voluntariness were not included as moderating factors, the current study does not test how the adapted UTAUT factors that were measured in the study are affected by these moderating factors.

6.4.2 *Suggestions for further research*

The study was cross-sectional, and according to Al-Debei et al. (2015), cross-sectional studies do not show changes in research participants' attitudes over time. Longitudinal studies on telecommunications mobile application use among South Africans may be conducted in the future. This study focused on South Africans but could be expanded to other countries.

Gender and voluntariness of use, two moderating factors of the UTAUT model, were excluded from the adapted UTAUT model tested in this study. The researcher suggests that future studies that include these moderating factors be conducted. This research will help to better understand the impact of these moderating factors on customer use of mobile applications in South Africa.

Further research could be carried out using qualitative methods to gain a better understanding of the qualitative dynamics of customer use of telecommunications mobile applications in South Africa. General awareness, individual innovation and system quality were added to the UTAUT model, and future research may include

other variables such as risks or trust factors to better understand customer use of telecommunication mobile applications in South Africa.

6.4.3 Recommendations for practice

The findings of this study demonstrate that effort expectancy has the greatest impact on customer use of telecommunication mobile applications in South Africa. This highlights the importance of telecommunications companies ensuring that their mobile applications are simple to use and provide the best value for money and low user effort. The applications should be simple to understand and should not require any special technological skills to operate. Users of mobile applications should feel the value, and it should be simple for them to choose mobile applications over physical retail stores for shopping, information, or inquiries.

In South Africa, social influence was found to have no significant effect on the use of telecommunication mobile applications. These findings suggest that when developing mobile applications, individual focus is required to ensure that customer needs are addressed at an individual level. This further motivates when developing mobile applications, the focus should be on frequently and most used products and services, as social appeal is perceived as less important in the mobile application sphere.

Individual innovation was discovered to have a significant positive impact on customer use of telecommunication mobile applications in South Africa. The attitude of the users towards the mobile application defines individual innovation in telecommunications mobile applications. Does the mobile application, for example, make their lives easier, and does it provide a compelling use case for telecommunications customers? Improving the customer experience individually entails adding value to the customer's relationship with the mobile telecommunications business.

In South Africa, system quality was discovered to have a significant positive impact on customer use of telecommunication mobile applications. System quality refers to the mobile application's understandability, which means that the information presented is clear and concise, timeliness, which means that the information presented is always up to date, usefulness, which means that the information can be used in other environments, and availability, which means that the mobile application is always available to perform its functions. These elements can entice customers and potential users to use a telecommunications mobile application.

In South Africa, customer satisfaction was discovered to have a significant positive impact on customer use of telecommunication mobile applications. Customer satisfaction is a post-purchase attitude developed through a mental comparison of the product (Kim et al. 2003). Customer satisfaction increases the likelihood of purchasing goods and services from a telecommunication mobile application. Users of mobile applications must be satisfied with the technology and be able to recommend it to friends and family.

6.5 Conclusion

The findings of the study on customer use of telecommunication mobile applications in South Africa revealed the critical factor of effort expectancy on mobile application use. The study found that the effect of system quality, general awareness, customer satisfaction and individual innovation had a significant effect on the use of telecommunications mobile applications. Although Venkatesh et al. (2003) found different findings on social influence, the study also proposed the unified theory of acceptance and use of technology (UTAUT) as a relevant theoretical lens to study individual acceptance of information technology. Customer satisfaction was found to be an important factor in the use and adoption of mobile applications. The results of performance expectancy, facilitating conditions, effort expectancy, and behavioural use agreed with those of Venkatesh et al. (2003), who discovered that these variables had a significant effect on acceptance of telecommunication mobile applications.

