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E-commerce Use Factors and Its Impact on Customer Experience: An Empirical Study in South African Retail

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A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business

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ABSTRACT

E-commerce adoption in South Africa has grown significantly, yet challenges such as increasing cyber threats and the gap between retailer adoption and actual customer usage continue to hinder customer use and diminish customer experience. This study investigated the factors influencing customer use of e-commerce and their impact on customer experience in the South African retail sector. The updated DeLone and McLean Information Systems (D&M IS) success model was adapted by introducing two security-related constructs: security quality and security knowledge.

A quantitative research approach was adopted, using survey data from 181 South African e-commerce users. Structural equation modelling (SEM) was utilised to analyse the relationships between system quality, information quality, service quality, security quality, security knowledge, customer use, user satisfaction, and customer experience. Findings revealed that system quality, service quality, security quality, and security knowledge positively influenced customer use and user satisfaction, while information quality only influenced user satisfaction. The link between information quality and customer use was excluded during model refinement to improve fit. Notably, the security-related factors were found to significantly influence customer use and user satisfaction.

Furthermore, customer use and user satisfaction were found to significantly impact customer experience. These results indicate that a positive customer experience not only encourages customers online shopping purchases but also ensures continued platform engagement. The study contributes to information systems research by validating the influence of security constructs within the D&M IS model and provides practical guidance for South African retailers seeking to enhance e-commerce strategies through cybersecurity improvements and user awareness initiatives.

Keywords: E-commerce; System Quality; Information Quality; Service Quality; Security Quality; Security Knowledge; Customer Use; User Satisfaction; Customer Experience; DeLone and McLean Information Systems Success Model

DECLARATION

I, _____Nelisiwe Nxumalo_____, 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.

Name: Nelisiwe Nxumalo Signature: 

Signed at: Dubai

On the 27 day of February 2025

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LIST OF ACRONYMS

AI – Artificial Intelligence

AMOS – Analysis of Moment Structures

AVE – Average Variance Extracted

B2B – Business-to-Business

B2C – Business-to-Customer

B2G – Business-to-Government

C2B – Customer-to-Business

C2C – Customer-to-Customer

C2G – Customer-to-Government

CE – Customer Experience

CFA – Confirmatory Factor Analysis

CFI – Comparative Fit Index

CR – Composite Reliability

CU – Customer Use

DF – Degrees of Freedom

D&M IS – DeLone and McLean Information Systems

DTC – Direct-to-Customer

EFA – Exploratory Factor Analysis

GFI – Goodness of Fit

ICT – Information and Communication Technology

IFI – Incremental Fit Index

IQ – Information Quality

IS – Information Systems

IT – Information Technology

KMO – Kaiser-Meyer-Olkin

NFI – Normed Fit Index

PCA – Principal Component Analysis

RFI – Relative Fit Index

RMSEA – Root Mean Square Error of Approximation

SA – South Africa

SD – Standard Deviation

SECQ – Security Quality

SEM – Structural Equation Modelling

SEQ – Service Quality

SK – Security Knowledge

SPSS – Statistical Package for Social Sciences

SQ – System Quality

SSL – Secure Socket Layer

TLI – Tucker-Lewis Index

US – User Satisfaction

WBS – Wits Business School

X^2 – Chi-Square

CHAPTER 1. INTRODUCTION

1.1 Purpose statement

In response to the increasing adoption of e-commerce by retail businesses in developing countries, this research aimed to examine the factors influencing customer use of e-commerce and their impact on customer experience within the South African retail sector.

To achieve the purpose of the research, the study adopted the updated DeLone and McLean Information Systems (D&M IS) success model. This model provides a comprehensive framework for assessing information systems success for both individuals and organisations, by considering key factors such as system quality, information quality, service quality, use and user satisfaction (DeLone & McLean, 2003). Although the D&M IS success model has been widely used to evaluate the success of various information systems, it has not been sufficiently tested in the e-commerce context, where cybersecurity threats represent a significant challenge. Therefore, the factors influencing customer use of e-commerce need to be revisited, particularly to assess whether the investments of retail businesses in e-commerce are justified (Liu et al., 2022).

This investigation is particularly relevant, as prior studies (Bartczak, 2021; Liu et al., 2022) have highlighted the increasing cybersecurity threats faced by e-commerce. Similarly, Hendricks & Mwapwele (2024) observed that low perceived trust in e-commerce platforms remains a barrier to widespread adoption. Moreover, Musikavanhu & Musakuro (2023) noted that despite widespread e-commerce adoption by South African retail businesses, this has not translated into an increase in customer use, potentially indicating a poor customer experience.

Given these cybersecurity and adoption challenges, this research aimed to reassess the factors influencing customer use of e-commerce, as these challenges may indicate a gap in understanding how such factors impact customer experience. These challenges also suggest that security may be playing a significant role in influencing customer use of e-commerce. Prior studies have highlighted system security as a key factor influencing user satisfaction, customer trust and overall customer experience in

e-commerce (Algarni et al., 2013; Noori, 2019; Rahmayanti et al., 2021). However, the D&M IS success model has yet to comprehensively consider security quality and security knowledge as key factors influencing customer use and its impact on customer experience.

Furthermore, existing studies on e-commerce success have produced mixed findings regarding the factors influencing customer use. Some studies (Pramudito et al., 2023; Setiadi et al., 2023) identified system quality and information quality as the primary drivers, while DeLone & McLean (2004) highlighted system quality, information quality, and service quality. Other studies identified service quality (Angelina et al., 2019), information quality (Tam et al., 2019) and system quality (Yel et al., 2020) as singular key factors. These inconsistencies highlight the need for further research to clarify the key factors contributing to customer use and their relationship with customer experience in e-commerce.

Building upon the limitations of the D&M IS success model, the inconsistencies in prior studies, and the increasing cybersecurity challenges in e-commerce, this study proposed an adapted conceptual framework. The adapted model integrates security quality and security knowledge as additional dimensions, as illustrated in Figure 1.

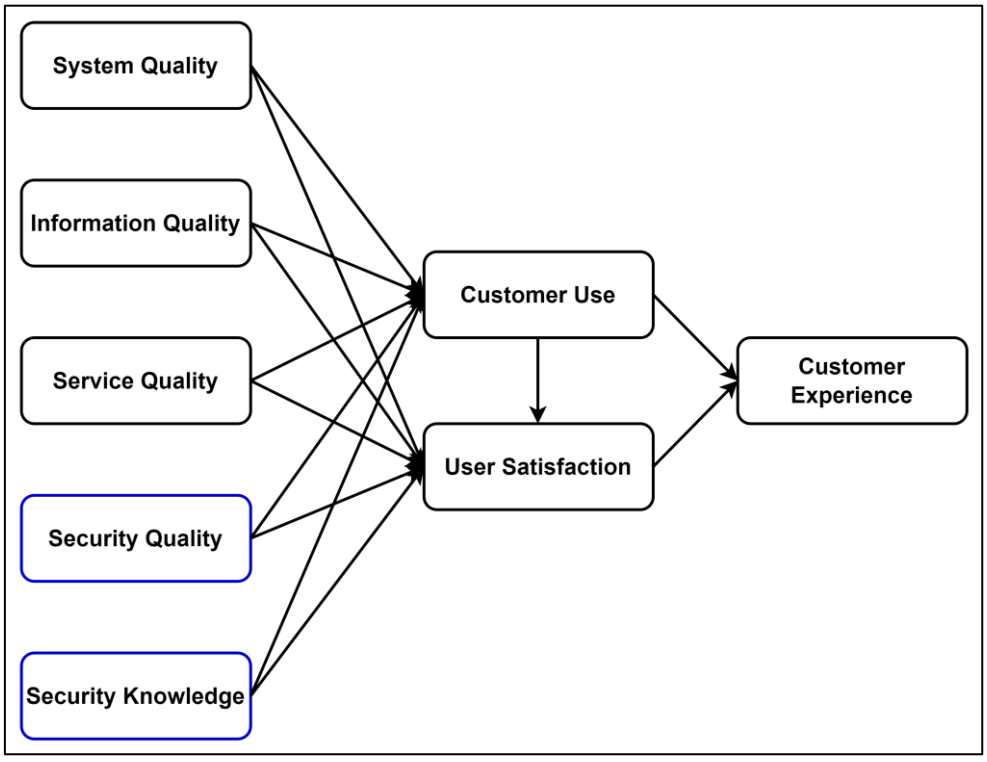


Figure 1: *Proposed conceptual framework (*researcher's own work).

1.2 Research background

The introduction of e-commerce significantly transformed traditional commerce, largely driven by the increasing customer demand for convenience (Browne et al., 2004). This shift has positioned e-commerce as the primary driver of modern trade, especially in the retail sector, where online shopping practices have been revolutionised (Ntumba et al., 2023; Oguta, 2024; Schwab 2016). E-commerce refers to the buying and selling of goods and services using secure internet connections and digital payment platforms (Gupta, 2014; Oguta, 2024; Simakov, 2020). It originated in the 1960s with the invention of electronic data interchange, which enabled the electronic exchange of documents between businesses (Gupta, 2014; Simakov, 2020). The growth of e-commerce accelerated in the 1990s with the invention of the World Wide Web and the launch of e-commerce websites such as Amazon and eBay (Gupta, 2014). Throughout the 2000s, its growth was further driven by advances in digital technology (Simakov, 2020).

Globally, e-commerce adoption has increased sharply, with markets dominated by countries such as China, the United Kingdom (UK), and the United States (US) (Buchholz, 2025). In 2023, e-commerce sales account for a significant proportion of total retail sales in these countries: 27.6% in China, 26.6% in the UK, and 15.6% in the US (Ma, 2025; Retail Sales team, 2025; Statista, 2024). In contrast, although South Africa's e-commerce market has experienced notable growth, it continues to lag behind global leaders like China, the UK, and the US. In 2023, e-commerce sales in South Africa (SA) accounted for only 6% of total retail sales, amounting to R71 billion (Goldstuck & Bannier, 2024). Despite its relatively low global share, SA remains one of the leading e-commerce markets in Africa. This position is driven by several factors, including increasing penetration of high-speed internet, a relatively stable economy, a young and diverse consumer base, a variety of payment solutions, and a fairly strong logistics infrastructure (IMARC Group, 2024). These conditions present a valuable context for examining the factors that influence customer use of e-commerce.

E-commerce offers numerous benefits, including convenience, personalisation, access to global markets, reduced overhead costs, scalability, and enhanced competition (Gupta et al., 2023; Niu & Zhao, 2023; Taher, 2021). However, despite these advantages businesses continue to face several challenges that must be

addressed to improve overall customer experience and justify continued investment in e-commerce. One challenge is the need to continuously upgrade technology infrastructure to remain competitive and deliver seamless customer experience (Jain et al., 2021; Santos et al., 2017). Additionally, the increase of counterfeit products damage e-commerce platform reputations and erode customer trust (Chawla & Kumar, 2021). Delivery and logistics present additional challenges as businesses must meet growing customer expectations for fast and reliable shipping (Hendricks & Mwapwele, 2024). Furthermore, navigating often inconsistent government regulations across different regions can be complex and costly (Gupta et al., 2023).

Amongst these challenges, security remains one of the most critical concerns in e-commerce, particularly given the increasing sophistication of cyber threats (Tanwar, 2025). Businesses must employ robust cybersecurity practices to strengthen system security measures, such as multi-factor authentication, encryption, and fraud detection systems, to protect customer data and mitigate risks associated with online transactions (Gupta et al., 2023; Hendricks & Mwapwele, 2024; Liu et al., 2022; Tanwar, 2025). These security challenges are more pronounced in developing countries due to infrastructural limitations and inadequate government policies and regulations (Hendricks & Mwapwele, 2024). By implementing such measures, businesses can foster a safer online shopping environment, build long-term customer trust, and enhance confidence in e-commerce platforms.

It is important to recognise that security challenges in e-commerce take many forms, including social engineering, identity theft, online fraud, malware, and data breaches. These emerging risks must be effectively addressed to provide a positive customer experience. Mofokeng (2019) and Saeed (2023) emphasised that enhancing security features is essential for increasing online sales and building customer trust. Failure to address these security concerns can result in severe financial and reputational losses for customers (DeLiema et al., 2021) or the compromise of sensitive personal data (Mthembu et al., 2018; Sausalito, 2024). Such challenges are more pronounced in developing countries, where weak cybersecurity infrastructure and the lack of regulations worsen risks (Mthembu et al., 2018). Consequently, these security concerns contribute significantly to customer distrust, discouraging potential users from engaging in online transactions (Agarwal & Wu, 2015; Alyoubi, 2015). This lack of trust, in turn, affects e-commerce adoption, with Agarwal & Wu (2015) predicting

that a lack of trust in online transactions will be a major factor slowing down the growth of e-commerce.

Despite the important role of security in influencing customer trust, behaviour and use of e-commerce platforms, existing theoretical models, particularly the DeLone and McLean Information Systems (D&M IS) success model have often failed to explicitly account for security-related factors as drivers influencing customer use of e-commerce. Originally developed by DeLone & McLean (1992), the D&M IS success model has been extensively applied at both the individual and organisational levels to assess information system success, focusing on system quality, information quality, service quality, system use and user satisfaction (DeLone & McLean, 2003). However, in the context of e-commerce the model has not been adequately tested, particularly for constructs such as security quality, defined as the system's ability to protect data and resources (Raghavan & Zhang, 2009), and security knowledge, which refers to the user's awareness of security risks and protective measures (Lee & Chua, 2024). This study aims to extend the D&M IS success model by including these two factors, addressing a gap in prior research in which security concerns in e-commerce adoption have been oversimplified through the lens of trust as a mediating factor (Larry, 2019; Mofokeng, 2019; Noori, 2019; Pramudito et al., 2023; Shah et al., 2021). Although trust is important, it does not adequately capture the system's security capabilities or the user's security awareness, both of which are critical in determining customer use of e-commerce platforms and user satisfaction.

Furthermore, prior studies examining e-commerce success have produced mixed findings regarding the primary drivers of customer use and user satisfaction. Some studies identified system quality and information quality as the main influencing factors (Pramudito et al., 2023; Setiadi et al., 2023), while DeLone & McLean (2004) highlighted system quality, information quality, and service quality as key causal factors to success. Other studies focused on singular quality dimensions, including service quality (Angelina et al., 2019), information quality (Tam et al., 2019) and system quality (Yel et al., 2020) as primary factors. These inconsistencies in the literature highlight the need for further research to clarify the factors influencing customer use and user satisfaction, particularly the role of security-related factors, which have received limited attention in prior applications of the D&M IS success model, despite their growing relevance in today's digital commerce landscape.

A central outcome of e-commerce success is positive customer experience, which the D&M IS success model conceptualised as the ‘net benefit’ derived from system use by users (DeLone & McLean, 2004). Prior research indicated that customer experience is influenced by various factors including support, value for time, rewards, promise fulfilment, personalisation, competence, and accessibility (Lemke et al., 2011; Syahnur et al., 2020). Enhancing these factors may lead to an improvement in customer experience, thereby encouraging repeat purchases and fostering customer loyalty (Mofokeng, 2021; Setiadi et al., 2023). However, sustaining consistent online customer use in South Africa has remained a challenge. Although major retail businesses in the country have adopted e-commerce, this shift has not translated into high customer usage (Johnson & Iyamu, 2019). As of 2023, e-commerce sales accounted for only 6% of total retail sales in South Africa, amounting to R71 billion (Goldstuck & Bannier, 2024). Studies also indicated that a significant proportion of customers still prefer shopping in physical stores rather than online (Makhitha et al., 2019; Musikavanhu & Musakuro, 2023). This gap between retailer e-commerce adoption and limited customer use suggests a presence of barriers hindering online customer experience, thus highlighting the need for further research.

Despite previous attempts to address the challenges faced by e-commerce adoption, there remains a gap in understanding the role of security-related factors such as security quality and security knowledge in influencing customer use, user satisfaction, and their impact on customer experience. While the D&M IS success model has been widely applied to evaluate information system success, it has not yet fully integrated these security constructs as causal factors of customer use. Given the increase in security challenges and the continued hesitancy of customers to engage in e-commerce, this study aims to provide a more comprehensive framework for understanding e-commerce adoption, guiding the development of secure e-commerce platforms that drive customer use of e-commerce, fostering customer loyalty, and ultimately guiding investment decisions of retail businesses.

1.3 Research problem

The research aims to investigate two research problems.

The *first* research problem examined in this study focuses on the factors influencing customer use of e-commerce in the South African retail sector. Although prior information systems (IS) research has extensively explored individual use of IS, these studies have primarily focused on system quality, information quality, and service quality (Angelina et al., 2019; Fang et al., 2011; Mahmoodi et al., 2017; Mudau et al., 2023; Pramudito et al., 2023; Rouibah et al., 2015; Setiadi et al., 2023; Yang et al., 2024; Yel et al., 2020). However, these studies have not adequately considered security related factors such as security quality and security knowledge as independent constructs influencing customer use, despite their increasing relevance in today's digital commerce landscape. Given the rise of cybersecurity threats, such factors are likely to play a significant role in influencing customer decisions to engage in online shopping (Hariharan et al., 2023). Studies by Larry (2019) and Oguta (2024) highlight the critical role of security in shaping customer trust and satisfaction in e-commerce. Despite this, research on e-commerce success continue to produce mixed findings regarding which factors most significantly influence customer use and user satisfaction. Some studies have identified system quality and information quality as primary drivers of customer use (Pramudito et al., 2023; Setiadi et al., 2023), whereas other studies argue that system quality, information quality and service quality are key drivers (Angelina et al., 2019; DeLone & McLean, 2004). These inconsistencies reveal a fractured understanding of what drives customer behaviour in online shopping. Despite ongoing research in e-commerce and information systems, there remains no unified framework that integrates both traditional quality constructs and emerging security-related factors. Existing studies often prioritise different constructs, resulting in a fragmented understanding of customer behaviour (Angelina et al., 2019; DeLone & McLean, 2004; Pramudito et al., 2023; Setiadi et al., 2023). This lack of consensus carries significant implications for both theory and practice, particularly in regions such as South Africa, where cybersecurity concerns are increasingly prevalent. Given these gaps, a comprehensive framework that combines security-related and traditional quality factors is justified. In particular, examining how security quality and security knowledge impacts customer experience can provide insights for improving customer use of e-commerce, improving customer trust, and ensuring customer loyalty.

The second research problem examined in this study addresses the gap between e-commerce adoption by retailers and actual customer usage, with a particular focus on

how customer use influences the overall customer experience. Despite the increasing adoption of e-commerce platforms by major South African retailers, achieving high customer engagement levels remains a significant challenge. E-commerce accounted for only 6% of total retail sales in South Africa in 2023, despite widespread investment in online platforms by major retail businesses (Goldstuck & Bannier, 2024). Furthermore, several studies have indicated that many customers continue to prefer purchasing from physical stores rather than using online platforms (Johnson & Iyamu, 2019; Makhitha et al., 2019; Musikavanhu & Musakuro, 2023), suggesting that the availability of e-commerce platforms alone is not sufficient to drive customer usage. This gap points to a limited understanding of factors shaping customer experience in relation to system use in e-commerce systems affected by security challenges, such as cyberattacks and fraud, which contribute to low customer trust in online transactions (Liu et al., 2022). Although the DeLone and McLean Information Systems (D&M IS) success model has been widely used to assess the success of information systems, it has not fully considered security-related factors, such as security quality and security knowledge, as direct drivers of customer use or experience.

To solve for the research problems, this study therefore extends the D&M IS success model by integrating security quality and security knowledge as additional causal factors influencing customer use of e-commerce. In doing so, the research aims to develop a more comprehensive framework for understanding the causal factors of customer use, user satisfaction, and their combined impact on customer experience in the South African e-commerce context. This theoretical contribution offers practical relevance, as understanding these problems is essential for promoting sustained e-commerce adoption in South Africa and informing strategic investment decisions of retail businesses. The research objectives addressing these problems are discussed in the following section.

1.4 Research objectives

Based the research problems discussed above, the key objectives of the research are as follows:

Research Objective 1 (RO1): To examine the factors influencing customer use of e-commerce.

Research Objective 2 (RO2): To examine the impact of customer use on customer experience.

1.5 Rationale

This research attempts to make an original contribution in three ways: theoretical, contextual, and practical.

Firstly, a theoretical contribution is made by improving the understanding of e-commerce adoption through the adaptation of the updated DeLone and McLean Information Systems (D&M IS) success model. This adaptation integrates security-related factors, specifically security quality and security knowledge which have not been sufficiently considered in prior studies. By integrating security-related factors, this research seeks to develop a more comprehensive framework that better reflects the current e-commerce landscape, particularly in response to the rise of cyber threats and the growing role of security in influencing e-commerce customer use and its impact on customer experience, especially within the context of developing countries. This adaptation extends the existing theoretical model through the addition of new constructs, contributing to a deeper understanding of the factors influencing customer use of e-commerce. Additionally, literature reviews reveal inconsistencies in prior research regarding key factors driving customer use of e-commerce (Angelina et al., 2019; DeLone & McLean, 2004; Pramudito et al., 2023; Setiadi et al., 2023). These inconsistent findings highlight the need for further research to reconcile conflicting perspectives on the key factors influencing e-commerce adoption. By addressing these inconsistencies in the literature, this research aims to offer a comprehensive framework for evaluating factors influencing customer use of e-commerce.

Secondly, a contextual contribution is made by examining the customer use of e-commerce in the South African retail sector, addressing a gap in South African-focused e-commerce studies, which remain underrepresented in the broader information systems literature. The growth of e-commerce in South Africa has been significantly driven by increasing internet and mobile device penetration (Research and Markets, 2025). However, despite this growth, e-commerce adoption continues to face significant challenges, including cyber threats, low perceived trust, and reliance on cash transactions (Mthembu et al., 2018). By focusing on the South African retail

sector, this research provides valuable insights into how local factors, such as infrastructure challenges, customer behaviour, and preconceived perceptions, influence customer use of e-commerce. This localised study contributes to both local and international e-commerce research by providing context-specific findings that reflect South Africa's unique economic, social, and technological landscape. Furthermore, by examining e-commerce adoption in the context of security concerns, this research enhances the understanding of e-commerce adoption in developing countries, providing insights into the role of security-related factors in shaping user behaviour and trust in online transactions (Netshirando et al., 2024).

Thirdly, a practical contribution is made by offering actionable insights to retail businesses, product managers, platform developers and cybersecurity professionals. One of the research objectives (RO1) is to examine the impact of the factors influencing customer use on customer experience, providing a clearer understanding of the role of security quality and security knowledge in fostering trust and engagement in e-commerce platforms. By integrating security-related factors into the updated D&M IS success model, this study aims to improve customer awareness of cybersecurity best practices, reducing perceived risks associated with online transactions. Enhancing security knowledge can mitigate customer hesitancy, promote safer online shopping practices, and encourage greater e-commerce adoption (Hanus & Wu, 2016; Osho et al., 2016). Additionally, the findings provide retail businesses and platform developers with actionable recommendations for enhancing e-commerce platforms through improved security features. This research highlights the importance of user-friendly security measures such as multi-factor authentication, secure payment gateways, and fraud detection systems transactions (Gupta et al., 2023; Hendricks & Mwapwele, 2024; Liu et al., 2022; Tanwar, 2025), which not only protect customers but also enhance trust, satisfaction, and overall customer experience. However, effective security implementation alone is insufficient, businesses must also educate users on these measures to bridge the trust gap hindering e-commerce. For South African retailers, the research offers a strategic approach to assessing and improving e-commerce platforms. By understanding how security quality and security knowledge shape customer behaviour, retailers can implement effective strategies to increase customer trust, engagement, and long-term e-commerce adoption, ultimately leading to higher sales and improved investment returns.

1.6 Delimitations of the study

a. This research was limited to the South African retail sector, primarily focusing on understanding the factors affecting the customer's use of e-commerce and its impact on customer experience.

b. The research's focus on the retail sector of e-commerce was specific to business-to-customer (B2C) e-commerce platforms with website and mobile application channels.

c. The research focused on top e-commerce retail platforms widely known and used in South Africa. The platforms were selected based on traffic volumes.

d. The research collected customer data through surveys using a quantitative research method. Qualitative methods, such as interviews or focus groups, were excluded to maintain a consistent and manageable scope of research.

e. The research's primary focus was on security-related factors influencing customer use of e-commerce and customer experience, in addition to the known factors based on the updated D&M IS Success model. The research did not delve into the technical specifics of cybersecurity measures but rather their perceived quality and impact on customer trust.

1.7 Definition of terms

Customer experience refers to the overall perception and feelings a customer has while interacting with an e-commerce platform during their buying journey (Setiadi et al., 2023).

Customer use is defined as the shopping behaviour of customers within an online store or a website designed for online purchasing (Alkan et al., 2021).

DeLone and McLean information systems success model is a framework for evaluating the success of information systems. It includes six dimensions: information quality, system quality, service quality, use, user satisfaction, and net benefits (DeLone & McLean, 2003).

E-commerce is defined as the buying and selling of products and services through digital platforms (Ntumba et al., 2023).

E-commerce platforms are information systems that enable businesses to create, manage, and operate online stores for the buying and selling of products and services over the Internet (DX Adobe, 2021).

Information quality assesses the quality of the information that the system produces. Key attributes include accuracy, completeness, relevance, and timeliness of the information provided (DeLone & McLean, 2003).

Net-benefits refer to the most important success measures as they capture the balance of positive and negative impacts of using e-commerce on customers, suppliers, employees, organisations, markets, industries, economies, and even societies (DeLone & McLean, 2003;2004).

Security knowledge refers to a user's awareness of security risks and protective measures (Lee & Chua, 2024).

Security quality refers to a system's ability to protect data and resources by maintaining confidentiality and integrity (Raghavan & Zhang, 2009).

Service quality refers to the overall support users receive from the IT department or service provider. It measures system characteristics such as reliability, responsiveness, and assurance in delivering support (DeLone & McLean, 2003).

System quality refers to the performance of the information system itself. It measures system characteristics such as usability, availability, reliability, and response time (DeLone & McLean, 2003).

System use/use measures the nature and extent of users' use of the information system. This measure considers factors such as system use frequency and duration (DeLone & McLean, 2003).

User satisfaction refers to the customers' perception of their experiences with an online retailer, evaluating how effectively the platform's products, services, and overall user experience meet or exceed expectations (DeLone & McLean, 2004; Masyhuri, 2022).

1.8 Assumptions

- It is assumed that the respondents will reflect standard perspectives and experiences representative of the South African retail sector's broader population of e-commerce users. This assumption is reasonable because e-commerce usage in South Africa has grown significantly, and user demographics align with broader retail trends. If this assumption does not hold, findings may not be generalisable to the entire e-commerce user base, affecting external validity.
- It is assumed that the respondents' experiences with e-commerce platforms will reflect varying levels of system quality, information quality, service quality, and security quality. This assumption is reasonable as e-commerce platforms differ in their user experience, security measures, and technological capabilities. The research outcome is sensitive to this assumption, as consistent quality across platforms could limit variability in responses, potentially affecting the study's ability to identify meaningful differences in general user perceptions.
- It is assumed that respondents had a varied understanding of the e-commerce platform's security measures, and the security knowledge required to use them safely. Security awareness among online customers varies based on education, experience, and exposure to cybersecurity risks. If all respondents are either highly knowledgeable or completely uninformed, the study's findings may be skewed.
- It is assumed that the respondents had reliable internet access and frequently used e-commerce platforms. A majority of South African internet users engage in online shopping, especially in urban areas. If respondents have limited internet access, the study may overestimate e-commerce adoption rates.