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Appendix A: Research instrument

Questionnaire: Using telecommunications mobile application in South Africa

Section A: Participant Details

Age: 22- 25 ☐ 26 – 30 ☐ 31- 35 ☐ 36- 40 ☐ 41 – 45 ☐ 46 – 50 ☐ 51- 55 ☐ 56- 60 ☐

Gender: Male ☐ Female ☐

Highest Qualifications

Matric ☐ Diploma ☐ Bachelor's degree ☐ Honours Degree ☐

Master's Degree ☐ Doctorate Degree ☐

Which mobile network operator are you using?

MTN ☐ Telkom ☐ Vodacom ☐ Cell C ☐

Do you have a smartphone?

Yes ☐ No ☐

How long have you been mobile application of your network operator?

☐ 0- 2 years ☐ 2 – 4 years ☐ 4- 6 years ☐ 6 years and more

How much do you spend average monthly on your mobile phone?

☐ 0- R30 Rands ☐ R31- R90 Rands ☐ R91 – R150 ☐ R151- R300
☐ R301 – R600 ☐ R601 – R1000 ☐ R1001 and more

Which province do you stay?

☐ Eastern Cape ☐ Free State ☐ Gauteng ☐ KwaZulu- Natal
☐ Limpopo ☐ Mpumalanga ☐ Northern Cape ☐ North West

Have you used telecommunication mobile applications?

☐ Yes ☐ No

How would you describe your understanding of telecommunication mobile application?

☐ Very Poor ☐ Poor ☐ Average ☐ Good ☐ Very Good

How would you describe your knowledge of telecommunication mobile applications?

☐ Very Poor ☐ Poor ☐ Average ☐ Good ☐ Very Good

Do you prefer using telecommunication mobile application, Cellular Shops & ATM or both?

☐ Mobile Applications ☐ Cellular Shops & ATM ☐ Both ☐

Section B: This part captures the respondents' awareness and attitude, perceived usefulness, effort expectancy, social beliefs, facilitating conditions, and behavioural use for using telecommunication mobile applications.

The items will be rated using a 7-point Likert scale ranging from (1): Strongly Disagree; (2) Disagree, (3) Somewhat Disagree (4) Neither Agree Nor Disagree; (5) Somewhat Agree; (6) Agree; (7) Strongly Agree

B1	General Awareness, Attitude and Trust telecommunication mobile application	1	2	3	4	5	6	7
1	I believe that mobile application can simplify transactions with my telecommunication service provider							
2	I believe that mobile application will provide value when I am transacting with my telecommunication service provider							
3	I would like to use mobile application when logging queries to my telecommunication service provider							
4	I would trust the information provided from telecommunication mobile applications							
5	I would feel comfortable using my telecommunication mobile application							
B2	Performance Expectancy	1	2	3	4	5	6	7
PE1	Mobile application could be useful for my telecommunication service provider							
PE 2	Mobile application could enable me (the user) to complete a queries and transaction quicker							
PE 3	I could save more time at work by using mobile application to transact with my network service provider							
PE 4	Mobile application would improve my life role and it will reduce time I spend going to shops or ATM to transact							
PE 5	Mobile Application will improve management of my monthly bill							

B3	Effort Expectancy	1	2	3	4	5	6	7
EE 1	I like to learn about the use of mobile application							
EE2	Mobile application are easy to understand and use							
EE3	I have the technical skills required and confidence to use mobile application							
EE4	Using mobile application will make my life easy							
EE5	It is easy to learn how to use mobile application							
B4	Social Influence	1	2	3	4	5	6	7
SI 1	My friends, colleague and family supports the use of mobile application							
SI 2	In my network of friends, there is an expectation that one should use mobile application when transacting with the telecommunication service provider							
SI 3	Utilising mobile application will propel my understanding of my telecommunication service provider							
SI4	Using mobile application gives me a higher status amongst my friends, colleagues and family							
SI 5	Being able to use mobile application give me a higher status than those who are unable to							
B5	Facilitating Conditions	1	2	3	4	5	6	7
FC1	My telecommunication service provider has the structure to support the use of mobile applications							
FC2	I think that the telecommunication service provider take effective measures to ensure use mobile application							
FC 3	I have the essential skills to start using mobile application							
FC 4	I have access to the necessary assistance if I run into issues when utilizing mobile application							
FC5	In South Africa, there are national and government efforts that support the use of mobile application use							
B6	Behavioural Use	1	2	3	4	5	6	7
BI 1	I prefer using mobile application from my telecommunication service provider							

CS 1	Rate your level of agreement with statement "I'm satisfied with the use of mobile applications"							
CS2	Would you recommend telecommunication mobile application to friends, family and colleagues							
CS 3	I would use the mobile application again							
CS 4	Rate your level of agreement with statement "I'm satisfied with the products and services offered on my mobile applications"							
BI 2	I intend using mobile application from my telecommunication service provider							
BI 3	I would use my telecommunication mobile application							
B 7	Individual Innovation	1	2	3	4	5	6	7
II 1	I enjoy trying new mobile applications							
II 2	I'm actively seeking for new mobile applications							
II 3	I find it easy to use new mobile application							
II 4	I find telecommunication mobile application innovative							
B8	System Quality	1	2	3	4	5	6	7
SQ 1	Telecommunication mobile application is always available on my smartphone							
SQ2	Telecommunication mobile application information is always accurate							
SQ3	Telecommunication mobile application is always not working on my mobile application							
SQ4	Telecommunication mobile application is fast when interacting with it							
SQ5	Telecommunication mobile application is secured							
B8	Customer Satisfaction	1	2	3	4	5	6	7

Section C: This section captures respondents' feedback on factors that enable the use of telecommunication mobile applications

C	telecommunication mobile applications use barriers and enablers
38	What would be the 3 things that will stop you from using telecommunication mobile applications (Complete answers on the 3 spaces provided: 180-word limit on each)

39

What are the 3 things that would enable you to use telecommunication mobile applications
(Complete answers on the 3 spaces provided: 180-word limit on each)

Appendix B: Participant letter

Dear Participant,

My name is Sisonke Manentsa, student number: 478138. I am a student at the University of the Witwatersrand studying towards a Master of Management in the field of Digital Business.

You are kindly invited to participate in an online research study project titled: The perceptions of Customer Use of Mobile Applications in a Telecommunication industry in South Africa. The purpose of this online survey is to collect data related to the use of telecommunication mobile application in South Africa. Participation in this online research study is completely voluntary and you may refuse or withdraw your participation at any time with no consequences. This online survey will take you about 30 minutes to complete. Please note that there is no compensation for participating in the online research study. The responses to the survey will be kept confidential and safe to protect the identities of all respondents as will be published in professional journals and presented at national and international conferences. Neither the researcher nor the University of the Witwatersrand has any conflict of interest on the results from the research study.

Should you have any questions and wish to know about research findings, you are most welcome to contact Sisonke Manentsa telephonically on 0829946860 or email 478138@students.wits.ac.za.

Your assistance will be greatly appreciated.

Kind Regards, Sisonke Manentsa

Appendix C: Ethics Clearance Certificate

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg



Wits Business School Ethics Committee

Constituted under the University Human Research Ethics Committee (Non-Medical)

Ethics Clearance Certificate

Ethics protocol number: WBS/DB478138/393

This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below).

Project title	Customer use of mobile applications in the telecommunication industry in South Africa
Investigator / Researcher	Mr Sisonke Manentsa
Nature of Project	MM (Digital Business)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed anonymity and confidentiality.
Issue Date of Certificate	2023-01-25
Expiry date	Date of submission of the project / research report
Chairperson	Dr Pius Oba 

Declaration by Researcher

One copy must be signed by the Researcher and returned to the Chairperson of the Wits Business School Ethics Committee.

I fully understand the conditions under which I am authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I undertake to resubmit the protocol to the Committee.



Signature

28 January 2023
Date•