1.9 Chapter Outline

This paper is divided into six chapters, as illustrated in Figure 2. Chapter 1 sets the tone of the research by describing its purpose and objectives, which entail examining the factors influencing customer's use of e-commerce and their impact on user satisfaction and customer experience. Chapter 2 reviews prior literature on the rapid growth of e-commerce and its transformation of consumer behaviour and expectations, highlighting the importance of user satisfaction and customer experience in e-commerce adoption. The Delone and McLean Information System success model is

applied as a theoretical framework for achieving the research objectives. The model's limitations are discussed, identifying a potential knowledge gap this research seeks to address. Chapter 3 outlines the research's design and methodology. Chapter 4 presents the research results, including the sample size, respondents' demographic and behavioural profile, descriptive statistics, and normality. Reliability, validity, and the correlation matrix are analysed before the confirmatory factor analysis is performed. The results of the structural model are visualised and discussed, followed by an analysis of the potential implications. Chapter 5 provides an in-depth discussion of the research results, focusing on how various factors influence e-commerce usage by customers to address the research objectives. Chapter 6 concludes the research with a summary of findings, the research contributions, its limitations, and suggestions for future research.

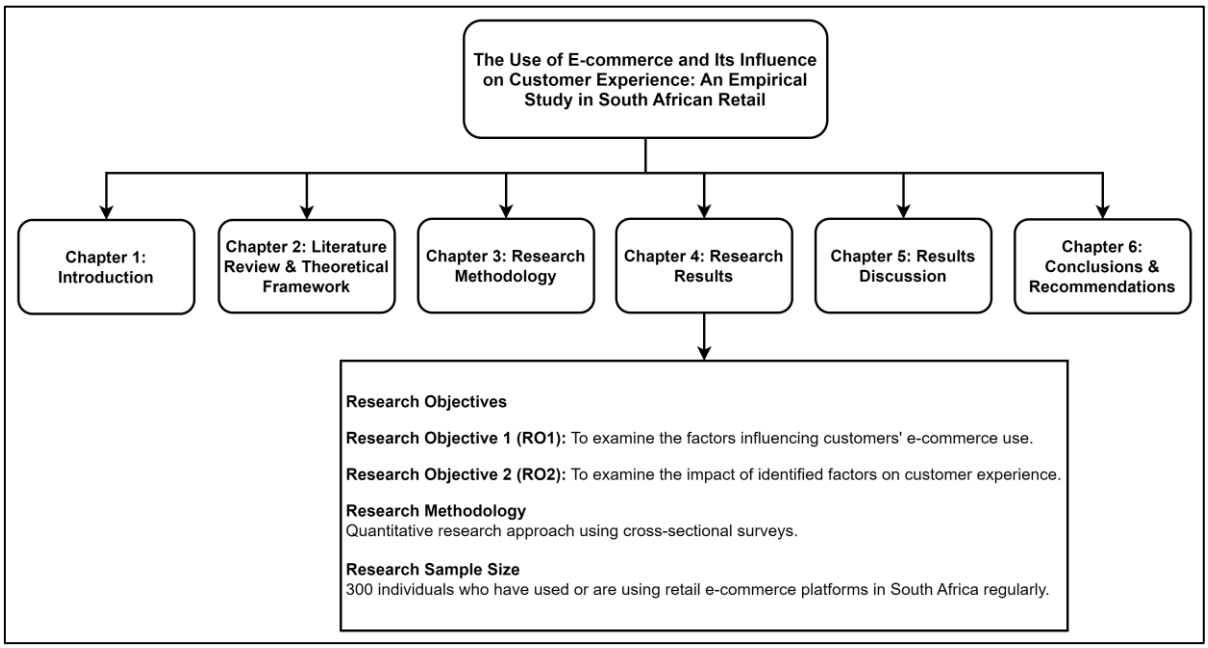


Figure 2: *The outline of the research (*researcher's own work).

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

In Chapter 1, the research topic and problem were introduced. This chapter covers a review of the literature relevant to the research. It begins by presenting the approach followed when conducting the literature review. Next, e-commerce is defined, its evolution is traced, and its benefits and challenges are discussed. E-commerce in the context of South Africa is also examined. It then discusses the factors influencing customer use of e-commerce, explicitly focusing on system quality, information quality, service quality, security quality, and security knowledge, where the impact of these factors on customer use of e-commerce, user satisfaction and customer experience are also examined. This examination aims to shed light on the importance of understanding how security-related factors affect customer's use of e-commerce platforms in the context of retail sectors in developing countries, providing insights to the global academic community.

2.2 Literature review approach

In determining the literature significant to this research, a traditional narrative literature review process was followed, as proposed by Bandara et al. (2011). In preparing the literature review, several reputable databases containing high-quality, peer-reviewed journals were identified and used. These databases included the Wits Library online databases it has access to such as EBSCOHost, ScienceDirect, etc.

The search strategy used in these databases included keywords such as "e-commerce", "system quality", "information quality", "service quality", "security quality", "security knowledge", "customer use", "user satisfaction", "customer experience", and "DeLone and McLean information systems success model". These keywords were combined using Boolean logic to refine the search. The literature considered spans between the years 2014 to 2025, with a preference for studies published between 2019 and 2025. Seminal papers were included where necessary. Comprehensive literature review sections were written based on the relevant, shortlisted journal articles in

English and in full text. The information gathered from these articles directly informed and supported the purpose of the research.

2.3 E-commerce

2.3.1 *E-commerce definition and evolution*

The early form of e-commerce emerged from businesses' need to advertise their products to the market to compete with other businesses. The precursor of e-commerce can be traced back to the 1800s with the invention of catalogues and mail orders (Cherry, 2008). Pryce Jones established the first mail-order business in 1861 by developing an illustration catalogue from which customers could select products based on availability (Campaign US, 2017). Once the market had caught on to catalogues and mail orders, a shift from remote retailing to direct retailing underpinned by brick-and-mortar stores followed naturally as informal retailing through market stands had been a common practice, though not formalised as current retail stores (Evans, 2011). These founding inventions revolutionised the sale of goods.

These foundational inventions laid the groundwork for modern-day e-commerce, shaped by the emergence of digital and mobile technology. The 1960s marked the beginning of modern e-commerce with the invention of electronic data interchange, enabling the electronic exchange of documents between companies through computers (Tian & Stewart, 2008). According to Reed (2024) and Simakov (2020), the 1980s saw the invention of the first electronic mall, introduced by CompuServe, enabling computer users to make deferred purchases in over 100 stores. Despite its failure due to a limited customer base, high computer costs and a lack of trust in online financial transactions, it was one of the first examples of online retail.

The 1990s were marked by key technological advancements that launched e-commerce into mainstream adoption. The development of the Secure Socket Layer protocol was a key website security feature that significantly enhanced the safety of online transactions (Ntumba et al., 2023; Simakov, 2020). This invention was followed by the development of third-party credit card processing facilities, which further improved the security of online transactions. The launches of Amazon in 1994 and eBay in 1995 significantly accelerated the growth and evolution of e-commerce (Ntumba et al., 2023; Simakov, 2020; Taher, 2021). In 1998, PayPal was launched as

an online payment system that further facilitated secure e-commerce transactions (Simakov, 2020). The launch of Alibaba.com in 1999 played a critical role in popularising business-to-business (B2B) e-commerce by connecting Chinese manufacturers to the global market (Jiang & Murmann, 2022; Ntumba et al., 2023).

These foundational developments were followed by years of incremental technological advancements that served as a primary driver of modern trade. These advancements include the introduction of online advertising services such as Google AdWords in 2000, which optimised advertising costs, and the launch of the Amazon Prime feature in 2005, offering a 1-day delivery guarantee and setting a benchmark for delivery efficiency (Ntumba et al., 2023; Simakov, 2020). The release of the first iPhone in 2007, followed by Android smartphones in 2008, made the convenience offered by e-commerce significantly accessible. This evolution led to the rise of mobile payments, exemplified by the launches of Google Wallet in 2011 and Apple Pay in 2014, which improved the speed of transactions. Furthermore, integrating e-commerce into social media platforms, exemplified by Facebook Marketplace and Instagram shopping features introduced in 2016, enhanced online marketing and advertising services (Ang, 2021; Ntumba et al., 2023; Simakov, 2020).

Reflecting on these technological advancements, it becomes important to explore how the definition of e-commerce has evolved over the years is crucial. Although no universally acceptable definition exists, e-commerce is commonly described as the process of buying and selling goods and services over the Internet through secure platforms (Jain et al., 2021; Niu & Zhao, 2023; Ntumba et al., 2023; Simakov, 2020; Taher, 2021). Figure 3 illustrates a typical purchasing cycle interaction between a customer and an e-commerce platform.

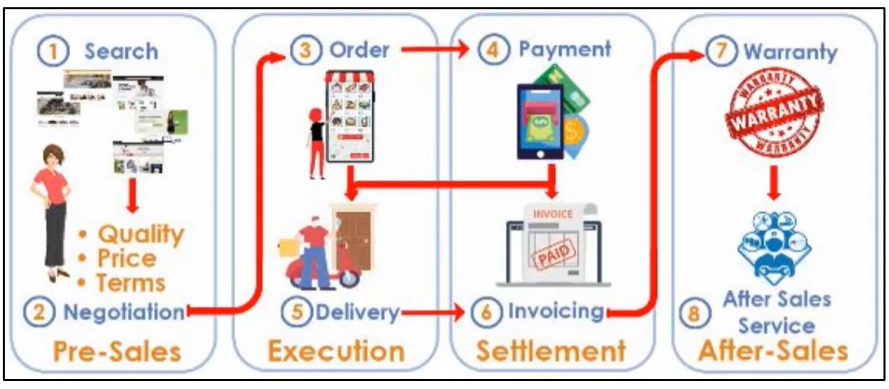


Figure 3: *E-commerce typical trade cycle (Simply Coding, 2021).*

Jain et al. (2021) defined e-commerce as the use of electronic media and the internet to trade goods and services. Similarly, Ntumba et al. (2023) described e-commerce as the buying and selling of goods and services over the internet. Niu & Zhao (2023) extended this definition by emphasising the role of digital information processing technology in business transactions to create, transform, and redefine relationships for value creation for both organisations and customers. Taher (2021) further integrated various perspectives, defining e-commerce as the application of telecommunication networks, internet technology, and computer systems to automate and facilitate business relations, workflow, organisational data exchange, operational transactions, and trade. Lastly, Simakov (2020) highlighted that while e-commerce is traditionally associated with the sale of goods over the Internet, it also includes electronic transmission, facilitating the buying and selling of goods and services. Early definitions of e-commerce primarily focused on online transactions, while more recent definitions focused on integrating automation and digitalisation in business workflows. For this study, e-commerce is defined as “the buying and selling of products and services through digital platforms” (Ntumba et al., 2023).

2.3.2 *Types of E-commerce Business Models*

The exchange of goods and services conducted through various e-commerce platforms involving multiple stakeholders for different purposes warrants an understanding of the various e-commerce business models. Figure 4 illustrates seven primary e-commerce business models along with the actors involved.

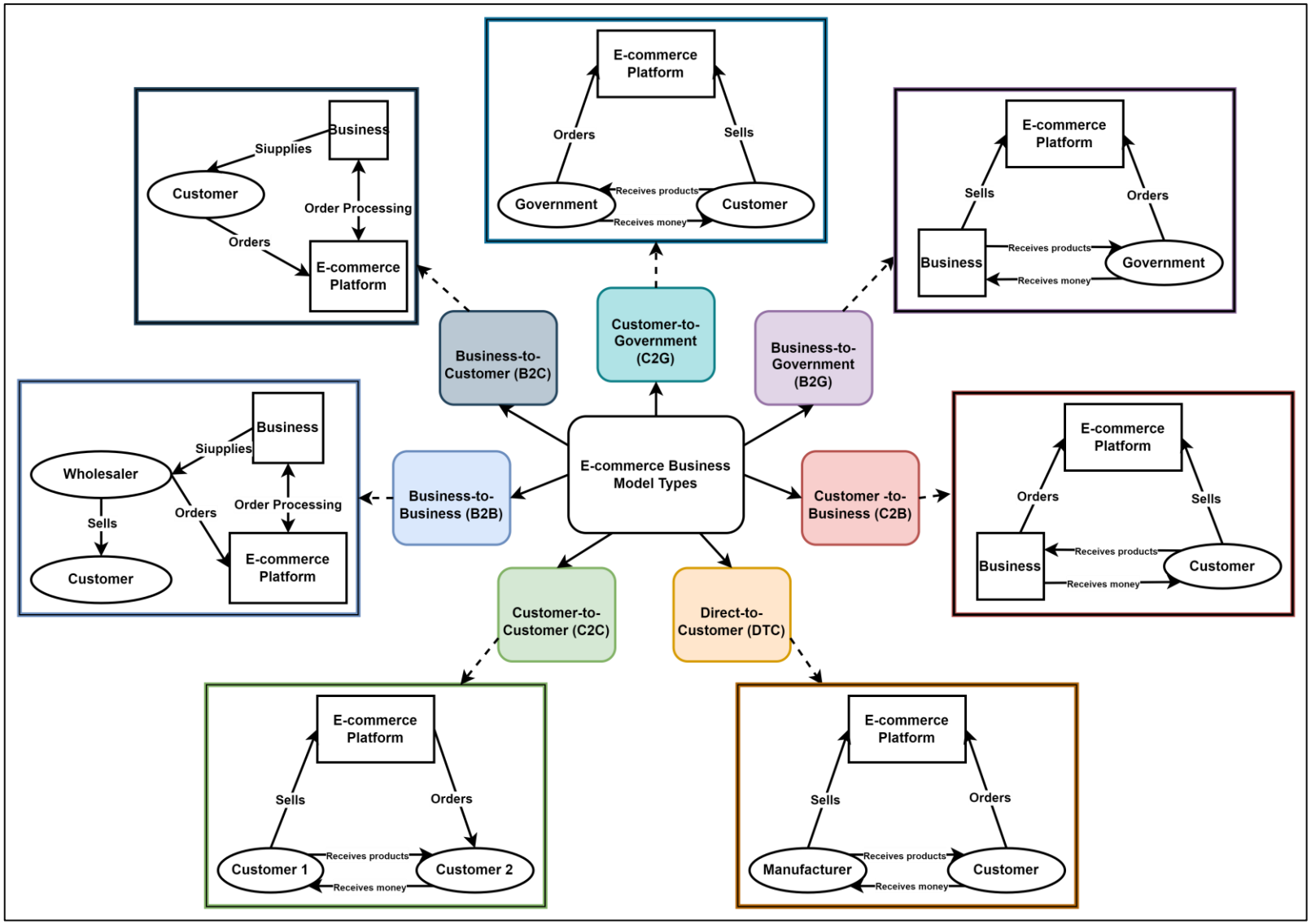


Figure 4: *Types of e-commerce business model (researcher's own work).*

a. *Business-to-customer (B2C)/customer-to-business (C2B).*

Business-to-customer (B2C) and customer-to-business (C2B) e-commerce refer to the electronic buying and selling of goods and services between businesses and customers. In a C2B transaction, traditional e-commerce retailing is reversed, enabling customers to avail their products to businesses. In such transactions, the business is represented by manufacturers, wholesalers and retailers (Azam & Ansari, 2024; Santos et al., 2017; Taher, 2021).

b. *Business-to-business (B2B).*

Business-to-business (B2B) e-commerce is the buying and selling of goods and services between businesses, often involving manufacturers, wholesalers, and retailers without involving customers (Azam & Ansari, 2024; Santos et al., 2017; Taher, 2021).

c. *Customer-to-customer (C2C).*

Customer-to-customer (C2C) e-commerce is the electronic buying and selling of goods and services between customers, facilitated by a third-party platform (Azam & Ansari, 2024; Santos et al., 2017; Taher, 2021).

d. *Direct-to-customer (DTC).*

Direct-to-customer (DTC) e-commerce enables manufacturers to sell directly to customers, bypassing intermediaries such as wholesalers and retailers. This approach has gained popularity among businesses seeking to engage directly with customers and maintain greater control over product distribution (Ang, 2021; Kim et al., 2021).

e. *Business-to-government (B2G).*

Business-to-government (B2G) e-commerce refers to the exchange of goods and services between businesses and governments. The rise of e-government services has significantly increased, enabling businesses to sell products to

government, such as software for efficient service delivery through online platforms (Azam & Ansari, 2024; Santos et al., 2017; Taher, 2021).

f. *Customer-to-government (C2G).*

Customer-to-government (C2G) e-commerce refers to transactions of goods and services between customers and governments. For example, customers paying for government services online, such as purchasing electricity through an online government-based platform (Azam & Ansari, 2024; Santos et al., 2017; Taher, 2021).

2.3.3 *E-commerce benefits*

To date, there has been a consensus on the benefits of e-commerce, which can be categorised into societal, business and individual benefits (Taher, 2021). This section provides an overview of these benefits as derived from the literature, explaining why retail companies globally, including those in developing countries, are increasingly adopting e-commerce to offer their products and services through online channels (Mkansi & Nsakanda, 2021; Musikavanhu & Musakuro, 2023).

a. *Individual benefits.*

E-commerce has revolutionised shopping experiences by offering significant benefits to customers. One primary advantage is the convenience of 24/7 shopping from any location with a stable internet connection (Oguta, 2024). Taher (2021) notes that this convenience saves time, simplifies product browsing, facilitates price comparisons, and provides access to a wide range of products and services. Ntumba et al. (2023) highlight that e-commerce offers competitive prices due to reduced overhead costs. Furthermore, improved inventory management and distribution networks in e-commerce results led to lower delivery costs and enhanced customer order tracking (Santos et al., 2017).

Another significant benefit, as echoed by Jain et al. (2021), is the ability for customers to leave feedback and read reviews, enhancing their shopping experience. Jain et al. (2021) also emphasise the convenience of conducting transactions from home or the office. Santos et al. (2017) identified lower

transaction and communication costs, better product information, 24/7 service availability, customised orders, and real-time stock updates as critical drivers of e-commerce adoption. Additionally, Niu & Zhao (2023) highlight the transparency and real-time tracking of transactions and logistics information provided by e-commerce, which fosters security and trust.

b. *Business benefits.*

One of the most influential benefits for businesses is the absence of geographical limitations offered by e-commerce, which opens up access to a global customer base and provides businesses with unprecedented opportunities for expansion (Oguta, 2024; Ntumba et al., 2023). Additionally, significant cost savings are achieved through the reduced need for traditional brick-and-mortar store operations and improved efficiency from streamlined processes. E-commerce platforms also enable businesses to target specific markets effectively, by leveraging customer data generated through the platforms (Taher, 2021).

Furthermore, e-commerce adoption offers a range of operational and marketing advantages that enhance business performance and growth. From a cost reduction perspective, businesses benefit from improved inventory management and distribution processes driven by customer demands for faster delivery and better service. Marketing advantages include enhanced product information, 24/7 service availability, customised orders, and real-time stock updates (Niu & Zhao, 2023; Santos et al., 2017).

Another significant benefit of e-commerce adoption is its potential to increase sales and enhance revenue projections. Digital operations facilitated by e-commerce allow businesses to use big data to analyse consumer behaviour and market trends, encouraging personalised shopping experiences and efficient inventory management (Niu & Zhao, 2023). Additionally, e-commerce platforms offer scalability, enabling businesses to quickly adapt to changing business demands (Oguta, 2024; Silitonga et al., 2024). E-commerce also facilitates the digital distribution of products, including books and other media, leading to the rise of Print-on-Demand (POD) publishing, which has

significantly reduced the costs associated with traditional book printing and storage (Gordon et al., 2014). Moreover, e-commerce enables small businesses to compete with large corporations by providing a platform to showcase their products and services to a global audience, eliminating the need for physical stores (Costa & Rodrigues, 2023; Oguta, 2024).

c. *Societal benefits.*

One of the most authoritative societal benefits of e-commerce is its significant contribution to job creation and the development of advanced logistics networks, particularly in developing regions. E-commerce has created new job opportunities in the Information Technology (IT) sector, including web development, digital marketing, and customer service roles. Moreover, developing advanced logistics networks facilitates efficient delivery, returns, and exchanges, thus enhancing the overall customer experience (Niu & Zhao, 2023).

Additionally, e-commerce reduces the need for transportation for customers in city centres and remote areas, consequently reducing air pollution levels. By offering variable product pricing, e-commerce provides customers with low-cost product options, benefiting communities in remote areas by democratising access to products and services and ensuring that customers across different income levels can purchase products. (Taher, 2021).

However, despite the numerous benefits of e-commerce identified in the literature, challenges such as low customer use and increased cyber threats persist. These issues continue even with the widespread adoption of e-commerce, primarily by retail businesses. Therefore, these challenges necessitate further research into the factors influencing its use. The following section discusses the challenges associated with e-commerce.

2.3.4 *E-commerce challenges*

Although e-commerce offers many advantages for customers, businesses, and society, it also presents significant challenges. These challenges, identified through the literature review, are discussed below.

a. *Customer challenges.*

From a customer perspective, a significant drawback of e-commerce is the inability to test products before purchase. Potential defects in products often lead to dissatisfaction when the received items fail to meet expectations (Gupta et al., 2023). This lack of a tangible experience dampens the overall shopping experience. Additionally, delivery delays or incorrect shipments can worsen customer dissatisfaction. Products damaged during transit, combined with limited customer services that are often managed through the platform or email, result in delayed issue resolution, further worsening dissatisfaction (Taher, 2021).

b. *Security challenges.*

In addition to customer-related issues, e-commerce faces significant technical challenges. Cybersecurity has become an important issue worldwide across various sectors and requires immediate attention, with several international businesses falling victim to cyberattacks, such as the Alibaba breach in 2021 and Barnes and Noble in 2020 (Dataquest, 2022). These incidents highlight the vulnerability of consumer data to cybercriminals, undermining the reliability of e-commerce security systems, culminating in customer trust issues and creating an insecure online shopping experience (Gupta et al., 2023).

Recent literature on e-commerce has reached a growing consensus on its security challenges (Liu et al., 2022). Addressing cybersecurity issues has become increasingly important for businesses to build customer trust and ensure long-term success (Niu & Zhao, 2023). Credit card fraud remains critical, posing significant risks to businesses and customers (Taher, 2021). Similarly, businesses must ensure transaction security and protect consumer data, as security is a critical challenge for e-commerce (Azam & Ansari, 2024). Hence, prior studies have emphasised the need for effective regulations to promote fair and secure e-commerce practices (Oguta, 2024; Santos et al., 2017). These findings were supported by Ntumba et al. (2023), highlighting that the persistent risks of cyberattacks and fraud highlight the urgent need for secure transactions and robust data protection measures.

c. *Logistics and infrastructural challenges.*

Beyond security challenges, e-commerce experiences various challenges. Efficient and reliable logistics are essential for timely product delivery, as logistical challenges can undermine customer trust and satisfaction, ultimately threatening the success of e-commerce operations (Niu & Zhao, 2023; Ntumba et al., 2023; Taher, 2021). Additionally, the rise of conscious consumers has also pushed the sustainability and ethical practices agenda to the forefront, compelling e-commerce businesses to adopt sustainable practices in their operations (Azam & Ansari, 2024; Ntumba et al., 2023). To address these evolving demands, e-commerce businesses must continuously invest in new technologies, such as artificial intelligence (AI), 3D printing, and adaptive interfaces, to enhance operations and user experience (Jain et al., 2021; Santos et al., 2017).

Traditional buying habits and the need for more reliable infrastructure in developing countries further complicate the adoption of e-commerce. Additionally, the high costs associated with internet access remain a significant challenge in less developed countries. Other challenges developing countries face include educational disparities, diverse cultures, political influence, difficulties in marketing and promotion, and limited internet coverage (Jain et al., 2021).

Another prominent challenge faced by e-commerce, which is increasingly becoming a barrier to its adoption, is the lack of customer use. While e-commerce has been widely adopted in developed countries, particularly in the retail sector, this trend is yet to be observed in many developing countries (Hendricks & Mwapwele, 2024; Makame et al., 2014). Several factors limiting e-commerce adoption in South Africa (SA) have been identified, including poor internet security, high illiteracy rates, insufficient legal frameworks, and underdeveloped information and communication technology (ICT) infrastructure (Johnson & Iyamu, 2019). Despite these challenges, there has been progress made in SA, with major retailers, primarily in the grocery sector, investing in e-commerce to meet evolving customer preferences, expand their physical presence, reduce operational costs, improve customer retention, and

improve sales (Ariyani et al., 2015; Hariharan et al., 2023; Leung et al., 2018; Mofokeng, 2021).

Despite the positive shift towards online shopping, the overall contribution of e-commerce to total retail sales in SA remains relatively low. In 2023, e-commerce accounted for only 6% of total retail sales, an increase from 4.7% in 2022 (Goldstuck & Bannier, 2024). This slow growth in e-commerce sales and customer usage indicates potential e-commerce adoption challenges, as many customers still prefer physical stores over online shopping platforms. Musikavanhu & Musakuro (2023) noted that while South Africa's major retailers operate in a competitive and well-developed retail market, online retailing has shown limited uptake, with customers still preferring physical stores for grocery purchases. Similarly, Makhitha et al. (2019) highlight that South African customers use the internet to research products but complete their purchases in physical stores. This discrepancy between e-commerce adoption by retailers and customer willingness to use online platforms suggests that certain factors, such as security-related concerns, may have been under-researched and could contribute to this gap. As discussed in section b on security challenges and supported by Hariharan et al. (2023), security-related concerns in e-commerce often lead to customer dissatisfaction and hesitancy in online shopping.

2.3.5 *State of e-commerce in South Africa*

The literature on e-commerce in South Africa (SA) remains relatively underdeveloped, with limited scholarly research on e-commerce across Africa, as corroborated by Bawack (2024) and Mofokeng (2021). This section reviews the state of e-commerce in SA, drawing on findings from market research reports by Prinsloo (2016) and Goldstuck & Bannier (2024), which explored South Africa's e-commerce retail sector.

Globally, the e-commerce landscape experienced significant growth over the past two decades, led by countries such as China, the United Kingdom (UK), and the United States (US) (Buchholz, 2025). In 2023, e-commerce sales accounted for 27.6% of total retail sales in China, 26.6% in the UK, and 15.6% in the US (Ma, 2025; Retail Sales team, 2025; Statista, 2024). In contrast, although South Africa's e-commerce market

has experienced notable growth, it continues to lag behind these marker leaders. In 2023, e-commerce sales in SA accounted for only 6% of total retail sales, amounting to R71 billion (Goldstuck & Bannier, 2024). Despite its relatively low global share, SA remains one of the leading e-commerce markets in Africa. This position is driven by several factors, including increasing penetration of high-speed internet, a relatively stable economy, a young and diverse consumer base, a variety of payment solutions, and a fairly strong logistics infrastructure (IMARC Group, 2024).

Consistent with global trends, the COVID-19 pandemic accelerated the growth of e-commerce in SA. Lockdown measures and movement restrictions led to an increase in online shopping, a trend that has persisted beyond the pandemic. Consequently, many retailers have adopted omnichannel retailing rather than relying solely on physical stores (Merritt & Zhao, 2020). This shift has been driven by evolving customer preferences, as customers increasingly value the convenience of online shopping or using online stores for product research before visiting physical stores (Azam & Ansari, 2024; Ellahi et al., 2024; Makhitha et al., 2019).

Despite the global e-commerce boom since the 1990s, e-commerce growth in SA has lagged behind its global counterparts, reflecting a consistent trend since 2013. However, key players in the South African retail market, including Checkers, Pick ‘n Pay, and Woolworths, have experienced significant growth due to e-commerce adoption. For example, Checkers’ Sixty60 grocery delivery service reported a 63% increase in sales in the second half of 2023, reflecting growing customer reliance on fast, convenient online shopping options (Goldstuck & Bannier, 2024).

This trend can be attributed to changing demographics and preferences amongst South African customers. South African online shoppers are predominantly young adults with high digital literacy levels and confidence in using technology (Akello, 2024). These shoppers generally belong to middle and high-income groups with access to disposable income. They primarily reside in urban areas such as Johannesburg, Cape Town, and Durban, where internet and logistics infrastructure are more developed (Johnson & Iyamu, 2019; Liu et al., 2022). However, a gender divide exists, with men engaging in online shopping more frequently than women, although the number of female online shoppers increased between 2022 and 2023 (Goldstuck & Bannier, 2024).

Nevertheless, several challenges continue to hinder e-commerce growth in SA. Prinsloo (2016) identified the inability to inspect products physically, concerns over product quality and delivery inefficiencies as significant drawbacks. More recent findings by Goldstuck & Bannier (2024) highlighted cart abandonment as a critical challenge, primarily due to declined credit cards and security concerns. Makhitha et al. (2019) also found that concerns about personal information and credit card safety significantly influence South African consumer online shopping behaviour. These challenges highlight the need for robust payment processing systems and enhanced security practices to reduce transaction failures and build customer trust.

This study examines these challenges as part of its investigation of the factors influencing customer use of e-commerce in SA. By doing so, it aims to encourage e-commerce growth while ensuring e-commerce adoption remains a worthwhile investment for retailers. The following section introduces the conceptual model and hypotheses underpinning this research.

2.4 Analytical framework

The earlier sections of this chapter reviewed the literature relevant to this research, identifying gaps in understanding the drivers of customer use of e-commerce and their impact on customer experience, thereby highlighting the need for further investigation. The next sections of this chapter address the research objectives RO1 and RO2 by examining the key factors influencing customer use of e-commerce and assessing their impact on customer experience. The study adopts the DeLone and McLean Information Systems (D&M IS) success model as its theoretical foundation, given its comprehensive framework for evaluating information system success (DeLone & McLean, 1992; 2003). To address the identified gaps, security quality and security knowledge constructs are introduced to extend the D&M IS model. These constructs are explored in detail, emphasising their significance in influencing customer use and customer experience in e-commerce platforms.

This theoretical basis leads to the development of a conceptual framework, supported by hypotheses designed to address the research objectives. This approach systematically evaluates the factors influencing customer use of e-commerce and their impact on customer experience.

2.4.1 *Theoretical framework*

This study is underpinned by the DeLone and McLean Information System (D&M IS) success model, which serves as its theoretical framework. The model provides a comprehensive framework for evaluating information system success and was originally proposed by (DeLone & McLean, 1992) following a review of 180 research studies on information systems. The original model included dimensions such as system quality, information quality, use, user satisfaction, individual impact, and organisational impact, as illustrated in Figure 5. According to the model, system and information quality influence both use and user satisfaction, which in turn impacts the individual and organisational outcomes.

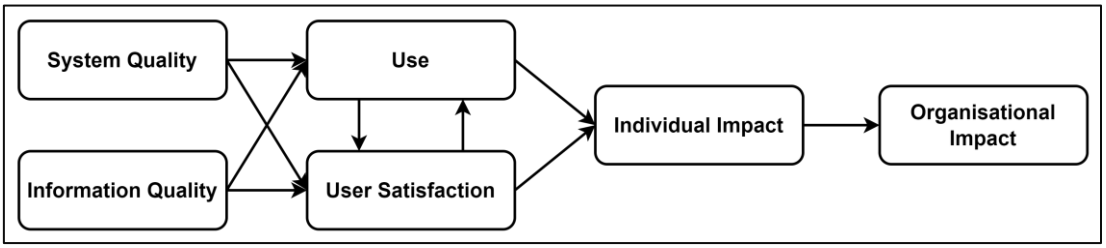


Figure 5: *D&M IS success model* (DeLone & McLean, 1992).

As illustrated in Figure 5, the original model conceptualised system success based on system quality, information quality, use, and user satisfaction, which in turn influenced individual and organisational impact. However, given the rapid evolution of information systems and the growth of e-commerce at the time, DeLone & McLean (2003) revised the model, including service quality as a key success factor and consolidated individual and organisational impact into a single construct ‘net benefits’. The ‘intention to use’ dimension was also introduced as an alternative measure of ‘use’, depending on the specific application context. The revised model, illustrated in Figure 6, highlighted the growing importance of customer service and its influence on system use, which impacts overall system success.

Although the D&M IS success model has proven to be an effective framework for evaluating system performance, it has limitations, particularly when applied to modern e-commerce contexts. Neither the original (DeLone & McLean, 1992) model nor the DeLone & McLean (2003) updated model explicitly account for security-related factors, which are increasingly important in the digital commerce landscape where cybersecurity concerns are on the rise. While the 2003 model was extended to include

service quality and net benefits, it falls short of accounting for system security quality or the user's security knowledge, both of which are essential for fostering system trust and enabling safe system usage.

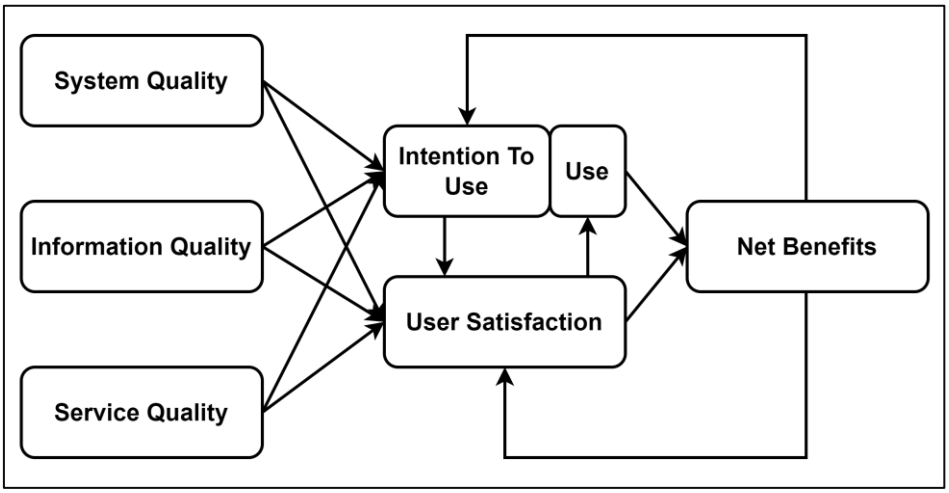


Figure 6: *Updated D&M IS success model* (DeLone & McLean, 2003).

DeLone & McLean (2004) later applied the updated success model in the context of e-commerce to validate its applicability for assessing online system success. Their assessment explored how e-commerce systems affect business operations and customer interactions, assisting businesses in making informed e-commerce investment decisions. Previous studies have supported the application of the D&M IS success model across various contexts, including traditional information systems (Mahmoodi et al., 2017; Nugroho & Prasetyo, 2018; Setiadi et al., 2023; Yang et al., 2024) and e-commerce platforms (Angelina et al., 2019; DeLone & McLean, 2004; Fang et al., 2011; Rouibah et al., 2015; Pramudito et al., 2023; Yel et al., 2020).

In this study, the D&M IS success model is adapted to assess the factors influencing e-commerce use and its impact on customer experience, conceptualised here as the model's *net benefit*. Given the increasing cybersecurity threats facing e-commerce platforms, this study argues that the D&M IS success model requires adaptations to reflect the current realities of the digital commerce landscape. Although the model has been widely applied in evaluating information system success, its application in assessing the role of security-related factors remains limited. The model often assumes that constructs such as information quality capture a user's perceptions of security, and prior studies attempting to address this limitation have typically introduced trust as a mediating factor in e-commerce adoption (Larry, 2019; Mofokeng,

2019; Noori, 2019; Pramudito et al., 2023; Shah et al., 2021). However, these assumptions overlook the technical aspects of system security, the significance of a user's knowledge in managing online risks, and the limitations of trust in capturing a system's technical capability to mitigate cyber threats. This oversight is especially problematic in regions such as South Africa, where cybersecurity threats are increasing and customer digital literacy levels vary. Therefore, this study argues for the inclusion of security quality, which reflects a system's ability to protect data and resources (Raghavan & Zhang, 2009), and security knowledge, which measures the user's awareness of security risks and protective measures (Lee & Chua, 2024), should function as independent factors influencing customer use of e-commerce. Their inclusion enhances the model's ability to explain customer use by capturing both the system's technical capabilities and the user's capacity to make secure online decisions, thereby offering a more comprehensive understanding of customer experience in digital commerce.

Furthermore, existing studies on factors influencing customer use of e-commerce have produced inconsistent findings, particularly within the South African context, where limited research has been conducted. These inconsistencies highlight the need for a more comprehensive framework to evaluate customer use of e-commerce platforms. This study extends the D&M IS success model by including security quality and security knowledge as critical factors of customer use and user satisfaction. In doing so, it addresses the existing gap in the literature while ensuring that the model remains responsive to current cybersecurity challenges while highlighting the growing importance of secure systems in building customer trust (Agarwal & Wu, 2015; Alyoubi, 2015; Niu & Zhao, 2023).

These findings align with arguments from previous studies (Mofokeng, 2019; Saeed, 2023), which emphasised the importance of improving security and privacy through transparent security practices to build customer trust and satisfaction, thereby influencing customer experience. As such, the conceptual model discussed in the next section extends the updated D&M IS success model by including security quality and security knowledge, providing a more comprehensive framework for evaluating the factors influencing customer use of e-commerce and their impact on customer experience. By grounding the study in the D&M IS success model, this research

contributes to the broader Information Systems discipline by empirically examining both established and extended constructs within the digital commerce landscape.

2.5 Factors influencing customer use of e-commerce

2.5.1 *Conceptual framework*

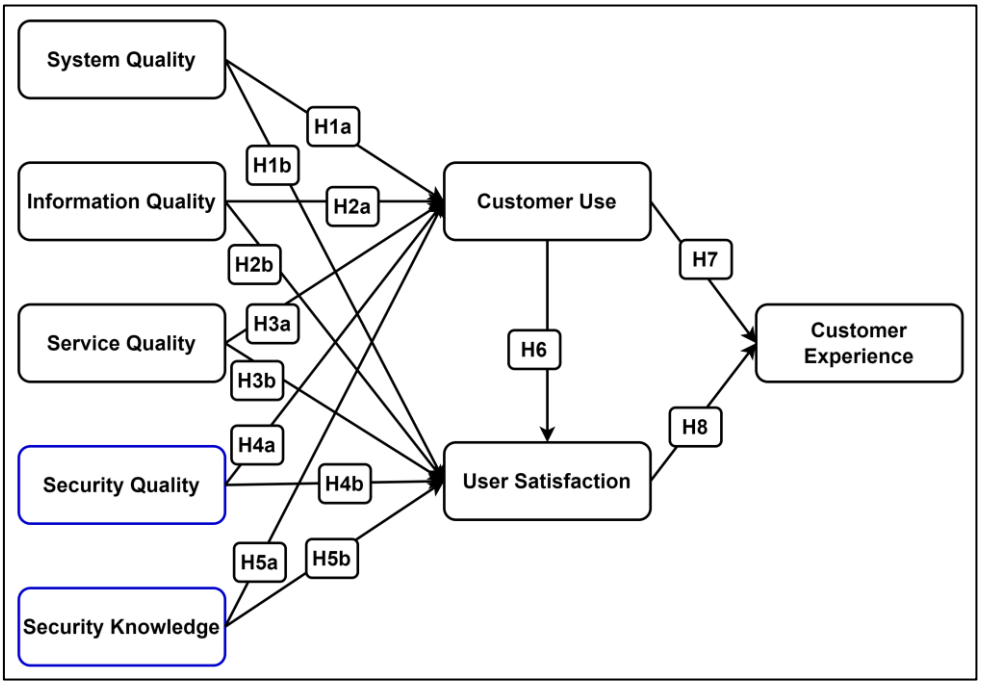


Figure 7: *Conceptual framework of the study (researchers own work).*

The revised DeLone and McLean Information Systems (D&M IS) success model has been adapted in this research to examine customer use of e-commerce. As illustrated in Figure 7, the research model includes five system assessment factors: information quality, system quality, service quality, security quality, and security knowledge. These factors are proposed as causal factors of customer use and user satisfaction, which are hypothesised to impact customer experience. Based on the literature review, eight hypotheses have been developed to test the relationships amongst these variables. A cross-sectional survey will be conducted to empirically test these hypotheses, addressing the following research objectives RO1: "*To examine the factors influencing customer use of e-commerce",* and RO2: "*To examine the impact of customer use on customer experience".*

2.5.2 *System quality*

System quality evaluates an information system's performance characteristics, including usability, availability, reliability, and response time (DeLone & McLean, 2003). Prior research highlights the significant impact of system quality on user behaviour, influencing both system use and user satisfaction (Mahmoodi et al., 2017; Mudau et al., 2023; Nugroho & Prasetyo, 2018; Yang et al., 2024). High-quality systems, characterised by ease of navigation, stability, and responsiveness, encourage frequent user engagement and enhance user satisfaction.

In the context of e-commerce, system quality measures the desired characteristics of an e-commerce platform that are crucial for enhanced user experience and operational efficiency. E-commerce users value usability, availability, reliability, adaptability, and responsiveness as critical system qualities (DeLone & McLean, 2004). Previous studies support the positive relationship between system quality and system use (Fang et al., 2011; Rouibah et al., 2015; Setiadi et al., 2023). However, Angelina et al. (2019) found that system quality had a positive relationship with user satisfaction but did not directly influence system use. Similarly, Pramudito et al. (2023) reported that system quality correlated with system use, but it did not directly influence user satisfaction.

These conflicting findings suggest that when users perceive an e-commerce platform as reliable, user-friendly, and responsive, they are more likely to engage with it and express higher satisfaction. Based on these theoretical findings, this study proposes the following hypotheses:

H1a: System quality will have a significant positive influence on customer use of e-commerce platforms.
H1b: System quality will have a significant positive influence on user satisfaction with e-commerce platforms.

2.5.3 *Information quality*

Information quality evaluates the accuracy, completeness, relevance, and timeliness of information produced by an information system (DeLone & McLean, 2003). Previous studies demonstrate that high-quality information positively influences system use and user satisfaction (Mahmoodi et al., 2017; Mudau et al., 2023; Nugroho & Prasetyo,

2018; Yang et al., 2024). In particular, accurate and relevant information, presented in an easily understandable format, fosters user trust and engagement.

In the context of e-commerce, information quality refers to the quality of information provided by the platform. To ensure effective communication, information must be personalised, complete, relevant, easily understandable, and secure, catering to both one-time and repeat customers (DeLone & McLean, 2004). Previous research supports the positive influence of information quality on system use and user satisfaction (Fang et al., 2011; Rouibah et al., 2015; Setiadi et al., 2023). However, Angelina et al. (2019) found that although information quality correlated with user satisfaction, it did not directly influence system use. Similarly, Pramudito et al. (2023) reported that information quality correlated with system use but did not directly influence user satisfaction.

Despite these conflicting findings, the majority of the literature highlights the importance of information quality in ensuring the effectiveness and success of e-commerce platforms. Based on these theoretical findings, this study proposes the following hypotheses:

H2a: Information quality will have a significant positive influence on customer use of e-commerce platforms.
H2b: Information quality will have a significant positive influence on user satisfaction with e-commerce platforms.

2.5.4 *Service quality*

Service quality refers to the overall support provided by an information system's IT department or an external service provider, evaluated through system characteristics such as reliability, responsiveness, assurance, and empathy in delivering support (DeLone & McLean, 2003). A number of studies have demonstrated the significant impact of service quality on system use and user satisfaction (Mahmoodi et al., 2017; Mudau et al., 2023; Nugroho & Prasetyo, 2018; Yang et al., 2024). Specifically, high-quality service support enhances user trust, loyalty, and engagement, encouraging more frequent use of the system.

In the context of e-commerce, service quality is crucial for ensuring customer satisfaction and facilitating seamless platform use without interruptions or issues (DeLone & McLean, 2004). Poor customer service can lead to reduced customer engagement and lost sales. Previous research has demonstrated that service quality significantly influences platform use and user satisfaction, particularly through responsive customer service, empathetic customer support, and reliable problem resolution (Angelina et al., 2019; DeLone & McLean, 2004). However, conflicting findings have been reported in the literature. Tam et al. (2019) found that although service quality correlated with user satisfaction, it did not directly influence system use. Similarly, Fang et al. (2011), Rouibah et al. (2015), and Setiadi et al. (2023) found no significant relationship between service quality, system use and user satisfaction.

Despite these conflicting findings, the majority of the literature highlights the importance of service quality in ensuring the success and effectiveness of e-commerce platforms. Based on these theoretical findings, this study proposes the following hypotheses:

H3a: Service quality will have a significant positive influence on customer use of e-commerce platforms.
H3b: Service quality will have a significant positive influence on user satisfaction with e-commerce platforms.

2.5.5 *Security quality*

According to Raghavan & Zhang (2009), *security quality* is defined as a system's ability to protect data and resources by maintaining confidentiality and integrity. This can be achieved by implementing secure coding practices, encrypting the authentication of credentials, and conducting regular security audits throughout the system's development lifecycle. Additionally, educating system users on cybersecurity best practices can further enhance system security by increasing awareness and reducing potential risks. These measures contribute to a secure system that protects users and minimises the likelihood of cyber threats.

Reliable and secure systems are crucial for building trust, significantly influencing user satisfaction and the overall online shopping experience (Yang et al., 2024). Previous research has attempted to address the security concerns of customers by introducing

trust as a mediating factor in e-commerce adoption (Larry, 2019; Mofokeng, 2019; Noori, 2019; Pramudito et al., 2023; Shah et al., 2021). Scholars typically conceptualise trust in e-commerce as a psychological state where users rely on a platform's integrity, competence, and benevolence to act in their best interest (Gashema & Alain, 2023; Gefen & Straub, 2004; Suh & Han, 2003). However, trust alone fails to account for a system's technical capability to mitigate cyber threats. Rouibah et al. (2015) and Setiadi et al. (2023) found that secure systems are crucial in protecting user data, thus ensuring user confidence and satisfaction. Similarly, Angelina et al. (2019) and Rouibah et al. (2015) reported that security features such as SSL protocols and security seals are key in encouraging users to reuse the platforms.

Despite the critical role of security in e-commerce adoption, the updated D&M IS success model does not include security quality as an independent factor influencing customer use and user satisfaction. Given the increasing importance of security, this study proposes extending the model by including security quality as a key factor influencing customer use of e-commerce. Based on these theoretical findings, this study proposes the following hypotheses:

H4a: Security quality will have a significant positive influence on customer use of e-commerce platforms.
H4b: Security quality will have a significant positive influence on user satisfaction with e-commerce platforms.

2.5.6 *Security knowledge*

Security knowledge refers to a user's awareness of security risks and protective measures (Lee & Chua, 2024). This understanding is crucial for implementing effective security measures and protecting information systems. Hanus & Wu (2016) highlighted the influence of cybersecurity awareness on security behaviour, noting that individuals with a higher awareness of cyber threats are more likely to exercise caution in their online activities. Conversely, insufficient security knowledge can lead to poor decision-making (Lee & Chua, 2024). For instance, a misunderstanding of a two-factor authentication feature may result in users making insecure decisions while mistakenly believing they are protected.

These issues highlight the importance of accurate and comprehensive cybersecurity education. Education programmes designed to address this gap should aim to raise the awareness of online threats while teaching practical measures to mitigate these risks. These programs should adopt a holistic approach, addressing both technical systems and human behaviour (Catal et al., 2023).

Osho et al. (2016) further observed that customers who understand security technologies are more likely to trust e-commerce platforms that visibly implement security measures. Conversely, a lack of visible security features can decrease trust and reduce platform use among knowledgeable users. These findings highlight the critical role of security knowledge in e-commerce platform success.

Despite the importance of security knowledge in driving system usage behaviour, the updated D&M IS success model does not include security knowledge as an independent factor influencing customer use and user satisfaction. Given the increasing importance of cybersecurity awareness, this study proposes extending the model by including security knowledge as a key factor influencing customer use of e-commerce. Based on these theoretical findings, this study proposes the following hypotheses:

H5a: Security knowledge will have a significant positive influence on customer use of e-commerce platforms.
H5b: Security knowledge will have a significant positive influence on user satisfaction with e-commerce platforms.

2.5.7 *Customer use, user satisfaction and customer experience*

The information system success factors discussed above have been proposed as independent factors influencing customer use of e-commerce and user satisfaction, which in turn impacts customer experience.

Customer use evaluates the nature and extent of customer engagement with information systems, including metrics such as the frequency and duration of system use (DeLone & McLean, 2003; 2004). In the context of e-commerce, *customer use* is defined as the shopping behaviour of customers within an online store or a website designed for online purchasing (Alkan et al., 2021). While customer use focuses on

the tangible interactions with an e-commerce platform, user satisfaction reflects the customers' subjective perceptions of the platform's performance, providing a complementary view of its effectiveness (DeLone & McLean, 2004). *User satisfaction* is defined as the customers' perception of their experiences with an online retailer, evaluating how effectively a platform's products, services, and overall user experience meet or exceed expectations (DeLone & McLean, 2004; Masyhuri, 2022). User satisfaction is critical for the long-term success of e-commerce businesses, as it drives customer retention, loyalty, positive word-of-mouth, and repeat purchases (Shah Alam & Yasin, 2010).

Previous research suggests an interdependent relationship between customer use and user satisfaction (Bokhari, 2005). In the context of e-commerce, satisfied users are more likely to use the system more frequently, and increased use can also reinforce satisfaction (Fang et al., 2011; Pramudito et al., 2023; Rouibah et al., 2015; Setiadi et al., 2023; Tam et al., 2019; Yel et al., 2020). These findings suggest that higher levels of customer use of e-commerce, driven by the success factors discussed in prior sections, can lead to higher satisfaction levels due to increased familiarity and perceived usefulness of the platform. Based on these theoretical findings, this study proposes the following hypothesis:

H6: Customer use of e-commerce platforms will have a significant positive influence on user satisfaction.

The relationship between customer use, user satisfaction and net benefits has been widely studied. Prior research has used key indicators such as time savings, productivity, effectiveness, convenience, enjoyment, broad product selection, flexibility, and usefulness to assess net benefits (Angelina et al., 2019; DeLone & McLean, 2004; Fang et al., 2011; Pramudito et al., 2023). Despite the increasing adoption of e-commerce, Georgiadis & Chau (2013) identified a research gap in investigating customer experience. They argued that customer experience is critical for the successful adoption of e-commerce by businesses, as it influences customer perceptions of value and service quality, ultimately affecting customer loyalty and retention.

These insights form the foundation for examining net benefits within the proposed research model, where the net benefits of users adopting e-commerce are viewed through the lens of customer experience. DeLone & McLean (2004) identified customer experience as the net benefit that individual users gain from using e-commerce platforms, focusing on utility and enjoyment. *Customer experience* refers to the overall perception and emotions customers have while interacting with an e-commerce platform throughout their buying journey (Setiadi et al., 2023). This includes all points of interaction in the purchasing journey, such as platform navigation, information quality, product selection, purchasing process, transaction efficiency, delivery, platform security, and customer service quality (Mofokeng, 2021; Pramudito et al., 2023; Setiadi et al., 2023). These factors collectively shape the customer experience, encouraging repeat purchases and customer loyalty (Mofokeng, 2021; Setiadi et al., 2023).

Previous studies have identified system quality, information quality, and service quality as critical drivers of system use and user satisfaction (Angelina et al., 2019; DeLone & McLean, 2004; Fang et al., 2011; Pramudito et al., 2023; Rouibah et al., 2015; Setiadi et al., 2023; Tam et al., 2019). These factors, in turn, improve the net benefits of IS success. In the context of e-commerce, IS success factors are expected to enhance customer experience, driving repeat purchases, customer loyalty, and retention. This cyclic process reinforces positive customer experiences, leading to long-term engagement with e-commerce platforms. Based on these theoretical findings, this study proposes the following hypotheses:

H7: Customer use of e-commerce platforms will have a significant positive impact on customer experience.
H8: User satisfaction with e-commerce platforms will have a significant positive impact on customer experience.

2.6 Conclusion

This chapter reviewed the literature relevant to the research, focusing on the evolution, benefits, and challenges of e-commerce, particularly within the South African context. The literature review highlighted the significance of factors such as system quality, information quality, service quality, security quality, and security knowledge in influencing customer use of e-commerce, user satisfaction, and customer experience.

These insights facilitated the development of a conceptual framework underpinned by the D&M IS success model for e-commerce. This approach addresses the limitations of past studies in more fully understanding the factors influencing customer use of e-commerce. Understanding whether the inclusion of security quality and security knowledge in the model can transform the consideration of e-commerce success offers an alternative for improving customer engagement with e-commerce. This, in turn, supports the broader adoption of e-commerce by South African retailers and potentially justifies their investment decisions. The next chapter outlines the research methodology used in the empirical investigation.

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Introduction

In Chapter 2, the research model and hypotheses of the study were presented. The hypotheses were developed to meet the research objectives RO1: "*To examine the factors influencing customer use of e-commerce*", and RO2: "*To examine the impact of customer use on customer experience*". This chapter outlines the research methodology used in collecting and analysing the data in order to test the research models and thus achieve the research objectives. In outlining the research methodology, the chapter discusses the research approach, research design, data collection method, sample size, sampling method, research instrument, data analysis, and finally the limitations and challenges to the validity of the study, together with the ethical considerations.

3.2 Research approach

The study used a deductive research approach, adopting a mono-method strategy by using quantitative procedures for data collection and analysis. Quantitative research involves the systematic empirical investigation of observable phenomena using statistical, mathematical, or computational techniques (Byrman, 2016; Cohen et al., 2017). This approach was used to examine the factors influencing customer use of e-commerce and its impact on customer experience in the South African retail sector. This allies with the assessment of information system success, which is reliant on quantifiable data (DeLone & McLean, 2003).

The primary advantage of adopting a quantitative research approach in this research is its ability to draw inferences about a population from a small, representative sample that can be statistically validated, and which would otherwise be too expensive to measure comprehensively. Additionally, this approach provides a high level of control and precision in measuring variables, enabling the use of statistical methods to test hypotheses and establish causality (Cohen et al., 2017).

These advantages are critical to this research as they facilitate the objective measurement of system quality, information quality, service quality, security quality, and security knowledge, thereby ensuring the reliability and validity of the collected

data. Additionally, the quantitative research approach enhances the generalisability of the findings to a broader population, which is essential for generating actionable insights and recommendations to improve e-commerce platforms in the South African retail sector.

3.3 Research design

The research adopted a non-experimental, descriptive, exploratory, and cross-sectional design, using a survey as the primary quantitative approach. This integrated research design facilitated comprehensive data collection and analysis, yielding valuable insights into the factors influencing customer use of e-commerce and its impact on customer experience in the South African retail sector.

A non-experimental design was employed to describe and explore relationships between variables as they naturally occur, without manipulating them. The descriptive approach provided a detailed snapshot of specific characteristics and behaviours among South African e-commerce users. Additionally, the exploratory element of the research generated new insights to inform future studies. The cross-sectional aspect enabled data collection at a single point in time, offering a snapshot of the current state of factors influencing customer use of e-commerce and its impact on customer experience (Cohen et al., 2017).

3.4 Data collection methods

This research used online surveys through the digital platform Qualtrics to distribute the survey and collect responses. Participants received the survey accompanied by a digital information sheet and a consent form, distributed primarily through LinkedIn. LinkedIn was selected as the primary platform for defining the study population due to its advanced filtering features (by industry, role, location, etc.), which allowed for precise targeting of professional respondents. Its network structure also enables a form of controlled, quasi-snowball sampling through both direct and extended connections, an approach particularly useful for reaching dispersed populations. Moreover, LinkedIn users are considered more likely to demonstrate technological proficiency and e-commerce purchasing behaviour compared to users of more general platforms such as Facebook or WhatsApp. This method has proven effective in prior studies in

recruiting hard-to-reach professionals while ensuring high response quality and cost efficiency (Kozlowski et al., 2021; Leighton et al., 2021).

Online surveys offer several advantages, including automated data collection and analysis, quick and cost-effective distribution, ease of management, and the ability to reach a broad and diverse audience (Cohen et al., 2017). Additionally, they facilitate data collection from various geographical areas without physical boundaries (Singh & Sagar, 2021). The survey design included structured questionnaires with closed-ended questions. Closed-ended questions offer predefined response options, facilitating efficient quantitative data analysis (Artino, 2012). These questions were valuable in this study as they enabled the consistent and efficient capture of specific attitudes, perceptions, and experiences (Babbie, 2016).

A preliminary version of the survey was pretested with selected academic experts and a closed group of participants. This phase aimed to evaluate the survey's content quality and validity, as pretesting is crucial for ensuring that survey questions are clear and understandable for participants (Hilton, 2017). The final survey was distributed through LinkedIn, targeting various e-commerce users within the researcher's professional network. Once the data was collected, it was encoded and exported to the Statistical Package for Social Sciences (SPSS) for analysis. A thorough data cleaning process, described in the next chapter, was conducted to address missing data, inconsistencies, and outliers (Punch, 2018). Throughout the data collection process, secure data privacy and confidentiality measures were implemented to protect the respondent's privacy.

3.5 Population and sample

3.5.1 *Population*

To achieve the research objectives, the target population for this study included South African adults employed in the public and private sectors who have used e-commerce platforms. This population was selected to examine the factors influencing customer use of e-commerce and their impact on customer experience amongst individuals with access to digital technologies and online platforms.

For the purpose of this study, the accessible population comprised approximately 3000 individuals within the researcher's professional LinkedIn network, all based in South Africa. This population was selected based on a criteria including the geographic location (South Africa), current employment status, and expected digital literacy. It was assumed that, given their professional and educational background, these individuals have interacted with e-commerce platforms.

This LinkedIn network served as both the sampling frame and population for the study, enabling the researcher to select in advance a relevant, accessible, and contextually appropriate professional group presumed to have experience with e-commerce platforms. Although this approach limits the generalisability of the findings to the broader South African public, it enhances internal validity and contextual relevance for evaluating e-commerce adoption within digitally literate segments of the retail sector.

3.5.2 *Sample*

The strategy used to determine the research's sample size and the factors driving the justification for the final sample size are outlined below.

- The research aimed to achieve a representative sample size with adequate variability. This was determined using Krejcie & Morgan (1970) methodology, which provides a formula for sample size calculation based on population size. Although some guidelines recommend selecting a sample size of 10-20% of the population for surveys and research studies, the study used 10% as a basis. Accordingly, the final sample size was determined to be 300, based on a total population of 3000 LinkedIn connections.
- The targeted population was assumed to have sufficient technological resources and capabilities to efficiently access and use e-commerce platforms. Their experiences provided valuable insights into e-commerce adoption and its impact on customer experience, aligning with studies emphasising technological capabilities and resource availability as critical factors in e-commerce adoption and user experience studies (Venkatesh et al., 2003).
- A sample size of 300 was considered feasible and practical within the constraints of this research, including time and resource limitations, although larger samples have been proven to provide broader insights (Dillman, 2000). The decision to

target 300 responses was also guided by the need for a manageable yet statistically meaningful sample, aligning with prior research methodologies using online professional networks as a sampling frame.

By focusing on individual e-commerce users, this study aimed to achieve a manageable sample size. These individuals represent a substantial portion of e-commerce users, providing a comprehensive and statistically balanced sample (n = 300). The selection of the sample size was also based on factors such as the volume of the South African e-commerce user population, results accuracy required, the value of findings, sampling costs, and population variability.

3.5.3 *Sampling method*

In a quantitative research approach, two commonly recommended sampling methods are probability sampling and non-probability sampling. In probability sampling, each member of the population has an equal chance of selected, whereas in non-probability sampling, not all members of the population have a chance or an equal chance of selection (Bryman, 2016; Cohen et al., 2017).

This study employed a non-probability sampling method, combining purposive, convenience, and snowball sampling techniques. Purposive sampling was used to select participants from the researcher's professional LinkedIn network based on predefined criteria, including geographic location (South Africa), current employment status, and expected digital literacy. Although the findings are not generalisable to the broader South African population, the sample provides valid insights into e-commerce experiences of digitally literate professionals. The unit of analysis is the individual e-commerce user.

Convenience sampling was used to recruit initial participants based on their availability and visibility within the researcher's LinkedIn network. To increase sample diversity, snowballing sampling was used. Participants were encouraged to share a recruitment poster or survey link with colleagues and connections outside the researcher's immediate network. This approach facilitated the inclusion of a broader and more varied sample of professionals familiar with e-commerce.

3.6 The research instrument

The research instrument used in this research was an online self-administered questionnaire. It was developed to measure the following research model constructs: system quality, information quality, service quality, security quality, and security knowledge, as well as their influence on customer use, user satisfaction, and customer experience. Figure 8 illustrates the process followed in developing the research instrument for the study.

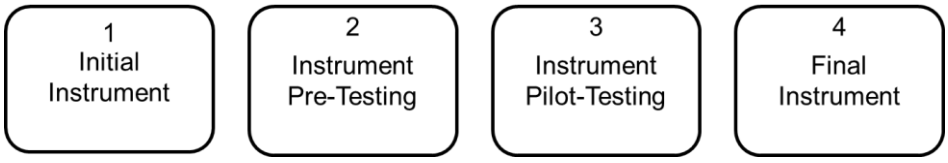


Figure 8: *Research instrument construction process (researcher's own work).*

The research instrument construction process occurred in four stages to ensure validity, reliability, and alignment with the research objectives. The process started with the adoption of survey items from previous research (refer to Table 1), forming the basis for the questionnaire. However, due to the complexity of this study, additional survey items were developed to address aspects not covered in prior research. These items were carefully designed to align with the study's objectives while maintaining consistency with validated constructs and existing literature. This was followed by pretesting, where a preliminary version of the survey was distributed to a selected group of academic experts, providing feedback on clarity and content validity. This was followed by pilot testing, where a closed group of participants assessed face validity and reliability. Finally, the validated instrument was distributed through LinkedIn.

The final research instrument includes a questionnaire with three sections (refer to Appendix A). The first section includes filter questions to ensure that only individuals who have used e-commerce platforms participate. The second section includes demographic questions to gather participant background information and ensure a diverse sample. The last section included compulsory closed-ended questions measuring the respondents' perceptions of the research model constructs, necessary to meet the research objectives RO1 and RO2. The number of items developed for each construct is outlined in the consistency table (refer to Appendix B). The constructs were measured using 7-point Likert scale questions with predetermined responses

ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), capturing the respondent's attitudes, perceptions, and experiences. This approach ensures standardisation, making the survey quantifiable and consistent, while also ensuring participants can engage easily and complete the survey in a timely manner.

Table 1 presents examples of survey items from previous studies from which the research instrument was derived (Angelina et al., 2019; DeLone & McLean, 2004; Fang et al., 2011; Lee & Chua, 2024; Mahmoodi et al., 2017; Mudau et al., 2023; Pramudito et al., 2023; Raghavan & Zhang, 2009; Setiadi et al., 2023).

Table 1: *Theoretical constructs for examining e-commerce customer use and its impact on customer experience.*

Factors	Conceptual Definition	Item Questionnaire Example	Literature Sources
System Quality	Refers to the performance characteristics of an information system, which include measures such as usability, availability, reliability, and response time.	"The system is always up and running."	Angelina et al., 2019; DeLone & McLean, 1992; 2003; 2004; Fang et al., 2011; Mudau et al., 2023
Information Quality	Assesses the quality of the information that the system produces. Key attributes include accuracy, completeness, relevance, and timeliness of the information provided.	"The information provided by the system is easy to understand."	Angelina et al., 2019; DeLone & McLean, 1992; 2003; 2004; Fang et al., 2011; Mudau et al., 2023
Service Quality	Refers to the overall support users receive from the IT department or service provider. It measures system characteristics like reliability, responsiveness, and assurance in delivering support.	"With the support that I have received, I believe I can now use the system with confidence."	Angelina et al., 2019; DeLone & McLean, 2003; 2004; Fang et al., 2011; Mudau et al., 2023
Security Quality	Refers to the robustness of the security measures implemented by e-commerce platforms and how they can educate their users on practising cybersecurity best practices to minimise the potential of cyber threats.	"Users are satisfied with the overall security of the system."	Pramudito et al., 2023; Raghavan & Zhang, 2009; Yang et al., 2024
Security Knowledge	Refers to the users' awareness, understanding, and implementation of security measures on these platforms and the best practices required to foster secure shopping environments.	Items conceptualised in assessing users knowledge about security related knowledge associated with using the internet and online shopping	Catal et al., 2023; Lee & Chua, 2024; Osho et al., 2016
Customer Use	Measures the extent and nature of users' use of the information system. This measure considers factors such as system use frequency and duration.	"I rely on this platform as my primary source for online shopping."	DeLone & McLean, 1992; 2003; 2004; Pramudito et al., 2023
User Satisfaction	Measures a customers' perception of their experiences with an online retailer, evaluating how effectively the platform's products, services, and overall user experience meet or exceed their expectations	"Overall, I am satisfied with the system I use."	DeLone & McLean, 1992; 2003; 2004; Masyhuri, 2022; Mudau et al., 2023
Customer Experience	Refers to the overall perception and feelings a customer experiences while interacting with an e-commerce platform during their buying journey.	"My experience with this platform meets my expectations for online shopping."	Georgiadis & Chau, 2013; Setiadi et al., 2023; Syahnur et al., 2020

3.7 Data analysis strategies and interpretation

The data analysis strategy for this research outlines the approach when analysing the quantitative data collected through the research instrument. This strategy followed six steps, as illustrated in Figure 9. Data was analysed using IBM SPSS Statistics version 29 and AMOS version 26 for structural equation modelling.

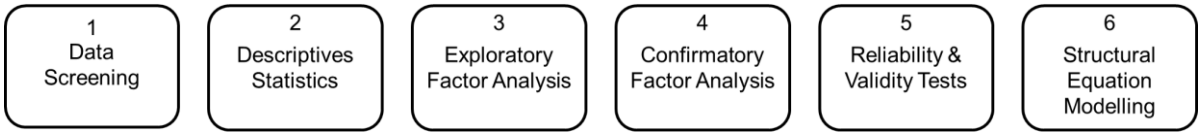


Figure 9: *Data analysis process (researcher's own work).*

3.7.1 *Data screening*

The first step of the data analysis process was data screening. After capturing the data from the Qualtrics platform, it was cleaned to ensure integrity by identifying and eliminating errors (e.g., duplicates, outliers) that could negatively influence the statistical results before further processing. The data was also validated and standardised for accurate coding. Data coding involved assigning numerical values to responses to facilitate analysis (Malo et al., 2006), ensuring that all variables adhered to a consistent format for easier processing and interpretation.

3.7.2 *Descriptive statistics*

The second step involved the application of descriptive statistics, a statistical analysis method used to summarise the basic characteristics of the data. Descriptive statistics include measures of central tendency (i.e., mean, median, mode) and measures of variability (i.e., range, variance, standard deviation), which illustrate the central tendency and distribution of the collected data (Pallant, 2011).

The literature consistently supports the use of descriptive statistics for analysing quantitative data collected through surveys with Likert scale items (Pallant, 2011; Sullivan & Artino, 2013). As discussed by Allen & Seaman (2007), descriptive statistics provide an initial understanding of the data distribution and central tendencies before proceeding to more complex statistical analyses. Harpe (2015) also recommends the use of nonparametric techniques to produce valid results.

3.7.3 *Exploratory factor analysis*

The third step involved an Exploratory Factor Analysis (EFA), a statistical method used to identify the underlying structure in large datasets. EFA identifies correlation patterns within a set of measured variables. EFA was conducted to identify latent variable structures, which will be followed by a CFA to validate the measurement model. In this study, EFA was conducted using Principal Components Analysis (PCA). A Principal Component Analysis (PCA) was performed to identify patterns in a dataset by grouping related variables into components (Tabachnick & Fidell, 2013).

In the process of conducting a PCA, data suitability for factor analysis was evaluated using the Kaiser-Meyer-Olkin (KMO) test, developed by Kaiser & Rice (1974). KMO values below 0.5 are considered unacceptable, indicating insufficient sampling adequacy, making the data unsuitable for factor analysis. Values between 0.5 and 0.59 are poor, 0.6 and 0.69 are mediocre, 0.7 and 0.79 are acceptable, 0.8 and 0.89 are good, and 0.9 and above are excellent, indicating high sample adequacy sampling (Field, 2009; Kaiser & Rice, 1974). This study achieved a KMO value within the acceptable range, supporting the dataset's suitability for analysis.

Before conducting reliability and validity tests on the data, uni-dimensionality should be evaluated through factor loadings. Uni-dimensionality ensures that all survey items within a construct measure only one underlying concept rather than multiple unrelated factors (Hair et al., 2019).

Hair et al. (2019) recommended that in principal component analysis (PCA), items with factor loadings below 0.6 should be removed to maintain uni-dimensionality and reduce redundancy. Eliminating redundant items enhances the accuracy and efficiency of the measurement scale by ensuring that each item contributes a unique value to the construct. PCA also supports the initial testing of convergent and discriminant validity (Hair et al., 2019). Since this study had no items with factor loadings below 0.6, convergent and discriminant validity were deemed satisfactory.

Validity further assesses whether findings accurately represent the topic investigated and whether the instruments measure the intended constructs (Collis & Hussey, 2014). The three types of validity are as follows (Collis & Hussey, 2014):

1. **Content validity** ensures that a measurement instrument accurately measures the intended construct it is intended to measure by adhering to guidelines from existing literature, operationalising variables appropriately, and conducting pre-tests with expert inputs.
2. **Face validity** evaluates the extent to which a measurement instrument appears to measure what it is intended to measure. This measure is determined through a pilot test to identify low variation in responses and unclear questions amongst respondents.
3. **Construct validity** is established using EFA to confirm that items measuring the same construct (convergent validity) load together on the same component while items measuring different constructs (discriminant validity) do not load onto unintended factors.

3.7.4 *Confirmatory factor analysis*

The fourth step involved conducting a Confirmatory Factor Analysis (CFA), which is used to test the factor structure of the observed variables. CFA evaluates whether the relationships between the measured variables and their underlying latent constructs are consistent with the researcher's hypothesis and proposed conceptual model (Hair et al., 2019).

The CFA was used to assess the measurement models to facilitate the final confirmation of uni-dimensionality and validate and establish the reliability of items measuring the constructs. During the final stages of testing for validity and reliability, items with unsatisfactory loadings were removed in preparation for structural model testing. In this study, one item had a factor loading below 0.6. As a result of its removal, convergent and discriminant validity was deemed satisfactory.

3.7.5 *Reliability and validity tests*

The fifth step involved reliability and validity tests, which evaluated whether the data was free from measurement error and whether the results were reliable (Collis & Hussey, 2014). Reliability is a key consideration in measurement models as it reflects the internal consistency of the items that measure a variable. It also ensures that the measured variables produce consistent results when tested repeatedly (Cooper & Schindler, 2014).

Hair et al. (2019) recommended that Cronbach's alpha values above 0.7 indicate good internal consistency. Pallant (2011) supported this, stating that Cronbach's alpha values above 0.7 are acceptable, while values above 0.8 are preferable. To enhance the robustness of the internal consistency assessment, Hair et al. (2019) advised including composite reliability (CR) in the assessment, with CR values recommended to be above 0.7.

Construct validity is measured using two components: convergent validity and discriminant validity. According to Hair et al. (2019), discriminant validity requires the items of a variable to correlate more strongly with their own variable than with other variables. Discriminant validity is confirmed using a matrix of correlations among variables and comparing it with the square root of the average variance extracted (AVE). This approach is commonly referred to as the Fornell-Larcker criterion (Fornell & Larcker, 1981). For this study, reliability and validity were deemed satisfactory. Cronbach's alpha values and CR values exceeded 0.7, while the square root of AVE values were above the inter-variable correlations.

3.7.6 *Structural equation modelling*

The final step of the data analysis process involved structural modelling, conducted using Structural Equation Modelling (SEM). SEM is a comprehensive statistical approach for testing hypotheses about the relationships between observed and latent variables. SEM combines elements of factor analysis and multiple regression analysis, enabling the simultaneous examination of a series of dependence relationships (Thakkar, 2020; Whittaker & Schumacker, 2022).

According to Fan & Sivo (2005) and Russolillo (2012), structural equation modelling (SEM) is distinct from other relational modelling methods, such as multiple regression analysis, due to its ability to distinguish between the direct and indirect relationships amongst variables and to analyse the relationships between latent variables while minimising random errors.

The SEM process usually includes the following steps (Whittaker & Schumacker, 2022):

i. The hypothesised model is defined by specifying the relationships between variables and developing a visual path diagram to represent the model.
ii. Mathematically identify the model by ensuring there are sufficient data points to estimate the model parameters.
iii. Estimate the parameters of the model using statistical software (SPSS Amos).
iv. Evaluate the model's '*goodness of fit*' using various model fit indices, such as Chi-square (X^2/DF) and Comparative Fit Index (CFI). All the model fit indices with their acceptable levels are presented in
v. Table 2.
vi. Modify the model based on the fit indices and make the necessary adjustments where required to improve overall fit.
vii. Cross-validate the model using different samples to ensure its generalisability.

Table 2: *Model fit indices criteria and acceptable levels.*

Model fit criteria	Description	Acceptable level	Source
Goodness-of-fit (GFI)	The GFI is the degree of fit between the hypothesized model and the observed covariance matrix.	Less than 0.8 (no fit) Between 0.8-9 (acceptable) Above 0.9 (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.	Less than 0.8 (poor) Between 0.8-9 (acceptable) Above 0.9 (good)	Fan and 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.	Less than 0.9 (poor) Above 0.9 (good)	Fan and Sivo, 2005
Incremental fit index (IFI)	The IFI's purpose is to correct the issue of parsimony and sample size related to NFI.	Less than 0.9 (poor) Above 0.9 (good)	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.	Less than 0.05 (good) Between 0.06-1 (acceptable) Above 1 (poor)	Cheung and Rensvold, 2002
Ratio of Chi-Square to Degrees of Freedom (χ2 /DF)	To assess the magnitude of the discrepancy between the sample and fitted covariance matrices. The estimation process is dependent on the sample data.	Less than 3 (good) Between 3-5 (acceptable) Above 5 (poor)	Cheung and Rensvold, 2002
Tucker-Lewis Index (TLI)	The TLC utilises simpler models and is known to address the issue of sample size associated with NFI.	Less than 0.8 (poor) Between 0.8-9 (acceptable) Above 0.9 (good)	Hoe, 2008
Relative Fit Index (RFI)	The RFI compares the chi-square of the hypothesised model with that of a null or baseline model.	Less than 0.8 (poor) Between 0.8-9 (acceptable) Above 0.9 (good)	Byrne, 2013

3.8 Possible limitations and challenges

This study has inherent limitations and challenges, like most research studies. This section outlines some potential limitations and challenges that may be encountered.

- Despite efforts to ensure a varied and representative sample, the study may be affected by sampling bias, potentially limiting the generalisability of the findings. Nonresponse bias or the exclusion of specific individuals from the survey may result in a sample that does not fully reflect the larger population of interest (Bryman, 2016).
- As this study relies on an online survey, achieving a high response rate presents a potential challenge. A low response rate could impact the validity and reliability of the findings, as a limited number of responses may not fully capture the diversity of perspectives within the target population (Dillman, 2000).
- The accuracy of responses is a critical factor influencing research validity. Respondents may misinterpret survey questions or provide inaccurate responses, either unintentionally or due to social desirability bias (Field, 2009).
- This study employs structural equation modelling to examine relationships among key variables. However, this method requires adherence to specific assumptions (e.g., normality, linearity, unidimensionality). Violations of these assumptions could compromise the statistical validity of the results (Hair et al., 2019).
- Although quantitative analysis was conducted, interpreting the findings involves a degree of subjectivity. Different researchers may draw varying conclusions from the same dataset, particularly when identifying trends, implications, or theoretical contributions (Bryman, 2016).

Despite these limitations, measures such as pretesting, pilot testing, and refining the research instrument for accessibility and usability were implemented to enhance data quality and reliability while mitigating the impact of these limitations on the research results.

3.9 Ethical considerations

This research adhered to ethical research standards by obtaining ethics approval from the *Human Research Ethics Committee (Non-Medical)* office at the *University of the*

Witwatersrand. Ethical clearance was granted by the University of the Witwatersrand with ethics protocol number WBS/DB800357/214, and the certificate is presented in Appendix C. The clearance guided the researcher in complying with the institution's ethical guidelines for research involving human participants.

The research instrument participant information sheet presented in Appendix D ensured that participants were informed of their right to withdraw at any stage, as their participation was entirely voluntary. The contact information for the researcher and supervisor was provided on the survey's introductory page to promote transparency and accountability. The adherence to ethical procedures is outlined in the clearance certificate, enhancing the study's reliability and validity. This process ensured the accuracy of the data and the integrity and credibility of the findings. The researcher maintained objectivity, safeguarded data confidentiality, and reported findings accurately, avoiding bias, misuse of information, or distortion of results.

3.10 Conclusion

In summary, this chapter details the research method necessary to examine factors influencing customer use of e-commerce and customer experience in South Africa. Building on the foundations of Chapters 1 and 2, this study employed a deductive, quantitative approach. A structured online survey was distributed through Qualtrics to a LinkedIn-based sample (n = 300) to collect and analyse data on the factors influencing customer use of e-commerce and their impact on customer experience in the South African retail sector. The research design employed convenience and snowball sampling. The data analysis followed a structured process, including descriptive statistics, exploratory and confirmatory factor analysis, reliability and validity tests, and structural equation modelling. Ethical clearance was obtained, and participant confidentiality was maintained in compliance with research ethics guidelines. The chapter also acknowledged research limitations, such as potential response bias and generalisability constraints, while ensuring rigorous data collection and analysis. The next chapter presents the results derived from the data analysed to test the research model.

CHAPTER 4. PRESENTATION OF RESULTS

4.1 Introduction

In Chapter 3, the research methodology used to examine factors influencing customer use of e-commerce and their impact on customer experience was outlined. A deductive, quantitative research approach was adopted to test the DeLone and McLean Information Systems (D&M IS) success model, which also included security quality and security knowledge. A cross-sectional survey was conducted using a structured Likert scale questionnaire targeting 300 participants through the LinkedIn platform. The sample targeted employed individuals from both the public and private sectors, using non-probability sampling methods. Data analysis included descriptive statistics, factor analysis, reliability testing, and structural equation modelling. Ethical approval was obtained from the University of the Witwatersrand Human Research Ethics Committee to ensure participant consent, confidentiality, and data protection. These methods supported the reliability and validity of the collected data and ensured a strong statistical foundation for the analysis.

The purpose of this chapter is to present and analyse the data collected using the survey in relation to the research objectives. Research Objective 1 (RO1) is "*To examine the factors influencing customer use of e-commerce*", and Research Objective 2 (RO2) is "*To examine the impact of customer use on customer experience*" and were both investigated and tested empirically. The survey data collected from South African retail e-commerce platform users, was used to evaluate the proposed research model regarding factors influencing the use of e-commerce and its impact on customer experience.

The chapter's sections begin by discussing data preparation and response rate analysis. This is followed by demographic statistics, descriptive statistics, including normality assessment and sample adequacy confirmation. Once the data assumptions were verified, principal component analysis (PCA), confirmatory factor analysis (CFA), reliability and validity testing, and structural equation modelling were conducted. Finally, the results of the structural model are discussed, and the conclusions provided.

4.2 Data preparation

Data preparation involves transforming raw data into a structured format suitable for statistical analysis (Fernandes et al., 2023). In this study, the process involved three steps, including data coding, data exporting, and data cleaning.

4.2.1 *Data coding*

Data coding was conducted on the Qualtrics platform during the questionnaire development phase before distributing the survey. The survey responses were assigned numerical values using a 7-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The resulting codes for all the questions and responses are presented in the research instrument (refer to Appendix A). This process was undertaken to ensure data integrity, facilitate data analysis and management, and improve the accuracy of research results (Pallant, 2011).

4.2.2 *Data exporting*

The 193 responses recorded on the Qualtrics platform were exported as an SPSS file for screening and further analysis using Statistical Package for Social Sciences (SPSS) Statistics version 29 and AMOS version 26.

4.2.3 *Data screening*

Data screening involves checking a dataset for errors and inconsistencies (Pallant, 2011). The process consists of two key steps: identifying and correcting errors. In this research, screening was done using SPSS to identify any missing values.

A manual analysis of the dataset showed that there were some survey questions that were not fully answered by the respondents. In some of the multiple-choice questions, one or two options were skipped, which was attributed to human error, system error, or a lack of understanding of the question by the respondent (Couper, 2000). To address this issue, a missing data analysis was conducted in SPSS to assess the extent of missing values and estimate values where appropriate. Missing data was estimated using the expectation-maximisation method (Pallant, 2011). The method assumes the pattern of missing values was related to the observed data but not to the missing responses themselves. In such cases, the missing responses are considered

missing at random (Rubin, 1987). In the analysis, the assumption that the distribution is normal was applied, and the pairwise exclusion of missing values was applied. Table 3 presents the results of the missing data analysis.

Table 3: *Summary of missing data and removed responses in the dataset.*

Respondent	Count of Missing Values per Respondent	%Missing	Affected Theoretical Variables
179;180;184;185	4	9	Customer Experience
39;66;103	6	13	System Quality, Information Quality
178;181;182;183	9	20	User Satisfaction, Customer Experience
62	33	72	All
Total respondents removed (%missing > 5%) = 12			

Survey responses with more than 5% missing data were removed from the dataset based on theoretical guidelines (Bennett, 2001; Hair et al., 2019). User Satisfaction and Customer Experience were the most affected theoretical variables. Since the survey questions for these variables appeared towards the end of the survey, it is plausible that respondent fatigue contributed to the missing data (Couper, 2000). As a result, a total of 181 responses were retained for further analysis.

4.2.4 *Sample outliers*

Outliers are data points that are significantly different from the overall pattern of a dataset and can unduly influence statistical results (Hair et al., 2019). To identify potential outliers, standardised scores (z-scores) exceeding ±3 standard deviations from the sample mean were analysed. This method is widely used in multivariate statistics and assumes a normal distribution of the data (Hair et al., 2019; Tabachnick & Fidell, 2013). The analysis revealed no extreme values, and all standardised scores were within the acceptable thresholds. This suggests that the response rate was relatively homogeneous, indicating that all respondents are likely to originate from the same underlying population.

4.3 Response rate

After data screening, a total of 181 valid responses were retained from 193 received, resulting in a response rate of 60.3%.

This relatively high response rate contributed to mitigating the risk of nonresponse bias, which can compromise the reliability and validity of research findings (Fincham, 2008). To further assess potential nonresponse bias, a paired samples t-test was conducted comparing the survey responses received in the first and last five days of the data collection period. The *p*-value for the paired differences tested was greater than 0.05, indicating no statistically significant differences between early and late responses. Therefore, nonresponse bias was not considered a concern for this study (refer to Appendix E).

4.4 Demographic statistics

This section outlines the demographic profile of respondents who participated in the empirical study. The key demographic characteristics examined included age, gender, level of education, province of residence, work experience, primary industry sector, preferred technology for accessing e-commerce platforms, frequency of online purchases, and commonly used e-commerce platforms. Table 4 presents the demographic profile of the dataset provided by 181 respondents.

Table 4: *Demographic data of respondents.*

Demographics	Category	Frequency	Percentage
Gender	Male	88	48.6
	Female	92	50.8
	Prefer not to say	1	0.6
Age	18 - 24	3	1.7
	25 - 34	121	66.9
	35 – 44	43	23.8
	45 – 54	11	6.1
	55 – 64	2	1.1
	Prefer not to say	1	0.6
Level of Education	Matric	6	3.3
	Diploma	17	9.4
	Bachelor’s degree	54	29.8
	Honours degree	59	32.6
	Master’s degree	44	24.3
	PhD	1	0.6
Province	Gauteng	113	62.4
	KwaZulu-Natal	5	2.8

	Limpopo	11	6.1
	Mpumalanga	12	6.6
	Northern Cape	18	9.9
	North West	6	3.3
	Western Cape	16	8.8
Work Experience	<2 years	12	6.6
	2 – 5 years	52	28.7
	6 – 9 years	49	27.1
	10 – 15 years	36	19.9
	16 – 19 years	13	7.2
	>20 years	19	10.5
Primary Industry Sector	Manufacturing	12	6.6
	Utilities and energy	5	2.8
	Logistics	9	5
	Retail	11	6.1
	Telecom	8	4.4
	Airline	1	0.6
	Pharmaceutical	1	0.6
	Public sector	8	4.4
	Service	11	6.1
	Finance	20	11
	Mining	67	37
	Other (please specify)	28	15.5
Devices Used for Accessing E-commerce Platforms	Smartphone	174	57.4
	Tablet	19	6.3
	Laptop	92	30.4
	Desktop computer	11	3.6
	Smart TV	3	1
	Smartwatch	4	1.3
Frequency of E-commerce Purchases	Daily	2	1.1
	Weekly	31	17.1
	2 – 3 times a month	53	29.3
	Once a month	30	16.6
	Every 2 – 3 months	42	23.2
	2 – 3 times a year	22	12.2
	Once a year	1	0.6
E-commerce Platforms Used for Retail Purchases	Takealot	163	21.4
	Makro	46	6
	Dischem	30	3.9
	Clicks	35	4.6

Checkers	104	13.6
Shein	76	9.8
Pick ‘n Pay	48	6.3
Superbalist	72	9.4
Builders	7	0.9
Game	29	3.8
AliExpress	14	1.8
Woolworths	47	6.2
Truworths	5	0.7
Leroy Merlin	10	1.3
OneDayOnly	21	2.8
Amazon	38	5
Other (please specify)	17	2.4

The results presented in Table 4 indicate that 50.8% (n = 92) of respondents were female, and 48.6% (n = 88) were male, with one respondent opting not to disclose their gender. This slight gender skewness is likely to limit the generalisability of the study to a broader population, although prior research has observed a growing trend of female online shoppers in South Africa (Goldstuck & Bannier, 2024; Maduku & Thusi, 2023). Additionally, women are often the primary decision-makers for household retail purchases, potentially explaining their significant presence in e-commerce (Chou et al., 2011).

The age distribution of e-commerce users indicates that 68.6% (n = 124) of respondents were aged between 18 and 34 years, while 23.8% (n = 43) were aged between 35 and 44 years. These findings are consistent with Goldstuck & Bannier (2024) report, which highlights the popularity of online shopping amongst younger adults in South Africa (SA). Akello (2024) notes that younger individuals in SA tend to display a higher digital literacy due to increased exposure to technology and formal education.

A majority of the respondents (96.7%, n = 175) hold an undergraduate or postgraduate degree. These findings are consistent with Goldstuck & Bannier (2024) report, which identified a positive correlation between education level and online shopping rates in SA. The majority of respondents (62.4%, n = 113) reside in Gauteng, which has a relatively developed internet and logistics infrastructure (Johnson & Iyamu, 2019; Liu et al., 2022).

The respondents had varying levels of work experience, with most respondents (55.8%, n = 101) having work experience between 2 and 9 years, with a significant proportion of the respondents employed in the mining industry (37%, n = 67). The respondents reported engaging with a wide range of e-commerce platforms. Takealot was the most popular at 21.4%, followed by Checkers at 13.6%, Shein at 9.8%, and Superbalist at 9.4%. Smartphones (57.4%, n = 174) and laptops (30.4%, n = 92) were the primary devices used to access these platforms, with a majority of the respondents most frequently shopping 2 - 3 times a month (29.3%, n = 53) and every 2 - 3 months (23.2%, n = 42).

The empirical study sample size and responses are considered adequate for testing the hypothesised relationships amongst factors influencing customer use of e-commerce, user satisfaction and their impact on customer experience.

4.5 Descriptive statistics

This section presents the descriptive statistics of the constructs investigated in this study. The constructs include system quality, information quality, service quality, security quality, security knowledge, customer use, user satisfaction and customer experience, which were all measured on a seven-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The mid-point of the seven-point Likert scale is 4. Mean values below 4 suggest disagreement with the meaning of the survey items, values between 4 and 4.5 indicate neutrality and values above 4.5 indicate most respondents tend to agree or strongly agree with the statements. The composite values for each construct were calculated as the arithmetic mean of their respective items weighted equally. Table 5 summarises the descriptive results for each variable, including minimum, maximum, mean, standard deviation, skewness, and kurtosis.

Table 5: *Descriptive statistics for the research's variables.*

Variables	N	Min.	Max.	Mean	Std. Deviation	Skewness	Kurtosis
System Quality	181	1.00	7.00	5.534	1.162	-2.076	5.739
Information Quality	181	1.00	7.00	5.483	1.024	-1.235	2.793
Service Quality	181	1.00	7.00	4.896	1.183	-0.340	-0.082
Security Quality	181	1.60	7.00	5.003	1.307	-0.400	-0.594
Security Knowledge	181	1.00	7.00	5.448	1.217	-1.025	0.681

Customer Use	181	1.38	7.00	5.713	0.949	-1.499	3.694
User Satisfaction	181	1.00	7.00	5.780	0.979	-1.503	3.792
Customer Experience	181	1.00	7.00	5.580	0.950	-0.868	2.252

*composite values for each construct are calculated as the arithmetic mean of their respective items.

4.5.1 *System Quality*

System quality (SQ) was conceptualised to capture customers' perceptions about the performance of e-commerce platforms, specifically measuring the platform's ease of use, response time and reliability. As presented in Table 5, SQ had a mean value of 5.53 and a standard deviation (SD) of 1.16, indicating that most respondents agreed with the statements on the platforms' performance. Table 6 depicts the descriptive statistics of SQ based on customer ratings across six items. The items were adapted from previous studies on the characteristics of information systems (IS) use (DeLone & McLean, 1992; 2003; 2004). The item means ranged from 4.69 to 5.97, indicating a general agreement with the statements measuring SQ. The SD for the items ranged from 1.18 to 1.28, reflecting some variability in the responses.

Table 6: *Descriptive results for SQ items.*

Item	Mean	Std. Deviation	Skewness	Kurtosis
SQ1	5.967	1.256	-2.099	5.665
SQ2	5.823	1.239	-2.051	5.525
SQ3	5.696	1.234	-1.875	4.841
SQ4	5.580	1.220	-1.746	4.464
SQ5	4.691	1.275	-0.734	1.427
SQ6	5.448	1.185	-1.757	4.529

4.5.2 *Information Quality*

Information quality (IQ) was conceptualised to capture customers' perceptions about the quality of information on e-commerce platforms by specifically measuring the completeness, understandability, personalisation, accuracy and relevance of the information provided to customers. As presented in Table 5, IQ had a mean value of 5.48 and a SD of 1.02, indicating that most respondents agreed with the statements measuring IQ as reflected on the e-commerce platforms. Table 7 depicts the descriptive statistics of IQ based on customer ratings across six items. The items were

adapted from previous studies on the characteristics of IS use (DeLone & McLean, 1992; 2003; 2004). The item means ranged from 4.93 to 5.72, indicating respondent agreement with the statements measuring IQ. The SD for the items ranged from 1.05 to 1.49, reflecting some variability in the responses.

Table 7: *Descriptive results for IQ items.*

Item	Mean	Std. Deviation	Skewness	Kurtosis
IQ1	5.691	1.045	-1.506	3.976
IQ2	5.724	1.145	-1.459	2.945
IQ3	5.580	1.216	-1.267	2.033
IQ4	5.425	1.212	-1.131	1.847
IQ5	5.552	1.147	-1.225	2.303
IQ6	4.928	1.487	-0.624	-0.141

4.5.3 *Service Quality*

Service quality (SEQ) was conceptualised to capture customers' perceptions of the service support provided by e-commerce platforms, specifically measuring the helpfulness, speed, and reliability of the support. As presented in Table 5, SEQ had a mean value of 4.9 and a SD of 1.18, indicating that most respondents agreed with the statements on the level of support provided by e-commerce platforms. Table 8 depicts the descriptive statistics of SEQ based on customer ratings across six items. The items were adapted from previous studies on the characteristics of IS use (DeLone & McLean, 1992; 2003; 2004). The item means ranged from 4.67 to 5.1, indicating that respondents somewhat agreed with the statements measuring SEQ. The SD for the items ranged from 1.32 to 1.37, reflecting some variability in the responses.

Table 8: *Descriptive results for SEQ items.*

Item	Mean	Std. Deviation	Skewness	Kurtosis
SEQ1	4.807	1.359	-0.571	-0.004
SEQ2	4.669	1.354	-0.220	-0.466
SEQ3	4.807	1.354	-0.308	-0.140
SEQ4	5.000	1.358	-0.377	-0.140
SEQ5	4.989	1.374	-0.655	0.180
SEQ6	5.105	1.323	-0.457	-0.231

4.5.4 *Security Quality*

Security quality (SECQ) was conceptualised to capture customers' perceptions of the security quality of e-commerce platforms by specifically measuring the platform's security robustness, educational features, and trustworthiness. As presented in Table 5, SECQ had a mean value of 5 and a SD of 1.31, indicating that most respondents agreed with the statements regarding the SECQ presented by e-commerce platforms. Table 9 depicts the descriptive statistics for SECQ based on customer ratings across five items. The items were adapted from previous studies related to the security of IS (Raghavan & Zhang, 2009). The item means ranged from 4.5 to 5.32, indicating that respondents somewhat agreed with the statements measuring SECQ. The SD for the items ranged from 1.26 to 1.79, reflecting some variability in the responses.

Table 9: *Descriptive results for SECQ items.*

Item	Mean	Std. Deviation	Skewness	Kurtosis
SECQ1	5.116	1.507	-0.594	-0.516
SECQ2	5.320	1.259	-0.626	-0.137
SECQ3	5.166	1.485	-0.854	-0.124
SECQ4	4.503	1.791	-0.263	-1.067
SECQ5	4.912	1.582	-0.764	-0.003

4.5.5 *Security Knowledge*

Security knowledge (SK) was conceptualised to capture customers' perceptions about their understanding of cybersecurity threats and the actions required to mitigate them. As presented in Table 5, SK had a mean value of 5.45 and a SD of 1.22, indicating that most respondents agreed with the statements related to their SK level. Table 10 depicts the descriptive statistics for SK based on customer ratings across six items. The items were adapted from previous studies related to security knowledge and awareness of users (Lee & Chua, 2024). The item means ranged from 5.05 to 5.86, indicating agreement with the statements measuring SK. The SD for the items ranged from 1.16 to 1.43, reflecting some variability in the responses.

Table 10: *Descriptive results for SK items.*

Item	Mean	Std. Deviation	Skewness	Kurtosis

SK1	5.050	1.380	-0.655	-0.096
SK2	5.359	1.429	-0.838	0.068
SK3	5.856	1.155	-1.333	1.836
SK4	5.823	1.179	-1.254	1.504
SK5	5.265	1.319	-0.633	-0.094
SK6	5.337	1.351	-0.907	0.405

4.5.6 *Customer Use*

Customer use (CU) was conceptualised to capture customers' perceptions about their shopping behaviour when using e-commerce platforms. As presented in Table 5, CU had a mean value of 5.71 and a SD of 0.95, indicating that most respondents agreed with statements related to their CU level. Table 11 depicts the descriptive statistics for CU based on customer ratings across eight items. The items were adapted from previous studies on the characteristics of IS use (DeLone & McLean, 2004; Pramudito et al., 2023). The item means ranged from 5.02 to 6.25, indicating respondents agreement with the statements measuring CU. The SD for the items ranged from 0.94 to 1.21, reflecting some variability in the responses.

Table 11: *Descriptive results for CU items.*

Item	Mean	Std. Deviation	Skewness	Kurtosis
CU1	6.249	0.942	-1.967	6.177
CU2	6.127	0.949	-1.559	3.706
CU3	6.044	1.043	-1.903	5.981
CU4	5.845	0.988	-1.362	3.667
CU5	5.878	1.042	-1.274	2.900
CU6	5.348	1.103	-0.901	1.444
CU7	5.193	1.155	-0.669	1.164
CU8	5.017	1.213	-0.277	0.370

4.5.7 *User Satisfaction*

User satisfaction (US) was conceptualised to capture customers' perceptions of their satisfaction with the e-commerce platforms they use. As presented in Table 5, US had a mean value of 5.78 and a SD of 0.98, indicating that most respondents agreed with the statements related to their level of US. Table 12 depicts the descriptive statistics for US based on customer ratings across five items. The items were adapted from

previous studies on the characteristics of IS use (DeLone & McLean, 2004; Masyhuri, 2022; Mudau et al., 2023). The item means range from 5.41 to 5.98, indicating agreement with the statements measuring US. The SDs for the items range from 1.06 to 1.31, reflecting some variability in the responses.

Table 12: *Descriptive results for US items.*

Item	Mean	Std. Deviation	Skewness	Kurtosis
US1	5.983	1.067	-2.186	7.393
US2	5.978	1.145	-1.956	5.005
US3	5.669	1.086	-1.179	1.954
US4	5.409	1.312	-1.076	0.998
US5	5.862	1.063	-1.374	2.919

4.5.8 *Customer Experience*

Customer experience (CE) was conceptualised to capture customers' perceptions about their overall experience while interacting with e-commerce platforms throughout their buying journey. As presented in Table 5, CE had a mean value of 5.58 and a SD of 0.95, indicating that most respondents agreed with the statements regarding their overall customer experience. Table 13 depicts the descriptive statistics for CE based on customer ratings across four items. The items were adapted from previous studies on the characteristics of IS use (DeLone & McLean, 2004; Georgiadis & Chau, 2013; Setiadi et al., 2023). The item means ranged from 5.46 to 5.74, indicating agreement with the statements measuring CE. The SDs for the items ranged from 1.07 to 1.27, reflecting some variability in the responses.

Table 13: *Descriptive results for CE items.*

Item	Mean	Std. Deviation	Skewness	Kurtosis
CE1	5.602	1.196	-0.945	1.197
CE2	5.740	1.067	-0.881	1.296
CE3	5.464	1.186	-0.763	0.557
CE4	5.514	1.241	-0.861	0.686

4.6 Assessment of normality

The assumption of normality was assessed by evaluating the skewness and kurtosis of all the variables prior to testing the measurement model. According to Kline (2023), acceptable levels of non-normality vary depending on the statistical test utilised and the characteristics of the dataset. While there are no universal absolute values for skewness and kurtosis statistics, commonly accepted guidelines suggest that skewness values should fall within ±3 and kurtosis values within ±2 (Hair et al., 2019).

As indicated in Table 5, the normality assessment criteria were generally met. However, kurtosis values for system quality (5.7), information quality (2.8), customer use (3.7), user satisfaction (3.8) and customer experience (2.3), slightly exceeded the recommended limits. Although these values were outside the ideal range, they are not considered problematic in large samples (n > 100), where small deviations from normality have an insignificant impact on findings (Tabachnick & Fidell, 2013).

Additionally, some individual items within these constructs (such as SQ1-SQ4, SQ6; IQ1-IQ2; CU1-CU5, US1-US2, US5) also exceeded the recommended limits. However, data analysis research has suggested that maximum likelihood estimation remains robust to moderate deviations from normality when the sample size exceeds 100 (Tabachnick & Fidell, 2013). Therefore, the observed kurtosis deviations were not considered to significantly affect the validity of the results.

4.7 Sample adequacy

Prior to conducting a Principal Components Analysis (PCA) to confirm the validity of construct measurement scales, sample adequacy must be established first. Sample adequacy is measured using the Kaiser-Meyer-Olkin (KMO) test, developed by Kaiser & Rice (1974). The KMO test is calculated as the ratio of the sum of squared correlations to the sum of squared correlations plus the sum of squared partial correlations (Tabachnick & Fidell, 2013). A KMO value approaching 1 indicates smaller partial correlations and greater suitability for factor analysis. The thresholds for interpreting KMO values are as follows: below 0.5 (unacceptable), 0.5–0.59 (poor), 0.6–0.69 (mediocre), 0.7–0.79 (acceptable), 0.8–0.89 (good), and 0.9 and above (excellent) (Field, 2009; Kaiser & Rice, 1974). The KMO test findings for the study are

presented in Table 14. The KMO value of 0.907 falls within the excellent range, confirming that the data is adequate for yielding reliable factors during factor analysis.

Table 14: *KMO and Barlett's test results.*

Variables		Skewness
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.907
Bartlett's Test of Sphericity	Approx. Chi-Square	9358.143
	df	1035
	Sig.	<0.001

Similarly, Bartlett (1954) proposed a test to evaluate the appropriateness of correlations between variables for factor analysis. The Bartlett test assesses the strength of the relationship within variables (Hair et al., 2019). A statistically significant chi-square value of 9358.14, p-value < 0.001 (refer to Table 14) indicates that the null hypothesis of the test can be rejected, suggesting there are meaningful correlations amongst the variables, yielding the dataset suitable for factor analysis.

4.8 Exploratory factor analysis

Exploratory Factor Analysis (EFA) is a statistical method that defines the underlying structure amongst a set of variables (Hair et al., 2019). In this study, EFA was conducted using Principal Components Analysis (PCA), a technique used to identify patterns in a dataset by grouping related variables into components (Tabachnick & Fidell, 2013). These components, which are largely uncorrelated with each other, help in understanding variable relationships where strong inter-correlations suggest that the variables measure similar underlying constructs. For a better interpretation of these components, factor rotation is employed, utilising two types: orthogonal (varimax, quartimax, equamax) and oblique (direct oblimin and promax) rotations (Hair et al., 2019; Tabachnick & Fidell, 2013).

This study conducted a PCA with a Promax rotation method based on the assumption that the underlying factors are correlated. Promax rotation was selected as it does not enforce orthogonality. Instead, it maximises the variance of squared loadings to provide a relatively realistic factor structure, ensuring only theoretically meaningful constructs are extracted (Hair et al., 2019). In the analysis, pairwise exclusion was applied for cases with missing values. Coefficients were sorted in descending order,

and coefficients with values below 0.45 were suppressed to focus on meaningful factor loadings that strongly relate to the underlying constructs (Hair et al., 2019). This approach also allowed for easier interpretation of the findings. Table 15 presents the factor loadings from the PCA with an eight-component solution.

Table 15: *PCA results of an eight-component solution.*

Pattern Matrix[a]								
Items	**Component**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
SQ1		0.946						
SQ2		0.956						
SQ3		0.944						
SQ4		0.953						
SQ5		0.887						
SQ6		0.958						
IQ1					0.816			
IQ2					0.948			
IQ3					0.627			
IQ4					0.814			
IQ5					0.853			
IQ6					0.911			
SEQ1				0.831				
SEQ2				0.974				
SEQ3				0.945				
SEQ4				0.859				
SEQ5				0.881				
SEQ6				0.855				
SECQ1						0.988		
SECQ2						0.911		
SECQ3						0.928		
SECQ4						0.750		
SECQ5						0.601		
SK1			0.876					
SK2			0.942					
SK3			0.996					
SK4			0.967					
SK5			0.856					
SK6			0.883					

CU1	0.912		
CU2	0.941		
CU3	0.968		
CU4	0.996		
CU5	0.951		
CU6	0.901		
CU7	0.768		
CU8	0.687		
US1		0.885	
US2		0.882	
US3		0.682	
US4		0.617	
US5		0.680	
CE1			0.825
CE2			0.750
CE3			0.812
CE4			0.794

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

From the PCA conducted on 46 items, eight components with eigenvalues exceeding one were extracted, explaining 80% of the total variance (refer to Appendix F). Table 24 in Appendix F presents the eigenvalues and the percentage of variance explained by each factor. Each of the eight components was defined as follows: Component 1: Customer Use (8 items), Component 2: System Quality (6 items), Component 3: Security Knowledge (6 items), Component 4: Service Quality (6 items), Component 5: Information Quality (6 items), Component 6: Security Quality (5 items), Component 7: User Satisfaction (5 items) and Component 8: Customer Experience (4 items).

All eight components were retained for further analysis, as their loadings exceeded the minimum threshold of 0.55 of good loadings (Tabachnick & Fidell, 2013), and each item loaded strongly onto only one component, and there were no cross-loadings. Overall, the validated factor structure underpins an eight-variable model, facilitating a robust confirmatory analysis.

4.9 Confirmatory factor analysis

Confirmatory Factor Analysis (CFA) was conducted to test the measurement model and examine the relationship between measured variables and their underlying theoretical constructs. CFA assesses the extent to which the hypothesised factor structure fits the observed data (Hair et al., 2019). The measurement model was developed using SPSS Amos software version 26, and model parameters were estimated using the maximum-likelihood method based on covariance matrices.

Figure 13 illustrates the initial CFA measurement model (refer to Appendix G), where latent variables (circles) are linked to measurement variables (rectangles), each with individual error terms. Covariance between latent variables is represented by two-headed arrows, and the causal relationships between measurement variables and latent constructs are indicated by one-headed arrows.

Once the measurement model was developed, the model fit was assessed using indices such as the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the chi-square to degrees of freedom ratio (X^2/DF) (Hair et al., 2021). Table 20 presents the model fit indices for the initial CFA measurement model for the study. While the values for RMSEA (0.081) and X^2/DF (2.182) indicated reasonable fit, other indices, such as GFI (0.651) and TLI (0.868), fell below the recommended thresholds, suggesting room for model refinement.

The main purpose of the CFA in this study was to evaluate convergent validity, assessed through standardised factor loadings. All the items demonstrated loadings above the recommended threshold of 0.6, except CE1, which had a loading of 0.59 (Comrey & Lee, 1992; Hair et al., 2019). Although CE1 had a strong loading during the exploratory factor analysis (0.825), it was removed from the final model due to its lower loading (0.59) in the CFA. Its removal resulted in improved model indices and maintained convergent validity.

Figure 10 illustrates the final CFA measurement model with CE1 removed, where all the retained items demonstrated strong factor loadings, ranging from 0.671 to 0.956, supporting the construct validity of the model. Retaining items with low loadings can compromise model fit and construct reliability. Therefore, convergent validity has been

achieved, as all the retained items demonstrate strong factor loadings, supporting the construct's measurement integrity and overall model adequacy. The next section evaluates the reliability, validity and internal consistency of the measurement model.

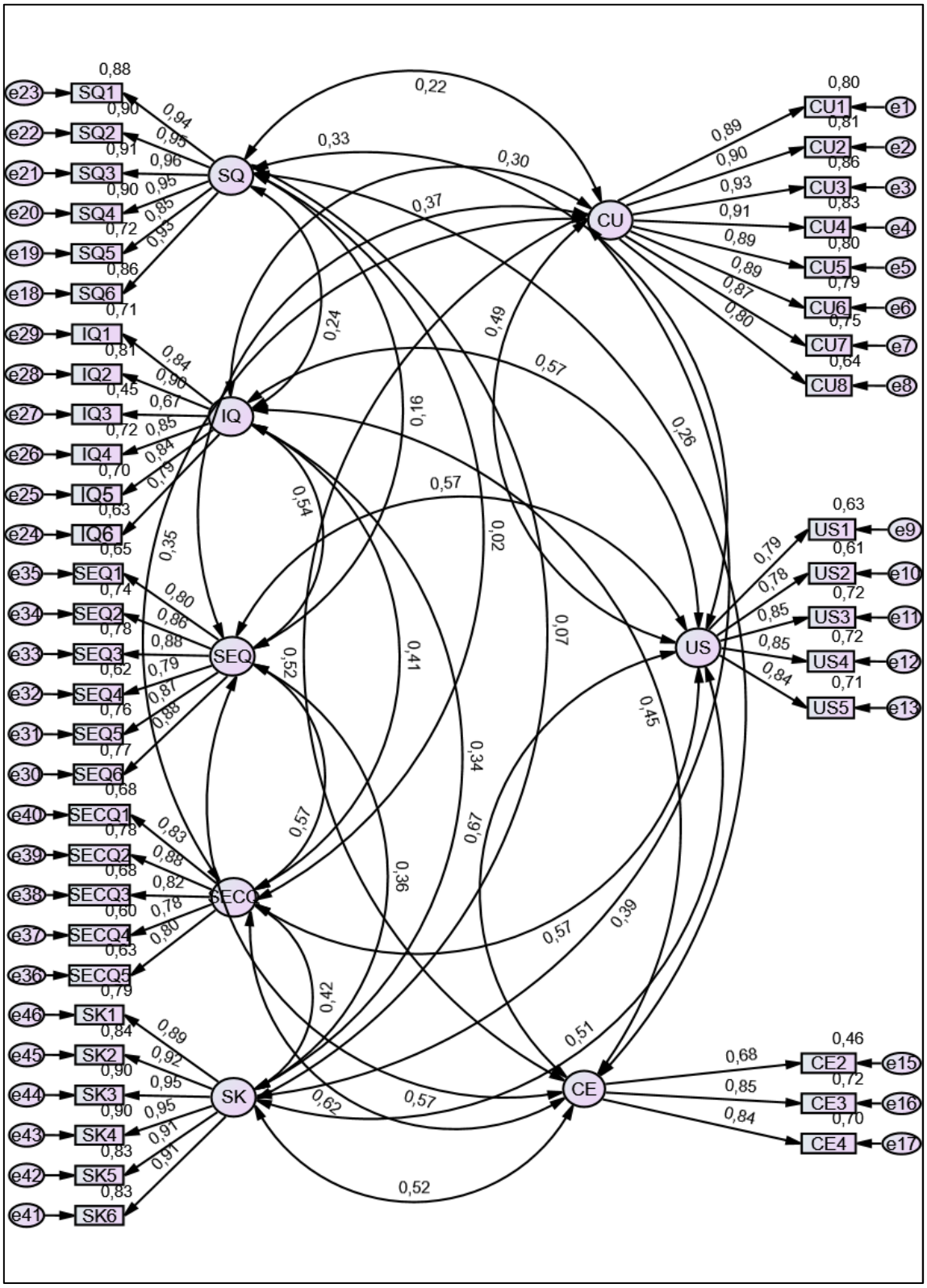


Figure 10: *Final CFA measurement model (researcher's own work).*

4.10 Reliability and validity

4.10.1 *Reliability*

Reliability is a key consideration in measurement models, reflecting the consistency of the items measuring a variable. It also refers to the internal consistency of the measured variables, ensuring identical results are produced upon repeated testing (Cooper & Schindler, 2014). Hair et al. (2019) recommend Cronbach's alpha values above 0.7 indicate good internal consistency. Pallant (2011) similarly recommends Cronbach's alpha values above 0.7 as acceptable, with values above 0.8 as preferable. Additionally, Hair et al. (2019) recommended including composite reliability (CR) for a more robust assessment of internal consistency.

As presented in Table 16, Cronbach's alpha values range from 0.823 to 0.974, all exceeding the recommended threshold of 0.7. The CR values, also presented in Table 16, range from 0.625 to 0.864, indicating that most values meet or exceed the recommended threshold of 0.7. Therefore, the reliability of the measurement model is deemed satisfactory.

4.10.2 *Convergent validity*

Convergent validity is a key analytical consideration in measurement models, reflecting the extent to which a variable explains the variance of its measured items (Hair et al., 2019). The average variance extracted (AVE) is commonly used to evaluate convergent validity, with a recommended threshold above 0.5 (Hair et al., 2019; Kline, 2023).

As presented in Table 16, the AVE values for all the variables range from 0.832 to 0.974, all exceeding the recommended threshold. These results confirm that convergent validity is deemed satisfactory in the measurement model.

Table 16: *Reliability and validity results.*

Variables	Initial number of Items (Final number of Items)	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
System Quality	6 (6)	0.974	0.974	0.864

Information Quality	6 (6)	0.918	0.924	0.670
Service Quality	6 (6)	0.938	0.939	0.718
Security Quality	5 (5)	0.905	0.912	0.674
Security Knowledge	6 (6)	0.970	0.969	0.838
Customer Use	8 (8)	0.965	0.965	0.777
User Satisfaction	5 (5)	0.912	0.913	0.678
Customer Experience	4 (3)	0.823	0.832	0.625

4.10.3 *Construct validity*

Construct validity is measured using two components: convergent validity and discriminant validity. Discriminant validity refers to the degree to which a construct or variable is truly unique from other constructs or variables (Hair et al., 2019). Discriminant validity is confirmed using a matrix of correlations among variables and comparing it with the square root of the average variance extracted (AVE). Table 17 presents the inter-variable correlation matrix, with the square root of AVE presented along the table's diagonal.

Table 17: *Inter-variable correlation matrix.*

Correlations	SQ	IQ	SEQ	SECQ	SK	CU	US	CE
SQ	**0.930**							
IQ	0.238**	**0.818**						
SEQ	0.168*	0.537**	**0.848**					
SECQ	0.023	0.384**	0.534**	**0.821**				
SK	0.069	0.324**	0.360**	0.422**	**0.915**			
CU	0.227**	0.317**	0.383**	0.378**	0.400**	**0.882**		
US	0.305**	0.519**	0.530**	0.511**	0.487**	0.474**	**0.824**	
CE	0.241**	0.418**	0.527**	0.545**	0.481**	0.528**	0.606**	**0.791**

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

SQ: System Quality, IQ: Information Quality, SEQ: Service Quality, SECQ: Security Quality, SK: Security Knowledge, CU: Customer Use, US: User Satisfaction, CE: Customer Experience

From the results presented in Table 17, discriminant validity is deemed satisfactory as the square root of AVE values exceeds the inter-variable correlations, indicating that variables share more variance with their own items than with other variables. On the basis of these outcomes, the reliability and validity of the variables are considered to

be satisfactory. As a result, these measures are confirmed, the next section analyses the structural model of the study.

4.11 Structural modelling

Structural Equation Modelling (SEM) is a comprehensive statistical approach for testing hypothesised causal relationships between latent variables. This approach specifies hypothesised causal paths between variables to test the study's theoretical framework (Hair et al., 2019). Figure 7 illustrates the relationships within the model tested in this research.

4.11.1 *Initial model testing*

For this research, 'free pathways' were modelled to represent the hypothesised causal relationships between the variables tested. This approach allowed the model to assess whether the hypothesised relationships hold true within the context of the data without imposing strict constraints (Hair et al., 2019; Kline, 2023). The initial results of the hypothesised model are illustrated in Figure 11.

The model was structured to exclude observed measures, with latent variables modelled directly based on hypothesised relationships. A one-headed arrow indicates the causal relationships between the independent and dependent variables. Error terms were added to both independent and dependent variables, and covariance arrows were removed to enhance the model's presentation. The model fit indices were as follows: GFI = 0.733, NFI = 0.58, CFI = 0.587, IFI = 0.598, RMSEA = 0.271, X^2/DF = 14.175 at a p-value < 0.05 (p = 0), TLI = 0.229, and RFI = 0.216. These results indicate poor model fit, a most of the model fit indices fall outside the acceptable threshold ranges presented in Table 20. This suggests that the model does not align with the data. There is a clear need for model improvement, which could involve removing insignificant hypotheses or variables or covarying some of the error terms based on the modification indices.

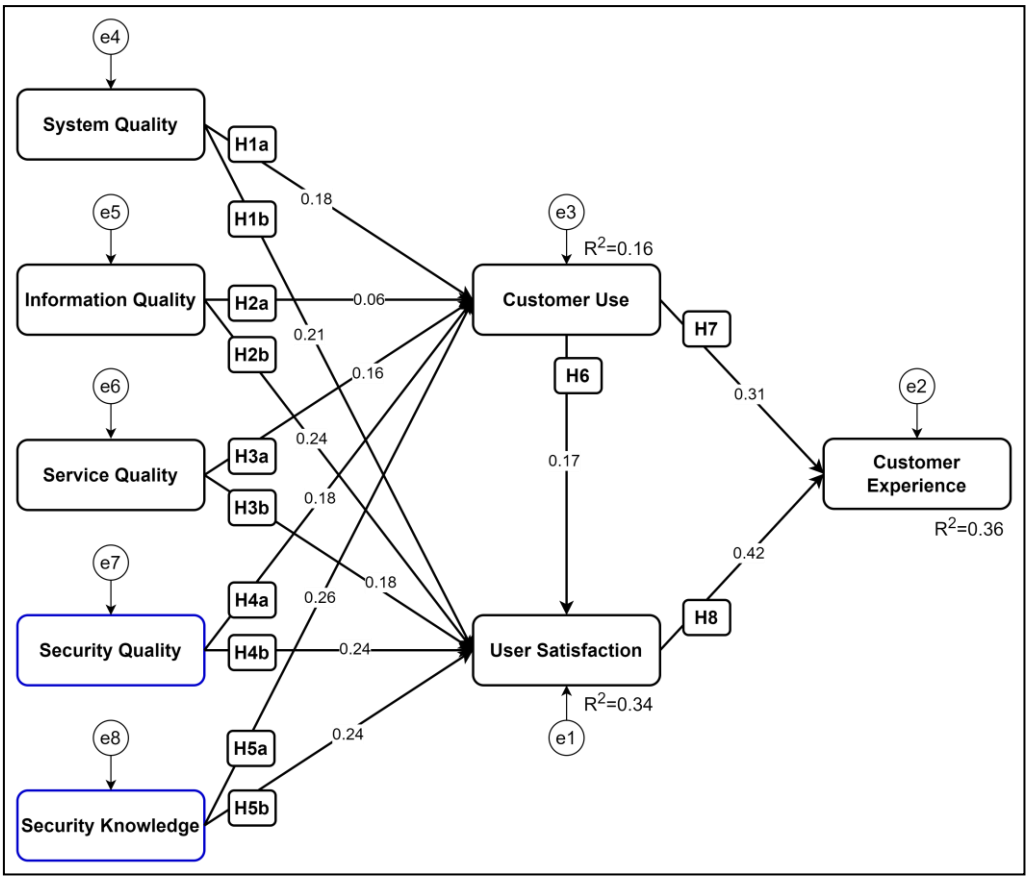


Figure 11: *Initial structural model.*

4.11.2 *Final model testing*

The final results of the hypothesised model are illustrated in Figure 12. The model fit indices were: GFI = 0.987, NFI = 0.982, CFI = 0.991, IFI = 0.991, RMSEA = 0.07, X^2/DF = 1.872 at a p-value > 0.05 (p = 0.096), TLI = 0.949, and RFI = 0.896. These results indicate an acceptable fit across most indices as they fall within the acceptable threshold ranges presented in Table 20, indicating that the model aligns well with the data.

In achieving the final model illustrated in Figure 12, several improvements were implemented to ensure alignment between the model and the data. These improvements are summarised as follows:

- The initially modelled CU<---IQ (H2a) path, as presented in Table 19, was removed to improve model fit, as the path was constraining the model.

- Error terms with high modification indices (M.I.), as presented in Table 18, were covaried, provided that the adjustment did not undermine the model tested (Fan & Sivo, 2005).

Table 18: *Error term modification indices.*

Paths	M.I.	Par Change
e7 <--> e5	26.481	0.51
e7 <--> e8	32.102	0.668
e6 <--> e5	51.907	0.647
e6 <--> e8	23.328	0.515

- The error terms for IQ, SEQ, SECQ, SK, and CE were also correlated due to common method variance, as these constructs were measured using the same research instrument with self-reported Likert scales. Given that all responses were collected within the same questionnaire, respondents might introduce systematic bias, leading to correlated errors among IQ, SEQ, SECQ, SK, and CE items (Podsakoff et al., 2003).

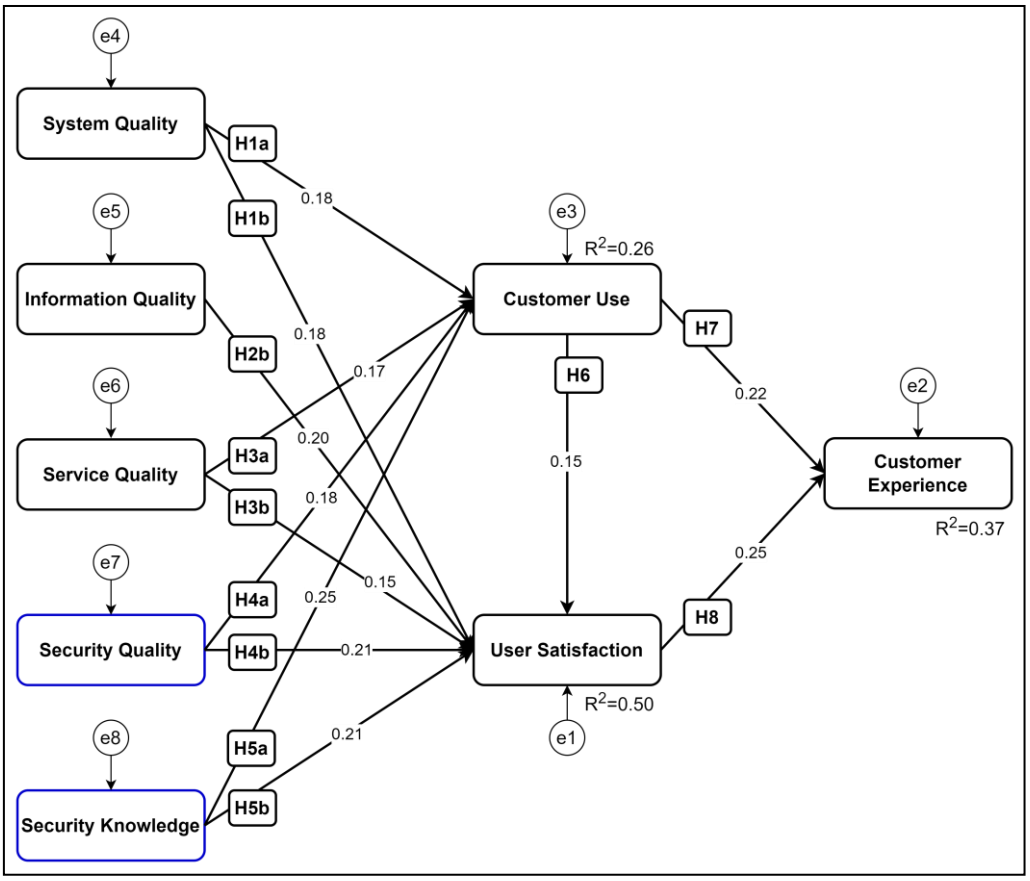


Figure 12: *Final structural model.*

4.11.3 *Hypothesis testing*

Table 19 presents the results of the hypothesis testing for the proposed model based on the data collected. It indicates the path coefficients (β) of the hypothesised relationships and identifies whether they are supported by the data.

Table 19: *Hypothesised model SEM results.*

Hypothesis	Relationship	Path Estimate (β)	S.E.	C.R.	p-value	Results
H1a	SQ <---> CU	0.179	0.052	2.79	0.005	Supported
H1b	SQ <---> US	0.182	0.045	3.314	***	Supported
H2b	IQ <---> US	0.203	0.061	3.17	0.002	Supported
H3a	SEQ <---> CU	0.169	0.061	2.197	0.028	Supported
H3b	SEQ <---> US	0.152	0.056	2.196	0.028	Supported
H4a	SECQ <---> CU	0.179	0.057	2.262	0.024	Supported
H4b	SECQ <---> US	0.208	0.049	3.124	0.002	Supported
H5a	SK <---> CU	0.255	0.056	3.544	***	Supported
H5b	SK <---> US	0.212	0.049	3.446	***	Supported
H6	CU <---> US	0.153	0.063	2.496	0.013	Supported
H7	CU <---> CE	0.222	0.064	3.656	***	Supported
H8	US <---> CE	0.252	0.073	3.579	***	Supported

If p = ***, it indicates the relationship is highly significant at the 0.1% level (2-tailed).

If p < 0.05, it indicates the relationship is significant at the 5% level (2-tailed).

SQ: System Quality, IQ: Information Quality, SEQ: Service Quality, SECQ: Security Quality, SK: Security Knowledge, CU: Customer Use, US: User Satisfaction, CE: Customer Experience

As indicated in Table 19, twelve out of the thirteen hypotheses were directly supported by the research model tested. The factors influencing customer use [SQ ($\beta = 0.179$, $p < 0.05$); SEQ ($\beta = 0.169$, $p < 0.05$); SECQ ($\beta = 0.179$, $p < 0.05$), and SK ($\beta = 0.255$, $p < 0.001$)] of e-commerce platforms were found to have a significant positive influence on user behaviour towards using e-commerce platforms. These findings support hypotheses H1a, H3a, H4a and H5a. This suggests that improvements in SQ, SEQ, SECQ, and SK have a significant positive influence on the customer use of e-commerce platforms. Surprisingly, the Information Quality factor ($\beta = 0.048$, $p > 0.05$) did not have a significant influence on Customer Use of e-commerce platforms. Therefore, H2a was not supported. This finding suggests that improvements in the information quality provided by e-commerce platforms may not be one of the factors directly influencing customer use of platforms.

The factors system quality (SQ), information quality (IQ), service quality (SEQ), security quality (SECQ), and security knowledge (SK) were found to have a significant positive influence on user satisfaction with e-commerce platforms, as indicated by their respective path coefficients (SQ: $\beta = 0.182$, $p < 0.001$; IQ: $\beta = 0.203$, $p < 0.05$; SEQ: $\beta = 0.152$, $p < 0.05$; SECQ: $\beta = 0.208$, $p < 0.05$; SK: $\beta = 212$, $p < 0.001$). These findings support hypotheses H1b, H2b, H3b, H4b and H5b, leading to the rejection of the null hypothesis. This suggests that improvements in SQ, IQ, SEQ, SECQ, and SK can lead to increased user satisfaction with e-commerce platforms.

Customer Use of e-commerce platforms was found to have a significant positive influence on User Satisfaction ($\beta = 0.153$, $p < 0.05$). This finding supports hypothesis H6, therefore, the null hypothesis is rejected. This suggests that the more customers use e-commerce platforms, the more likely they are to experience improved satisfaction with those platforms.

Additionally, customer use was found to have a significant positive impact on customer experience ($\beta = 0.222$, $p < 0.001$). This finding supports hypothesis H7, therefore, the null hypothesis is rejected. This suggests that a customer's behaviour, including their frequency of using e-commerce platforms, likely contributes to a positive customer experience. Similarly, the user satisfaction of customers with e-commerce platforms was found to have a significant positive impact on customer experience ($\beta = 0.252$, $p < 0.001$). This finding supports hypothesis H8, therefore, the null hypothesis is rejected. This suggests that a customer's satisfaction with e-commerce platforms likely contributes to a positive customer experience. Furthermore, the R-squared results from the final structural model, as illustrated in Figure 12, indicate that the model explains 26% of the variance in customer use ($R^2 = 0.26$), 50% of the variance in user satisfaction ($R^2 = 0.5$), and 37% of the variance in customer experience ($R^2 = 0.37$). These findings suggest a moderate level of explanation for the theoretical variables tested.

4.12 Model fit indices

This section presents the model fit indices evaluated for all models tested by conducting a confirmatory factor analysis (CFA) and structural equation modelling (SEM). The model parameters were estimated using the maximum-likelihood

estimation method. Table 20 provides a summary of the model fit indices for the models under investigation, along with their corresponding recommended values initially presented in section 3.7 (refer to Table 2).

Table 20: *Model fit indices.*

Fit Index	Recommended Value	CFA Final	SEM Initial	SEM Final
Goodness-of-fit (GFI)	Less than 0.8 (No fit) Between 0.8-0.9 (acceptable) Above 0.9 (Perfect fit)	0.654	0.733	0.972
Normed fit index (NFI)	Less than 0.8 (poor) Between 0.8-0.9 (acceptable) Above 0.9 (good)	0.803	0.580	0.958
Comparative fit index (CFI)	Less than 0.9 (poor) Above 0.9 (good)	0.883	0.587	0.968
Incremental fit index (IFI)	Less than 0.9 (poor) Above 0.9 (good)	0.884	0.598	0.969
Root mean square error of approximation (RMSEA)	Less than 0.05 (good) Between 0.06-1 (acceptable) Above 1 (poor)	0.081	0.271	0.12
Ratio of Chi-Square to Degrees of Freedom ($\chi 2$ /DF)	Less than 3 (good) Between 3-5 (acceptable) Above 1 (poor)	2.167	14.175	3.576
Tucker-Lewis Index (TLI)	Less than 0.8 (poor) Between 0.8-0.9 (acceptable) Above 0.9 (good)	0.873	0.229	0.849
Relative Fit Index (RFI)	Less than 0.8 (poor) Between 0.8-0.9 (acceptable) Above 0.9 (good)	0.788	0.216	0.802

4.13 Conclusion

The objective of the chapter was to analyse the data collected during the study, providing insights into e-commerce platform customer use factors and their impact on customer experience. The chapter commenced with an overview of the sample

characteristics, revealing the sample demographic composition and descriptive statistics of the investigated constructs. This was followed by a normality assessment, confirmed using skewness and kurtosis, as well as sample adequacy verification using the Kaiser-Meyer-Olkin test and Bartlett's test of sphericity. Upon this confirmation, principal component analysis was conducted to reveal the underlying structure of the variables, followed by confirmatory factor analysis to evaluate convergent validity. The reliability and validity of the results were assessed using Cronbach's alpha and composite reliability for reliability, while construct validity was verified using the average variance extracted and a correlation matrix. Finally, the research model was tested using structural equation modelling.

The findings indicated statistically significant correlations between System Quality, Service Quality, Security Quality, Security Knowledge and Customer Use. However, the relationship between Information Quality and Customer Use was not tested, as it was removed to improve model fit. Additionally, there were statistically significant positive correlations between System Quality, Information Quality, Service Quality, Security Quality, Security Knowledge and User Satisfaction. Furthermore, when combined with Customer Use and User Satisfaction, these factors demonstrated a statistically significant positive correlation with Customer Experience. These results provide a new perspective on the factors influencing the use of e-commerce platforms and their impact on customer experience in the retail sector, providing valuable insights for businesses aiming to adopt e-commerce platforms to improve efficiency and profitability. A more detailed discussion of the results is presented in the next chapter.

CHAPTER 5. DISCUSSION OF THE RESULTS

5.1 Introduction

In Chapter 4, the e-commerce success model was validated by identifying factors influencing customer use of e-commerce. The hypothesis testing results presented in Figure 12 and Table 19 indicate statistically significant relationships between System Quality, Service Quality, Security Quality, and Security Knowledge and Both Customer Use and User Satisfaction. However, the influence of Information Quality on Customer Use was not tested, as the relationship was removed to improve model fit. These findings contribute to a deeper understanding of e-commerce platform adoption by demonstrating how these factors impact customer experience.

The purpose of this chapter is to discuss the empirical results obtained through structural equation modelling in addressing research objectives RO1: "*To examine the factors influencing customer use of e-commerce*", and RO2: "*To examine the impact of customer use on customer experience*". In fulfilling these objectives, this study used the updated DeLone and McLean Information Systems (D&M IS) success model as the theoretical foundation for the research model presented in Figure 7. The D&M IS success model provides a comprehensive framework for assessing information systems at an organisational and individual level, considering dimensions such as system quality, information quality, service quality, use, user satisfaction, and net benefits (DeLone & McLean, 1992; 2003).

Although various studies have used the D&M IS success model to evaluate the success of information systems, its application within the context of e-commerce remains limited. Specifically, e-commerce platforms are increasingly faced with cybersecurity threats that significantly impact customer trust and adoption (Agarwal & Wu, 2015; Alyoubi, 2015). This study identified a research gap, highlighting a limited understanding of the security-related factors influencing customer use of e-commerce and its impact on customer experience. In addition, while previous studies have attempted to determine the factors influencing customer use of e-commerce, their findings have been inconsistent, highlighting the need for further research. Furthermore, a gap persists between the high adoption rate of e-commerce by retailers and lower customer engagement, where physical store shopping remains prevalent

(Johnson & Iyamu, 2019; Musikavanhu & Musakuro, 2023). To address these limitations, this study adapted the D&M IS success model by integrating security quality and security knowledge as additional factors influencing the use of e-commerce. The integration of these factors was aimed at providing a better understanding of how security challenges affect customer behaviour when using e-commerce platforms. The following sections of this chapter elaborate on the empirical findings, offering a detailed interpretation of the findings and their implications.

5.2 Factors[1] influencing customer use of e-commerce

The findings presented in Chapter 4 provide answers regarding the factors influencing customer use of e-commerce in the South African retail sector. The results of the influence that the identified e-commerce system success factors have on customer use are summarised in Table 21.

Table 21: *Influence of statistically significant system success factors on customer use of e-commerce.*

E-commerce System Success Factors	Customer Use	User Satisfaction
System Quality	Yes	Yes
Information Quality	N/A	Yes
Service Quality	Yes	Yes
Security Quality	Yes	Yes
Security Knowledge	Yes	Yes

The original D&M IS success model only considered system quality and information quality as key system success factors (DeLone & McLean, 1992). The model was later revised to include service quality, reflecting the growing importance of customer service in information systems, particularly the growth of e-commerce at the time (DeLone & McLean, 2003). These three factors have since been widely applied in evaluating IS success across various contexts, including traditional and e-commerce systems (Angelina et al., 2019; Fang et al., 2011; Mahmoodi et al., 2017; Mudau et al.,

[1] In this chapter, words referring to factors influencing IS success refer to both these concepts as occurring in real life as well as their representation as statistical constructs, which are two different things. Usually, the former is written in lower case and the latter in upper case. However, for ease of discussion, they are both presented in lower case here.

2023; Nugroho & Prasetyo, 2018; Pramudito et al., 2023; Rouibah et al., 2015; Setiadi et al., 2023; Yang et al., 2024; Yel et al., 2020).

Given the increasing cybersecurity threats faced by e-commerce platforms, it is evident that the D&M IS success model requires adaptations to reflect the realities of the modern digital world. This study contributes to the existing body of knowledge by extending the updated D&M IS success model through the inclusion of security quality and security knowledge as critical factors influencing customer use of e-commerce. The adaptation is aimed at ensuring the model remains relevant in addressing modern day cybersecurity challenges while highlighting the growing importance of secure systems in building customer trust and e-commerce success (Agarwal & Wu, 2015; Alyoubi, 2015; Niu & Zhao, 2023). The lack of cybersecurity awareness and education amongst users has been identified as a significant contributor to cybersecurity risks in e-commerce (Bartczak, 2021; Liu et al., 2022; Vuță et al., 2022). This suggests that, in addition to the technical aspects of system security, the level of user awareness and education on online security practices significantly influences customer trust and willingness to engage with e-commerce platforms.

While the D&M IS success model has been widely used to measure IS success, its application in examining the role of security-related factors in e-commerce success remains under-researched. Prior studies explicitly considering security quality and security knowledge as causal factors driving customer use of e-commerce remain limited, with only a few studies (Larry, 2019; Mofokeng, 2019; Noori, 2019; Pramudito et al., 2023; Shah et al., 2021) addressing security concerns by introducing trust as a mediating factor. However, while trust has been integrated into some models, it does not fully account for the technical and behavioural dimensions of security in e-commerce. Instead, this study extends the D&M IS success model by including security quality and security knowledge as additional dimensions for evaluating e-commerce success, ensuring a more comprehensive approach to addressing cybersecurity challenges.

Accordingly, the research model developed in this study adapted the updated D&M IS success model, providing a more comprehensive framework for understanding the factors influencing customer use of e-commerce and its impact on customer experience. By emphasising the critical role that security quality and security

knowledge play in shaping customer behaviour, this study highlights the potential for increased e-commerce adoption amongst customers and informs investment decisions for retailers. This section addresses RO1, and the discussion is structured around the five e-commerce system success factors proposed in the extended D&M IS success model: system quality, information quality, service quality, security quality, and security knowledge.

System quality was identified as a key causal factor of customer use in e-commerce, evaluated through usability, availability, reliability, adaptability and response time (DeLone & McLean, 2003; 2004). This study found that most respondents perceive e-commerce platforms as user-friendly, reliable, and responsive, which encourages frequent use. Additionally, the findings confirmed that system quality has a positive influence on customer use. Customers prefer platforms that are fast, reliable, and easy to navigate, with platform features such as seamless checkout, fast-loading pages, and minimal transaction errors, further enhancing customer use. The study findings also confirmed that system quality has a positive influence on user satisfaction. These findings align with prior research (Fang et al., 2011; Pramudito et al., 2023; Rouibah et al., 2015; Setiadi et al., 2023), confirming that e-commerce platform performance directly influences customer use and user satisfaction. The results further suggest that improved system quality drives e-commerce adoption by ensuring platform availability, ease of use, reliability in processing orders, quick response times, and user-friendliness, all of which contribute to increased customer engagement. In contrast, slow or unreliable platforms drive users to abandon e-commerce in favour of physical retail stores or competing platforms with better system performance. This reinforces (DeLone & McLean, 2004) assertions that system quality is a critical causal factor of customer use and user satisfaction in e-commerce. Therefore, both hypotheses H1a and H1b were empirically supported, thereby fulfilling RO1. The findings highlight the importance of continuous platform optimisation, as businesses that neglect system performance risk losing customers, reducing operational efficiency, and decreasing profitability. For South African retailers, prioritising system performance is essential for bridging the gap between e-commerce investment and actual customer engagement.

Information quality evaluates the quality of content provided on e-commerce platforms, evaluated through accuracy, completeness, relevance, clarity, and personalisation (DeLone & McLean, 2004). This study found that most respondents perceive e-

commerce platform information as complete, accurate, relevant, understandable, and personalised. Additionally, the findings confirmed that information quality has a positive influence on user satisfaction. Platform features such as detailed product descriptions, transparent pricing, and personalised recommendations further enhance satisfaction by providing users with reliable and relevant information. These results accord with previous findings (Angelina et al., 2019; Fang et al., 2011; Rouibah et al., 2015; Setiadi et al., 2023; Tam et al., 2019; Yel et al., 2020), which identify a positive relationship between information quality and user satisfaction in e-commerce platforms. Although the influence of information quality on customer use was not fully explored due to model fit adjustments that led to the removal of hypothesis H2a, its influence on satisfaction remains a significant finding. This finding aligns with DeLone & McLean (2004) that information quality is a critical causal factor of user satisfaction in e-commerce. Therefore, hypothesis H2b was empirically supported, thereby fulfilling RO1. The findings highlight the importance of continuous content optimisation, as businesses that fail to provide precise and reliable product information risk driving customer dissatisfaction, reducing engagement, and impacting sales. For South African retailers, prioritising high-quality and personalised information is essential for enhancing user satisfaction. Further research is required to determine specific conditions under which information quality becomes a key causal factor of customer use of e-commerce, particularly in markets with varying levels of digital literacy.

Service quality refers to the overall support provided by an e-commerce platform, evaluated through reliability, responsiveness, assurance and empathy in delivering customer support (DeLone & McLean, 2003; 2004). This study found that most respondents perceive e-commerce platforms as providing reliable, responsive, and assuring support, which encourages frequent use. Additionally, the findings confirmed that service quality positively influences customer use. Customers value efficient and responsive support systems, particularly when encountering issues with orders, payments, or technical difficulties. The study also confirmed that service quality has a positive influence on user satisfaction. These findings align with prior studies (Angelina et al., 2019; DeLone & McLean, 2004), confirming that e-commerce platform service quality directly influences customer use and user satisfaction. The results further suggest that enhanced service quality fosters user trust and confidence, increasing engagement with e-commerce platforms. However, despite the positive influence of

service quality, its mean score in the research model was lower than the other key causal factors, indicating weaker perceived effectiveness. This finding aligns with prior studies (Fang et al., 2011; Rouibah et al., 2015; Setiadi et al., 2023; Tam et al., 2019), where an insignificant relationship was observed between service quality and customer use. One possible explanation is that customer expectations for e-commerce support may exceed the current level of service provided. Unlike traditional retail, where face-to-face interactions allow for immediate issue resolution, e-commerce support is often limited to virtual assistants, delayed email responses, or automated systems, which may not fully meet customer needs. These findings reinforce (DeLone & McLean, 2004) assertions that service quality is a critical causal factor of customer use and user satisfaction in e-commerce but will have to continually evolve to meet customer expectations. Therefore, both hypotheses H3a and H3b were empirically supported, thereby fulfilling RO1. The findings highlight the need for businesses to invest in more responsive and personalised customer support systems. Improving live chat functions and enhancing the efficiency of issue resolution mechanisms using artificial intelligence can increase customer use and satisfaction. For South African retailers, prioritising service quality is crucial to ensuring that customer engagement translates into long-term loyalty and repeat purchases.

Security quality refers to a system's capability to protect data and resources. It is evaluated based on security robustness, user education on security risks, and trustworthiness (Raghavan & Zhang, 2009). This study found that most respondents perceive e-commerce platforms as secure, which encourages frequent use. Additionally, the findings confirmed that security quality positively influences customer use. Customers feel more confident using platforms with strong data protection measures, secure payment gateways, and proactive fraud prevention mechanisms. The study also confirmed that security quality has a positive influence on user satisfaction. These findings align with prior studies (Pramudito et al., 2023; Rouibah et al., 2015; Yang et al., 2024), confirming that a secure platform builds customer trust, increasing customer use of e-commerce and enhancing the overall shopping experience. Customers are more likely to engage with e-commerce platforms when they perceive their personal and financial data as protected against fraud, identity theft, and cyberattacks. This study supports previous research (Agarwal & Wu, 2015; Alyoubi, 2015), which highlighted that improving security perceptions can significantly

impact customer behaviour, reinforcing security as a critical e-commerce success factor. Therefore, both hypotheses H4a and H4b were empirically supported, thereby fulfilling RO1.

One notable finding from this study is that security quality should be considered an independent factor in e-commerce success models, an aspect that has received limited attention in prior applications of the D&M IS success model (DeLone & McLean, 1992; 2003). This finding represents a new contribution to information systems research. A practical example of these findings is seen in global e-commerce platforms such as Amazon and Alibaba, which have invested heavily in multi-layered security measures. These measures have increased user confidence, leading to higher customer retention and satisfaction levels. Similarly, South African retailers can enhance their platforms by adopting cutting-edge security technologies and improving security transparency to foster long-term customer engagement. As cyber threats evolve, businesses must continuously enhance security infrastructure, comply with data protection regulations, and educate users on cybersecurity best practices to sustain customer use and satisfaction.

The final system success factor identified in this study was security knowledge, evaluated through user's awareness of security risks and protective measures, understanding of security features, and application of security best practices (Lee & Chua, 2024). This study found that most respondents perceive themselves to be knowledgeable about online security risks, which encourages frequent engagement with e-commerce platforms. This aligns with the demographic profile of the respondents, consisting mainly of highly educated young adults who are likely to have heightened cybersecurity awareness. Additionally, the findings confirmed that security knowledge positively influences customer use. Users with greater cybersecurity awareness are more confident in navigating e-commerce platforms, identifying risks, and mitigating security threats. These findings are in line with prior findings (Hanus & Wu, 2016), which emphasised that cybersecurity awareness significantly influences security behaviour, leading to more cautious online activity. The study also confirmed that security knowledge has a positive influence on user satisfaction. These findings are consistent with previous research (Hanus & Wu, 2016; Osho et al., 2016), which highlights that users with a strong understanding of security best practices are more likely to trust e-commerce platforms, engage in online transactions, and report higher

satisfaction levels. Therefore, both hypotheses H5a and H5b were empirically supported, thereby fulfilling RO1.

One notable finding from this study is that security knowledge should be considered an independent factor in e-commerce success models, an aspect that has received limited attention in prior applications of the D&M IS success model (DeLone & McLean, 1992; 2003). This finding represents a new contribution to IS research. This study highlights the need for integrating security education into e-commerce platforms. South African retailers can enhance cybersecurity awareness by embedding fraud prevention tips, offering secure browsing guidelines, and promoting security transparency. As cyber threats continue to evolve, businesses must prioritise security knowledge in platform design, offering educational resources, and fostering a culture of security awareness among users.

The findings presented in this study reveal both consistencies and inconsistencies with prior research on customer use of e-commerce. While system quality, service quality, security quality, and security knowledge were found to significantly influence customer use, information quality did not have a statistically significant influence. This result contrasts with prior studies, such as Pramudito et al. (2023) and Setiadi et al. (2023), which identified system quality and information quality as primary drivers of customer use and user satisfaction. Similarly, DeLone & McLean (2004) emphasised system quality, information quality, and service quality as key causal factors for e-commerce success. Other studies have also highlighted the importance of service quality (Angelina et al., 2019), information quality (Tam et al., 2019) and system quality (Yel et al., 2020) in influencing customer use and user satisfaction. These inconsistencies suggest that additional contextual factors, such as security quality and security knowledge, may influence e-commerce adoption in ways not previously accounted for in traditional IS success models. This study addresses these gaps by adapting the D&M IS success model to include security quality and security knowledge as independent factors, providing a more comprehensive framework for understanding e-commerce adoption in the South African retail sector. The following section explores the relationships between customer use, user satisfaction, and customer experience to further contextualise these findings.

5.3 Customer use, user satisfaction and customer experience

The five information system success factors discussed in this chapter were proposed as causal factors on customer use and user satisfaction, which in turn impact customer experience. This section evaluates the validity of these proposed relationships, addressing Research Objective 2 (RO2) “To examine the impact of customer use on customer experience”. The relationship between customer use of e-commerce and user satisfaction has been widely studied, with previous research highlighting that satisfied users are more likely to increase their system use, and conversely, increased use can sometimes indicate satisfaction with the system (Bokhari, 2005). While customer use of e-commerce focuses on the tangible interactions with e-commerce platforms (Alkan et al., 2021), user satisfaction reflects the customers’ subjective perceptions of these platforms (DeLone & McLean, 2004). This study found a positive correlation between customer use of e-commerce platforms and user satisfaction. These findings are aligned with prior studies which found a significant positive relationship between these two constructs (DeLone & McLean, 2004; Fang et al., 2011; Pramudito et al., 2023; Rouibah et al., 2015; Setiadi et al., 2023). Therefore, hypothesis H6, proposing a positive correlation between customer use and user satisfaction, was empirically supported, thereby fulfilling RO2. The findings suggest that customer use may precede user satisfaction, as the user interaction with the system may lead to increased satisfaction or indicate satisfaction with the platform (Bokhari, 2005; Setiadi et al., 2023). This highlights the necessity for businesses to prioritise the performance of e-commerce platforms to drive customer use, fostering long-term satisfaction, which will encourage retail purchases through e-commerce. However, while the relationship between customer use and user satisfaction is clear, its dynamics are complex. Hence, further research is needed to examine potential mediating or moderating variables affecting this relationship.

Building on an understanding of this relationship, examining how customer use and user satisfaction collectively impact customer experience is crucial. Customer experience is a critical outcome for e-commerce success, as it reflects the overall perception and feelings of a customer when interacting with an online platform (Setiadi et al., 2023). It represents the net benefits derived from customer use of e-commerce (DeLone & McLean, 2004). Although customer experience is widely recognised as an

essential driver of e-commerce adoption (Georgiadis & Chau, 2013), its direct role in IS success models has been under-researched. This study found a significant positive relationship between customer use and customer experience. Similarly, user satisfaction was found to be positively correlated with customer experience. These findings are in line with previous studies (DeLone & McLean, 2004; Fang et al., 2011; Pramudito et al., 2023; Setiadi et al., 2023), which found a significant positive relationship between customer user, user satisfaction and net benefits. These results empirically support hypotheses H7 and H8. These findings support RO2, demonstrating that when customers perceive an e-commerce platform as efficient, reliable, informative, supportive, and secure, they are more likely to engage with it in future, leading to greater satisfaction and an enhanced overall experience. For instance, global platforms such as Amazon have invested heavily in optimising system performance, ensuring data security, and improving service quality, which has led to a seamless shopping experience, increased retention, and higher repeat purchases. Similarly, South African retailers aiming to improve e-commerce adoption should focus on enhancing platform usability, providing accurate product information, ensuring high-quality customer service, and prioritising security to create a positive customer experience. Another key contribution of this study is its emphasis on customer experience as a net benefit within the D&M IS success model. Prior applications of the model have primarily focused on customer use and satisfaction, with limited attention given to how these factors collectively influence customer experience. By demonstrating that a combination of system success factors drives a positive e-commerce experience, this study addresses a gap identified by Georgiadis & Chau (2013) and highlights the need for further research on customer experience in digital business environments.

5.4 Conclusion

This chapter provided a comprehensive discussion of the empirical findings obtained from the analysis of factors influencing customer use of e-commerce platforms and their impact on customer experience. The study extended the revised D&M IS success model by including security quality and security knowledge as critical dimensions. The findings demonstrate that system quality, service quality, security quality, and security knowledge significantly influence customer use and user satisfaction, while information

quality only influences user satisfaction without directly influencing customer use. The findings indicate that information quality significantly influences user satisfaction, aligning with prior research. However, its direct impact on customer use was not fully explored due to model fit adjustments, which led to the removal of hypothesis H2a. Thus, while information quality remains a critical factor for satisfaction, its role in customer use requires further investigation. These findings highlight the importance of good system performance, reliable customer support, robust security measures, and security knowledge in fostering e-commerce adoption and improved satisfaction. The study's findings also highlighted a positive correlation between customer use, user satisfaction, and customer experience, emphasising the need for businesses to prioritise these factors to encourage customers to make their retail purchases through e-commerce in the long term.

The inclusion of security-related factors into the D&M IS success model represents a significant contribution to the existing body of knowledge by ensuring the model remains relevant in addressing the cybersecurity challenges faced by e-commerce and highlighting the importance of security quality and security knowledge in shaping customer shopping behaviour. This study provides valuable insights for retailers aiming to adopt e-commerce to improve operational efficiency and profitability. Furthermore, the focus on customer experience as a net benefit within the D&M IS success model offers a fresh perspective, encouraging future research to explore this dimension in greater depth as customer experience is a key consideration for e-commerce adoption. Overall, the findings of this study not only validate the extended D&M IS success model but suggest that retailer investments in system reliability, security, and user education could build customer trust and foster a positive online shopping experience. Future research should explore the dynamics of these relationships further, particularly the mediating and moderating factors that may influence customer use, user satisfaction and customer experience in diverse e-commerce contexts.

CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

This chapter builds on the validation of the e-commerce success model developed and tested discussed in Chapters 2, 3, 4, and 5, investigating the factors influencing customer use of e-commerce and their impact on customer experience in the South African retail sector. The previous chapter presented the key findings of the study and discussed their implications in relation to existing literature. This chapter concludes by summarising the key research findings and highlighting the study's theoretical, contextual, and practical contributions. In addition, this chapter discusses research limitations and provides recommendations for future research and also for retailers.

6.2 Research summary

In *Chapter 1,* the research problems and motivation for conducting the study was introduced. The first research problem examined the key factors influencing customer use of e-commerce platforms in the South African retail sector. In addition, this study explored how the inclusion of security quality and security knowledge influences customer use of e-commerce platforms, given the rise of cybersecurity threats faced by e-commerce and the influence these threats have on customer behaviour in using e-commerce platforms. Prior studies investigating e-commerce success using information system success models have primarily focused on system quality, service quality, and information quality, often overlooking security quality and security knowledge as independent causal factors in customer use of e-commerce. The second research problem examined the impact of the identified factors on customer experience in e-commerce. The study aimed to analyse how customer use impacts customer experience. By doing so, this research aimed to bridge the gap between the high adoption of e-commerce by retailers and the comparatively lower customer use of these platforms. This was an importance consideration, given the critical role of positive customer experience for e-commerce success. To address these research problems, this study aimed to fulfil two research objectives RO1: "*To examine the factors influencing customer use of e-commerce*", and RO2: "*To examine the impact of customer use on customer experience*".

In *Chapter 2*, the literature review provided a foundation for understanding e-commerce, its adoption, and the information system success models. It explored the evolution of e-commerce and its role in South Africa, discussing the benefits and challenges, including security concerns, while highlighting existing research gaps in its use. The chapter critically assessed the financial impact of e-commerce adoption on South Africa's total retail sales and South African businesses and the challenges to its adoption, aiming to encourage e-commerce growth. Furthermore, it explored factors influencing customer use of e-commerce, proposing a conceptual framework that integrates system quality, information quality, service quality, security quality, and security knowledge as key causal factors of customer use of e-commerce, user satisfaction, and customer experience. The literature review identified a research gap, highlighting a limited understanding of how security-related factors influence customer use of e-commerce and customer experience. It demonstrated that security quality and security knowledge have largely been largely ignored in previous studies. Additionally, while previous studies have explored factors influencing customer use of e-commerce, their findings have been inconsistent, pointing to a need for further investigation. The findings of this research would provide retailers with practical strategies to improve customer use of e-commerce, ensuring that e-commerce adoption remains a worthwhile investment for retailers.

In *Chapter 3,* the research methodology used to investigate and empirically test the proposed hypotheses was outlined. The study used a deductive quantitative research approach to test the DeLone and McLean Information Systems (D&M IS) success model, which also included security quality and security knowledge. A descriptive and explanatory research design was adopted, using a quantitative survey distributed to 300 professionals via LinkedIn to ensure a diverse sample from individuals working in the public and private sectors. The survey instrument was designed around the key research model constructs including system quality, information quality, service quality, security quality, security knowledge, customer use, user satisfaction, and customer experience. These constructs were measured using multi-item scales, and all responses were measured on a 7-point Likert scale. The survey instrument was subjected to validity and reliability tests to ensure robustness. The data analysis techniques conducted included exploratory factor analysis (EFA) to identify key factors, followed by confirmatory factor analysis (CFA) to validate the constructs and structural

equation modelling (SEM) to test relationships amongst the factors. These analysis techniques were conducted using the SPSS package including Statistics version 29 and AMOS version 26. The methodology ensured rigorous statistical validation, providing reliable insights into e-commerce adoption in South Africa. The research methodology approach ensured rigorous statistical validation, providing reliable insights into the factors influencing customer use of e-commerce in South Africa.

In *Chapter 4,* the data collected to examine the factors influencing customer use of e-commerce and its impact on customer experience in the South African retail sector was analysed. This chapter provided a detailed interpretation of the key findings of the structural model, addressing research objectives RO1 and RO2. The findings confirmed that system quality, service quality, security quality, and security knowledge significantly influence customer use, user satisfaction, and customer experience. Information quality did not directly influence customer use, but instead positively influenced user satisfaction, which in turn enhanced customer experience. This finding reinforces the idea that customer use of e-commerce is primarily driven by functional characteristics such as system usability, speed, security, and perceived benefits rather than informational characteristics. Security quality and security knowledge played a critical role in influencing customer use and user satisfaction, highlighting the importance of secure systems and cybersecurity awareness in building trust and overall e-commerce success. Additionally, the study demonstrated that higher customer use and user satisfaction led to an improved customer experience, further highlighting the role of customer experience in not only encouraging customers to make their retail purchases through e-commerce, but also enjoying using the platforms. The structural model fit indices (e.g., CFI, RMSEA, X^2/DF) validated the robustness of the proposed conceptual framework, empirically supporting the extended D&M IS success model within the e-commerce context.

Finally, in *Chapter 5* a detailed interpretation of the research findings, focusing on the factors influencing customer use of e-commerce and their impact on customer experience in South African retail was provided. This study adapted the D&M IS success model by including security quality and security knowledge as additional success factors, addressing cybersecurity challenges in e-commerce adoption. The results were interpreted in relation to the existing literature, confirming that system quality, service quality, security quality, and security knowledge positively influence

customer use and user satisfaction, while information quality influenced only user satisfaction without directly affecting customer use. These findings highlight the importance of robust system performance, effective customer support, and security awareness in fostering e-commerce adoption, thus encouraging retail purchases through e-commerce. The study further validated the positive relationship between customer use, user satisfaction, and customer experience, reinforcing the need for businesses to invest in system reliability and security to enhance online shopping experiences. Additionally, this study contributed to the existing body of knowledge by integrating security quality and security knowledge into the D&M IS success model, providing a more comprehensive understanding of cybersecurity's role in e-commerce success. Security quality is crucial for ensuring a secure shopping environment and mitigating customer concerns about fraud, data breaches, and identity theft. Meanwhile, e-commerce platforms can enhance customer security knowledge by providing educational resources and empowering them to make informed security decisions when shopping online. This, in turn, increases their confidence in conducting retail purchases online. Furthermore, customer experience was examined as a net benefit of using e-commerce platforms, providing insights into its role in building long-term e-commerce adoption. The findings suggest that retailer investments in security, system reliability, and customer education could build customer trust and satisfaction, ultimately enhancing a positive online shopping experience.

6.3 Research contributions

This study examined the use of e-commerce platforms at the individual level, enabling the research to make significant theoretical, contextual, and practical contributions.

6.3.1 *Theoretical contributions*

Firstly, the study made a theoretical contribution by extending the updated D&M IS success model to include security-related factors, specifically security quality and security knowledge as key dimensions for e-commerce success. Despite the increasing cybersecurity threats faced by e-commerce that impact customer trust and e-commerce adoption (Agarwal & Wu, 2015; Alyoubi, 2015), prior research has not fully integrated these security dimensions into e-commerce success models. Security quality refers to a system's ability to protect data and resources by maintaining

confidentiality and integrity (Raghavan & Zhang, 2009). Furthermore, security knowledge refers to an individual's awareness of security risks and protective measures (Lee & Chua, 2024). This study found that both security quality and security knowledge significantly influence customer use of e-commerce platforms. The inclusion of security quality ensures that the model remains relevant in addressing modern cybersecurity challenges and highlighting the growing importance of secure systems in building customer trust and e-commerce success (Agarwal & Wu, 2015; Alyoubi, 2015; Niu & Zhao, 2023). Security knowledge addresses the growing concern of cybersecurity awareness amongst users identified as a significant contributor to cybersecurity risks in e-commerce (Bartczak, 2021; Liu et al., 2022; Vuță et al., 2022). The inclusion of security quality and security knowledge highlights the importance of technical aspects of system security and user awareness in fostering e-commerce adoption.

Furthermore, previous studies assessing factors influencing customer use of e-commerce have produced inconsistent findings, particularly within the South African context, where research on this topic remains limited. This study contributes to addressing these inconsistencies by clarifying the drivers of e-commerce adoption and establishing security quality and security knowledge as key causal factors of IS success.

Another theoretical contribution of this study is the inclusion of customer experience as a net benefit within the D&M IS success model. Customer experience refers to the overall perception and feelings a customer has while interacting with an e-commerce platform during their buying journey (Setiadi et al., 2023). While customer experience has been widely investigated, its role as an outcome in IS success models and e-commerce use remains under-researched (Georgiadis & Chau, 2013). By integrating customer experience as a net benefit of individual users using e-commerce, this study highlights the importance of customer experience in driving long-term adoption of e-commerce, influencing customer perceptions of value and service quality, and ultimately affecting customer loyalty and retention.

6.3.2 *Contextual contributions*

Secondly, the study made a contextual contribution by examining customer use of e-commerce at an individual level within the South African retail sector. By focusing on the challenges, motivations, and behavioural trends shaping customer use of e-commerce in a developing economy, the research provides valuable insights into the South African e-commerce landscape. Previous literature highlights that, while e-commerce adoption is high in developed markets, e-commerce growth in SA remains relatively low, accounting for only 6% of total retail sales in 2023 (Goldstuck & Bannier, 2024). Some of the barriers to widespread e-commerce adoption stem from South African customers, who remain hesitant to fully embrace digital retail platforms due to concerns about the inability to physically inspect products before purchase, product quality and delivery issues, personal data security risks, and high cart abandonment rates caused by payment failures and cybersecurity concerns (Goldstuck & Bannier, 2024; Makhitha et al., 2019; Prinsloo, 2016). These concerns highlight the need for secure online shopping systems and robust cybersecurity measures to build customer trust and ensure sustainable e-commerce growth in SA. This study provides empirical evidence on the role of security quality in influencing customer use of e-commerce and customer experience, providing solutions to the security concerns associated with online shopping. Addressing these challenges will not only make e-commerce favourable to customers but will also position e-commerce as a viable investment for retailers. These findings align with existing literature, which highlights the growing importance of cybersecurity considerations for businesses to foster customer trust and ensure long-term business success (Azam & Ansari, 2024; Niu & Zhao, 2023).

Beyond security quality, the study also provides empirical evidence on the role of security knowledge in influencing customer use of e-commerce. The findings emphasise the importance of cybersecurity awareness amongst customers, ensuring they can recognise and act on security risks when shopping online. Previous literature suggests that a lack of cybersecurity awareness amongst users significantly contributes to e-commerce cybersecurity risks, likely discouraging users, particularly those with limited digital literacy, from engaging in online shopping risks (Bartczak, 2021; Johnson & Iyamu, 2019; Liu et al., 2022; Vuță et al., 2022). However, this study's findings identify a shift in this trend, indicating that the majority of South African online shoppers are young adults with high digital literacy, particularly in relatively developed

regions of the country. Nevertheless, for e-commerce to grow beyond its current levels in SA, businesses must prioritise security knowledge as a key factor in their e-commerce adoption strategy. The level of user awareness and education on online security practices significantly influences customer trust and willingness to engage with e-commerce platforms.

This study confirms that security quality and security knowledge play a critical role in influencing customer use of e-commerce platforms. Therefore, retail businesses that prioritise these factors alongside system quality, information quality and service quality are more likely to increase customer confidence and encourage retail purchases through e-commerce platforms. Given the unique nature of the South African e-commerce market, where platforms are primarily used for repeat purchases or fast-moving consumer goods (Rouibah et al., 2015), addressing customers' security concerns can enhance operational efficiencies and business profitability. Strategic investments in security quality and awareness not only have the potential to meet customer expectations but also contribute to e-commerce growth in SA.

Finally, the study sheds light on the demographic profile of South African e-commerce users, with a higher representation of younger, highly educated individuals in the sample. While this aligns with global trends, there has also been a notable increase in online shopping among older customers, indicating a potential shift in e-commerce adoption patterns. Further research is needed to determine whether younger individuals are truly more likely to engage in online shopping or if targeted strategies are required to increase e-commerce adoption among older and less digitally literate populations in SA.

6.3.3 *Practical contributions*

Thirdly, this study made a practical contribution by offering actionable insights into the e-commerce adoption by customers and, more critically, for retail businesses interested in investing in e-commerce. These insights are also valuable for product managers, platform developers and cybersecurity professionals aiming at enhancing online shopping experiences. As cybersecurity threats continue to affect both businesses and consumers, maintaining customer trust is crucial for the long-term success of e-commerce platforms (Niu & Zhao, 2023; Taher, 2021). This study

provides retail businesses with a better justification for investing in e-commerce, demonstrating how security quality and security knowledge influence customer trust and reliance on e-commerce platforms. By improving online shopping experiences and implementing robust security measures, businesses can drive greater e-commerce adoption in South Africa.

One of the most critical practical contributions of this study is its potential to enhance the cybersecurity of e-commerce platforms and strengthen customer protection. The findings confirm that security quality is one of the main drivers of customer use, primarily due to its role in fostering trust in online shopping platforms. The existing literature highlights that customers are often reluctant to engage in e-commerce due to concerns about fraud, data breaches, and perceived vulnerabilities in online security (Mthembu et al., 2018; Sausalito, 2024). This has implications for retail businesses that have invested in e-commerce or are considering doing so. Businesses must integrate stronger security measures such as multi-factor authentication, secure payment gateways and AI-driven fraud detection. For example, companies should conduct regular cybersecurity awareness programmes through email campaigns, website pop-ups, and video tutorials explaining safe shopping habits. These should cover how to identify phishing attempts, recognise secure payment gateways, and use strong authentication methods. Additionally, interactive security workshops and step-by-step guides embedded within e-commerce platforms can empower users to shop more securely. However, implementing these cybersecurity measures alone is insufficient, businesses must also communicate these features effectively to users to bridge the trust gap hindering customer use of e-commerce. This is in line with prior studies (e.g., Osho et al., 2016), showing that customers who understand security technologies are more likely to trust e-commerce platforms that visibly implement security measures.

Another key contribution of the study is highlighting the importance of customer cybersecurity awareness. The findings confirm that security knowledge is one of the primary drivers of customer use, as a lack of cybersecurity awareness significantly reduces customer willingness to shop online. This is particularly relevant in South Africa, where many customers lack awareness of safe online shopping practices, secure browsing habits, and fraud prevention tactics, making them more vulnerable to cybersecurity threats. This has implications for retail businesses working collaboratively with payment service providers such as banks to launch cybersecurity

awareness campaigns to educate customers on online security best practices. Such campaigns could include gamified interactive tutorials, email alerts about potential scams, security alert prompts when using platforms, and step-by-step guides on how to verify secure websites. Prior research has found that increasing cybersecurity awareness of customers significantly reduces exposure to cybersecurity threats while improving customer confidence in online shopping (Hanus & Wu, 2016; Osho et al., 2016).

Product managers, platform developers and cybersecurity professionals can also benefit from this study's findings by helping South Africa's e-commerce sector implement more robust and user-friendly security measures. These improvements can reduce barriers to e-commerce adoption and foster long-term customer trust and engagement.

Lastly, this study offers South African retailers a framework for assessing and improving existing e-commerce platforms. By understanding the key role of security quality and knowledge in influencing customer behaviour, retailers can implement effective strategies to drive customer use of e-commerce, increase sales, and enhance business investment returns in the digital retail sector.

6.4 Limitations and recommendations

6.4.1 *Limitations*

While this study made valuable contributions to understanding the factors influencing customer use of e-commerce in the South African retail sector, several of its limitations must be acknowledged. Recognising these limitations highlights opportunities for future research to refine and expand upon the understanding of factors influencing customer use of e-commerce.

Firstly, the research was limited to South African users within the retail sector. This presents challenges in generalising the findings to other regions, thereby limiting external validity (Byrman, 2016; Creswell & Creswell, 2018). As a result, caution should be exercised when attempting to extrapolate these findings in other regions. Future research should consider conducting multiregional comparisons to explore how cultural and regulatory differences influence e-commerce adoption.

Secondly, the study employed a quantitative research approach, relying solely on data collected through a cross-section survey. Surveys are effective in collecting data from a large sample efficiently and analysing statistical relationships between variables at a single point in time. However, this method has limitations as it does not establish temporal precedence or track changes over time, making it less reliable for drawing strong causal conclusions without additional theoretical justification or statistical control inferences (Byrman, 2016; Creswell & Creswell, 2018). While associations between variables can suggest potential causal relationships, they should be interpreted with caution. Additionally, this approach introduces the issue of common method bias, as data on all variables was collected from a single respondent at the same time, potentially inflating correlations due to subjective biases (Patton, 2001; Podsakoff et al., 2003). Respondents may unintentionally misjudge their knowledge of online security, either overestimating or underestimating their actual competence. Additionally, they may report socially desirable behaviours rather than their actual practices. Future research should consider a mixed-methods approach or a qualitative study using interviews and case studies. Alternatively, a longitudinal study could provide a deeper understanding of customers' perceptions of e-commerce (Tashakkori & Teddlie, 2020).

Another major limitation of the study is the exclusion of additional factors that may influence customer use of e-commerce. This study focused solely on investigating the influence of system quality, information quality, service quality, security quality, and security knowledge on the customers use of e-commerce. However, other factors, such as payment method preferences, cultural attitudes towards online shopping, and customer trust, may also play a critical role. For example, prior research highlights the fact that trust in e-commerce platforms is a key factor influencing user intention to use online shopping platforms (Zaini et al., 2024). The exclusion of these factors presents a potential gap in fully understanding customer behaviour, which may be essential in developing a holistic view of e-commerce adoption in the retail sector. Future research should expand the investigation of factors influencing customer use of e-commerce to include customer trust, thus providing a deeper understanding of customers' motivations for using online shopping platforms.

6.4.2 *Future research recommendations*

The findings of this study provided an understanding of the factors influencing customer use of e-commerce in the South African retail sector, particularly focusing on the role of system quality, information quality, service quality, security quality, and security knowledge. From this vantage point, the study identifies key areas that require further investigation to develop a clearer, more nuanced understanding of how to address the challenges associated with customer use of e-commerce.

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The findings indicate that system quality, service quality, security quality, and security knowledge positively influence customer use and satisfaction. Future research should investigate whether the independent constructs of customer use and user satisfaction vary seasonally. For example, these relationships may vary across different seasons or may not hold beyond the timeframe of this study. This suggests a need to assess how customer behaviour and satisfaction change throughout the year, which could provide valuable insights for developing timed e-commerce strategies and targeted cybersecurity awareness campaigns.

The study's findings also revealed that information quality does not positively influence customer use at a statistically significant level. Future research should investigate the conditions under which information quality become a key factor influencing customer use of e-commerce. For example, while information quality may not be a significant factor in customer use of e-commerce, it could play a crucial role in service-driven sectors such as financial services, healthcare, and education; research may clarify this.

Although a positive relationship was found between service quality, customer use and user satisfaction, the mean value for service quality was lower than that of the other constructs in the research model. Future research should investigate how different aspects of customer service, such as personalised support and chatbots, influence

long-term e-commerce adoption. Understanding these factors could help retail businesses design service strategies that enhance customer experience and encourage customers to conduct retail purchases through e-commerce platforms.

The study's findings indicate that security quality and security knowledge positively influence customer use and satisfaction. While these two constructs represent a new contribution to digital business research, prior studies have established that poor security quality and low security knowledge negatively impact customer trust in online shopping platforms. Given the importance of these factors, further research should explore the rate at which customers internalise and act upon security quality and security knowledge, leading to increased trust and higher platform use. Investigating the long-term influence of these factors on customer use of e-commerce could provide retailers with a clearer roadmap for promoting security practices and developing targeted cybersecurity awareness campaigns.

6.5 Conclusion

This study explored factors influencing customer use of e-commerce in the South African retail sector. The research findings highlight the significant influence of system quality, information quality, service quality, security quality, and security knowledge on customer use and their impact on customer experience. The integration of security-related factors, security quality and security knowledge into the DeLone and McLean (D&M IS) success model in this study contribute to both theoretical understanding and provides practical strategies for enhancing customer use of e-commerce in developing markets such as South Africa.

These findings not only validate the extended D&M IS success model but also offer valuable guidance for businesses seeking to improve e-commerce adoption strategies. These position businesses to better justify investments in e-commerce, enhancing platform use over time to improve customer experience and confidence. Practical implications include enhancing system reliability, improving security features, and increasing user education on cybersecurity, which are critical for fostering trust and encouraging customer use of e-commerce. Ultimately, this should enhance business performance and accelerate the adoption of e-commerce in the South African retail sector.

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APPENDIX A Research instrument

Survey Mandatory Exclusion Criteria Questions

These questions are included to ensure that only participants with relevant experience with e-commerce are included in the study.

1.	Have you used or interacted with any e-commerce platforms (e.g., Takealot, Superbalist, Checkers) to buy online in the past 2 years?
1	Yes
2	No
2.	Are you currently working?
1	Yes
2	No

*If a “No” is selected for either of these questions. the respondent will be thanked for their time and participation and exited from the survey.

Part A: Demographic Questions

The following questions aim to collect your background and demographics information.

1.	Please select your age.
1	18 or younger
2	18 - 24
3	25 - 34
4	35 - 44
5	45 - 54
6	55 - 64
7	65 or older
8	Prefer not to say
2.	Please select your gender.
1	Male
3	Female
3	Prefer not to say
3.	Please select your highest level of education.
1	Less than Matric
2	Matric
3	Diploma
4	Bachelor’s degree
5	Honours degree
6	Master’s degree
7	PhD
4.	Please select the province you live in.
1	Eastern Cape
2	Free State
3	Gauteng
4	KwaZulu-Natal
5	Limpopo
6	Mpumalanga
7	Northern Cape

8	**North West**
9	**Western Cape**
5.	**Please select your years of work experience.**
1	**<2 years**
2	**2-5 years**
3	**6-9 years**
4	**10-15 years**
5	**16-19 years**
6	**>20 years**
6.	**Please select your primary industry sector.**
1	**Manufacturing**
2	**Utilities and energy**
3	**Logistics**
4	**Retail**
5	**Telecom**
6	**Airline**
7	**Pharmaceutical**
8	**Public sector**
9	**Service**
10	**Finance**
11	**Mining**
12	**Accounting**
13	**Other (please specify)**
7.	**Which e-commerce platforms do you use for your retail purchases?**
1	**Takealot**
2	**Makro**
3	**Dischem**
4	**Clicks**
5	**Checkers**
6	**Shein**
7	**Pick ‘n Pay**
8	**Superbalist**
9	**Builders**
10	**Game**
11	**AliExpress**
12	**Woolworths**
13	**Truworths**
14	**Leroy Merlin**
15	**OneDayOnly**
16	**Amazon**
17	**Other (please specify)**
8.	**How often do you make purchases through e-commerce platforms?**
1	**Daily**
2	**Weekly**
3	**2-3 times a month**
4	**Once a month**
5	**Every 2-3 months**
6	**2-3 times a year**
7	**Once a year**
9.	**Which devices or technologies do you typically use to access e-commerce platforms?**
1	**Smartphone**
2	**Tablet**

3	**Laptop**
4	**Desktop computer**
5	**Smart TV**
6	**Smartwatch**
7	**Voice assistant (e.g., Amazon Alexa, Google Assistant)**
8	**Other (please specify)**

Part B

The following statements aim to collect data on your perceptions about your use of e-commerce platforms, such as Takealot, Superbalist, and Checkers. Please indicate the extent to which you agree with each of the following statements in relation to the e-commerce platforms you currently use as a customer.

System Quality: These statements aim to assess how different parts of e-commerce platforms (e.g., how easy it is to use, how fast it responds, and how reliable it is) affects how you use these platforms and your overall shopping experience.

#	Statements	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
SQ1	**The platform I use is always available when I want to shop.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SQ2	**The platform is easy to use and navigate.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SQ3	**The platform is reliable. processing orders and payments without problems.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SQ4	**The platform responds quickly when I click or take actions.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SQ5	**The platform regularly adds new features that meet my needs.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SQ6	**The platform is user friendly.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Information Quality: These statements aim to assess how the information on e-commerce platforms (e.g., how complete, easy to understand, personalised, accurate, and relevant it is) affects how you use these platforms and your overall shopping experience.

#	Statements	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
IQ1	**The information provided on the platform I use is complete and detailed.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
IQ2	**The platform's information is easy to read and understand.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

IQ3	**The platform gives product recommendations that match my interests.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
IQ4	**The product information on the platform is accurate.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
IQ5	**The product information on the platform is relevant to me.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
IQ6	**The platform's product information is complete, so I don't need to check other sources.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Service Quality: These statements aim to assess how the support from e-commerce platforms (e.g., how helpful, fast, and reliable it is) affects how you use these platforms and your overall shopping experience.

#	Statements	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
SEQ1	**The platform's support team is always helpful.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SEQ2	**The platform's support team quickly responds to my questions and issues.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SEQ3	**The platform's support team is committed to fixing any problems with the platform.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SEQ4	**The platform offers good customer support for security-related issues.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SEQ5	**The platform's support team addresses my concerns in a friendly and personalised way.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SEQ6	**The support I get makes me feel confident using the platform.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Security Quality: These statements aim to assess how different elements of security quality (e.g., robustness, education, and trust) influence your use of e-commerce platforms and its impact on your overall customer experience.

#	Statements	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
SECQ1	**The platform I use has strong security measures (e.g., multi-factor authentication) to protect my personal and financial information.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SECQ2	**The platform's security features (e.g., multi-factor authentication) are easy to use and understand.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SECQ3	**The platform encourages me to use good security practices. like strong passwords and two-factor authentication.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SECQ4	**The platform provides real-time alerts for any suspicious activities on my account.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SECQ5	**I trust the platform's security features to keep my data safe during transactions.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Security Knowledge: These statements aim to assess how your knowledge of online security (e.g., your awareness and understanding of security risks and features) affects how you use these platforms and your overall shopping experience.

#	Statements	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
SK1	I know the security measures available on e-commerce platforms.	1	2	3	4	5	6	7
SK2	I understand why security features are important for safe online shopping.	1	2	3	4	5	6	7
SK3	I am aware of the potential security risks when shopping online.	1	2	3	4	5	6	7
SK4	I regularly use security practices like strong passwords when shopping online.	1	2	3	4	5	6	7
SK5	My security knowledge increases my trust in e-commerce platforms.	1	2	3	4	5	6	7
SK6	My security knowledge helps me choose e-commerce platforms and payment methods wisely.	1	2	3	4	5	6	7

Customer Use: These statements aim to assess your thoughts and feelings on your use of e-commerce platforms.

#	Statements	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
CU1	I enjoy using e-commerce platforms.	1	2	3	4	5	6	7
CU2	I feel confident using e-commerce platforms.	1	2	3	4	5	6	7
CU3	I find e-commerce platforms to be an efficient way to make purchases than physical stores.	1	2	3	4	5	6	7
CU4	I prefer using e-commerce platforms over physical stores for most of my purchases.	1	2	3	4	5	6	7
CU5	I use e-commerce platforms to find products that may not be available in local physical stores.	1	2	3	4	5	6	7
CU6	I use e-commerce platforms because of their security features.	1	2	3	4	5	6	7
CU7	The platform's advice on security practices make me more likely to continue using it.	1	2	3	4	5	6	7
CU8	My knowledge of security best practices makes me more likely to use e-commerce platforms.	1	2	3	4	5	6	7

User Satisfaction: These statements aim to assess how satisfied you are with e-commerce platforms you use.

#	Statements	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree

US1	**I am satisfied with how easy it is to use e-commerce platforms.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
US2	**I would recommend the e-commerce platforms I use to others.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
US3	**The e-commerce platforms I use work the way I expect them to in terms of performance and security.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
US4	**I am satisfied with the security features provided by e-commerce platforms.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
US5	**Overall. I am satisfied with the e-commerce platforms I use.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Customer Experience: These statements aim to assess your overall experience with using e-commerce platforms.

#	Statements	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
CE1	**The e-commerce platform I use is easy to use.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
CE2	**My overall experience of shopping through e-commerce platforms is enjoyable.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
CE3	**The security features of the platform make my shopping experience better.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
CE4	**My knowledge of security when using e-commerce platforms makes my shopping experience better.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

APPENDIX B Consistency table

Table 22: *Consistency table (research objectives, hypothesis, data collection and data analysis).*

RO #	Research Objective	Hyp. #	Hypothesis	Data Collection Detail	Data Analysis Method
1	To examine the factors influencing customer use of e-commerce	H1a, H1b	H1a: System quality positively correlates with customers' use of e-commerce platforms. H1b: System quality positively correlates with user satisfaction on e-commerce platforms.	Questionnaire Likert statement SQ1-6	Structural equation modelling (SEM)
		H2a, H2b	H2a: Information quality positively correlates with customers' use of e-commerce platforms. H2b: Information quality positively correlates with user satisfaction on e-commerce platforms.	Questionnaire Likert statement IQ1-6	
		H3a, H3b	H3a: Service quality positively correlates with customers' use of e-commerce platforms. H3b: Service quality positively correlates with user satisfaction on e-commerce platforms.	Questionnaire Likert statement SEQ1-6	
		H4a, H4b	H4a: Security quality positively correlates with customers' use of e-commerce platforms. H4b: Security quality positively correlates with user satisfaction on e-commerce platforms.	Questionnaire Likert statement SECQ1-5	
		H5a, H5b	H5a: Security knowledge positively correlates with customers' use of e-commerce platforms. H5b: Security knowledge positively correlates with user satisfaction on e-commerce platforms.	Questionnaire Likert statement SK1-6	
2	To examine the impact of customer use on customer experience	H6, H7, H8	H6: The customer use of e-commerce platforms positively correlates with user satisfaction on e-commerce platforms. H7: Customer use of e-commerce platforms positively correlates with customer experience. H8: User satisfaction on e-commerce platforms positively correlates with customer experience.	Questionnaire Likert statement CU1-8, US1-5 & CE1-4	

APPENDIX C Ethical clearance certification

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg

Wits Business School

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

Ethics Clearance Certificate

Ethics protocol number: WBS/DB800357/214

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

Project title	E-commerce use factors and its impact on customer experience: an empirical study in South African retail
Investigator / Researcher	Mrs Nelisiwe Nxumalo
Nature of Project	MM (Digital Business)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed anonymity and confidentiality.
Issue Date of Certificate	09/09/2024
Expiry date	Date of submission of the project / research report
Chairperson	Dr Ayanda Magida ☎ +27 11 717 3953 ✉ ayanda.magida@wits.ac.za

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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

16/09/2024
Date:

APPENDIX D Participant research information & consent

Dear Prospective Participant

My name is Nelisiwe Nxumalo. a Master of Management student in Digital Business at the University of the Witwatersrand. Johannesburg. As a degree requirement. I am conducting a study on the factors influencing the use of e-commerce and its impact on customer experience in South Africa. I am completing the study under the guidance of Dr. Norman Mudau. The title of the research is ***'E-commerce Use Factors and Its Impact on Customer Experience: An Empirical Study in South African Retail'***. E-commerce platforms are defined as information systems that enable the buying and selling of products over the internet. These include platforms such as Takealot. Superbalist. and Checkers Sixty60.

As a user of e-commerce platforms. you are invited to take part in this study by completing this questionnaire. The questionnaire aims to uncover what drives your use of e-commerce and its impact on your online shopping experience. By participating. your insights could contribute to a deeper understanding that drives innovation and enhances e-commerce use and customer experience across the industry.

Reasons for participation:

- Your participation is completely voluntary. and you are free to withdraw at any point without penalty.
- Your response is important and there are no right or wrong answers.
- All responses are 100% confidential (no personal information will be collected. and your responses will be anonymous).
- The survey will take 10-15 minutes of your time.
- The survey was approved by the Wits Human Research Ethics Committee (Non-Medical). protocol Number: WBS/DB800357/214.

If you have any questions or would like to know more about the study's outcomes. please feel free to reach out to me or my supervisor using the contact details below.

Researcher: Nelisiwe Nxumalo; nelisiwenxumali@gmail.com; +27619087096
Supervisor: Dr Norman Mudau; mudauno@yahoo.com; +27826117131

Request for Consent

By selecting 'Yes'. I confirm that I have read and understood the study's information. agree to participate. consent to the anonymous use of my responses for academic purposes. and acknowledge my right to withdraw at any point in time without penalty.

- No
- Yes

APPENDIX E Non-response bias analysis

Table 23: *T-test results for non-response bias analysis of early and late survey responses.*

Pairs	Mean diff	Std. Deviation diff	t-statistic	Sig.(2-sided p)
SQ1 - SQ1late	-0.909	2.427	-1.242	0.242
SQ2 - SQ2late	-0.818	2.401	-1.13	0.285
SQ3 - SQ3late	-0.727	2.649	-0.911	0.384
SQ4 - SQ4late	-0.455	2.734	-0.551	0.593
SQ5 - SQ5late	-0.727	2.611	-0.924	0.377
SQ6 - SQ6late	-1.273	2.24	-1.884	0.089
IQ1 - IQ1late	-0.727	2.195	-1.099	0.298
IQ2 - IQ2late	-1	2.191	-1.514	0.161
IQ3 - IQ3late	-0.909	2.212	-1.363	0.203
IQ4 - IQ4late	-1.091	2.508	-1.443	0.18
IQ5 - IQ5late	-0.818	2.272	-1.194	0.26
IQ6 - IQ6late	-0.455	2.115	-0.713	0.492
SEQ1 - SEQ1late	-0.636	2.618	-0.806	0.439
SEQ2 - SEQ2late	-0.455	1.44	-1.047	0.32
SEQ3 - SEQ3late	-0.545	2.018	-0.896	0.391
SEQ4 - SEQ4late	-0.545	1.753	-1.032	0.326
SEQ5 - SEQ5late	-0.455	2.162	-0.697	0.501
SEQ6 - SEQ6late	-0.455	1.968	-0.766	0.461
SECQ1 - SECQ1late	0.364	2.248	0.536	0.603
SECQ2 - SECQ2late	-0.091	1.446	-0.209	0.839
SECQ3 - SECQ3late	0.182	1.94	0.311	0.762
SECQ4 - SECQ4late	-0.364	2.618	-0.461	0.655
SECQ5 - SECQ5late	-0.364	1.804	-0.669	0.519
SK1 - SK1late	-0.636	1.912	-1.104	0.295
SK2 - SK2late	-1.091	2.343	-1.544	0.154
SK3 - SK3late	-0.909	2.256	-1.336	0.211
SK4 - SK4late	-0.091	1.921	-0.157	0.878
SK5 - SK5late	0.182	2.316	0.26	0.8
SK6 - SK6late	0	2.049	0	1
CU1 - CU1late	-0.818	1.834	-1.48	0.17
CU2 - CU2late	-0.091	1.3	-0.232	0.821
CU3 - CU3late	-0.727	2.284	-1.056	0.316
CU4 - CU4late	0.273	2.005	0.451	0.661
CU5 - CU5late	-0.455	1.809	-0.833	0.424
CU6 - CU6late	-0.364	2.541	-0.475	0.645
CU7 - CU7late	0.091	2.212	0.136	0.894
CU8 - CU8late	0.182	2.483	0.243	0.813
US1 - US1late	-0.545	1.968	-0.919	0.38
US2 - US2late	-0.455	1.809	-0.833	0.424
US3 - US3late	-0.091	1.758	-0.171	0.867
US4 - US4late	-0.091	1.814	-0.166	0.871
US5 - US5late	-0.455	1.809	-0.833	0.424
CE1 - CE1late	-0.364	2.063	-0.585	0.572

CE2 - CE2late	-0.727	2.054	-1.174	0.267
CE3 - CE3late	-0.818	2.272	-1.194	0.26
CE4 - CE4late	-0.455	2.018	-0.747	0.472

APPENDIX F Principal component analysis

Table 24: *Total variance explained from principal component analysis.*

Total Variance Explained							
Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings[a]**
	Total	**Variance (%)**	**Cumulative (%)**	**Total**	**Variance (%)**	**Cumulative (%)**	**Total**
1	16.732	36.374	36.374	16.732	36.374	36.374	10.658
2	5.384	11.705	48.079	5.384	11.705	48.079	6.685
3	4.294	9.335	57.414	4.294	9.335	57.414	9.232
4	3.362	7.308	64.722	3.362	7.308	64.722	10.806
5	2.464	5.357	70.080	2.464	5.357	70.080	8.908
6	1.917	4.168	74.247	1.917	4.168	74.247	9.190
7	1.669	3.629	77.876	1.669	3.629	77.876	9.545
8	1.183	2.572	80.448	1.183	2.572	80.448	10.526
9	0.755	1.641	82.089				
10	0.688	1.496	83.585				
11	0.562	1.221	84.807				
12	0.515	1.119	85.925				
13	0.466	1.012	86.937				
14	0.424	0.923	87.860				
15	0.382	0.830	88.690				
16	0.349	0.760	89.449				
17	0.340	0.739	90.189				
18	0.325	0.706	90.895				
19	0.314	0.683	91.578				
20	0.303	0.660	92.237				
21	0.292	0.634	92.871				
22	0.266	0.577	93.449				
23	0.254	0.553	94.001				
24	0.240	0.521	94.523				
25	0.228	0.495	95.018				
26	0.209	0.454	95.472				
27	0.195	0.424	95.895				
28	0.186	0.404	96.300				
29	0.182	0.396	96.696				
30	0.162	0.351	97.047				
31	0.156	0.338	97.386				
32	0.133	0.290	97.676				
33	0.126	0.273	97.949				
34	0.121	0.262	98.212				
35	0.107	0.232	98.444				

36	0.105	0.229	98.673
37	0.099	0.214	98.887
38	0.085	0.185	99.072
39	0.082	0.177	99.250
40	0.072	0.157	99.407
41	0.059	0.129	99.535
42	0.053	0.115	99.650
43	0.050	0.109	99.759
44	0.049	0.106	99.865
45	0.034	0.073	99.938
46	0.029	0.062	100.000

Extraction Method: Principal Component Analysis.

a. When components are correlated. sums of squared loadings cannot be added to obtain a total variance.

APPENDIX G Confirmatory factor analysis

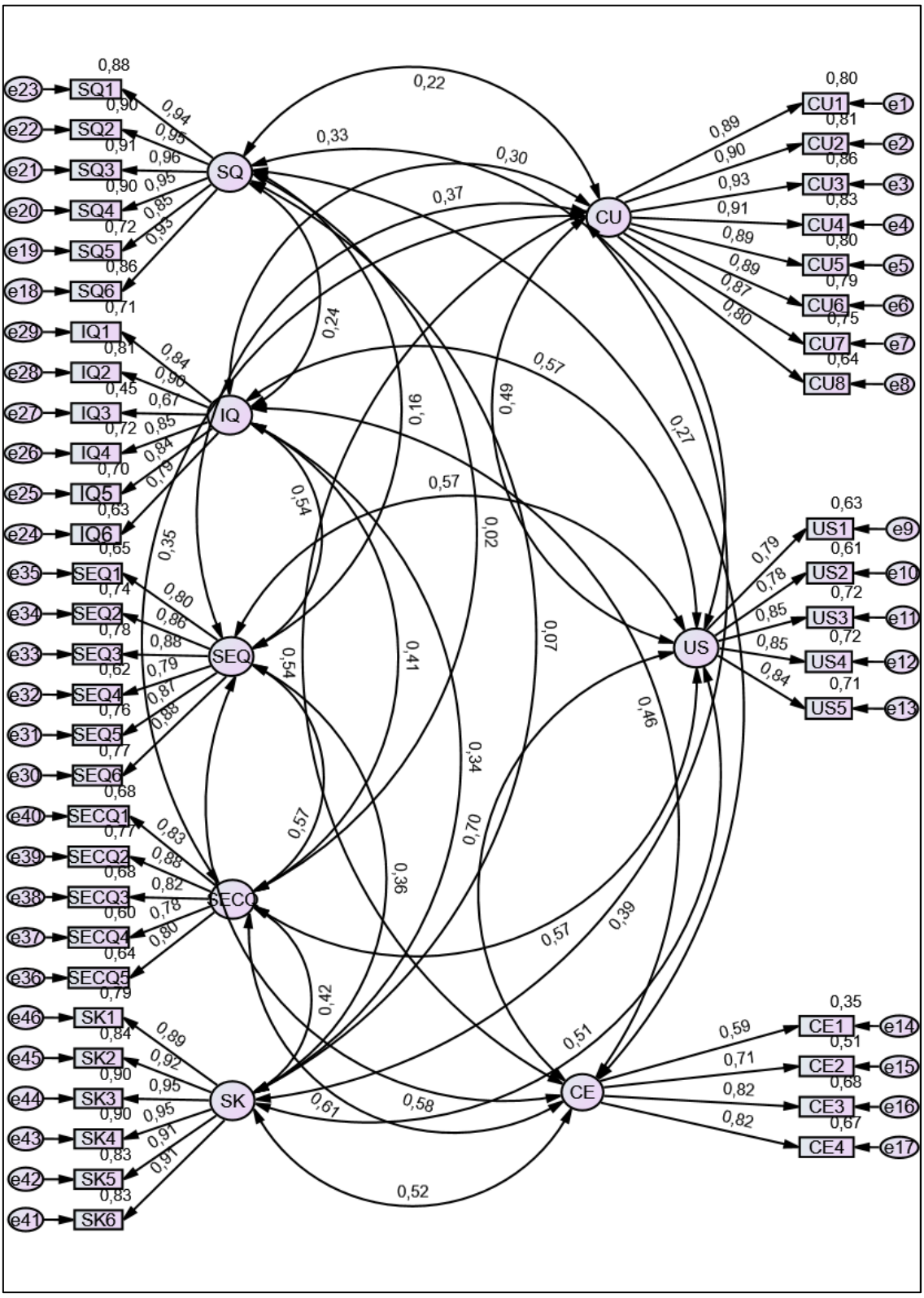


Figure 13: *Initial CFA measurement model.*