

**Investigating consumer 's intention to adopt and use
automated parcel lockers for last mile delivery in Gauteng**

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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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Declaration

I, Dineo Ramokoena, declare that except as noted in the references and acknowledgements, I declare that this research project is my own work. It is submitted in partial fulfilment for the Master of Management in Digital Business degree at the University of the Witwatersrand's Graduate School of Business Administration in Johannesburg. It has never been submitted for a degree or exam at this or any other university before.

A handwritten signature in black ink, appearing to read 'Dineo Ramokoena', is written over a horizontal line.

Dineo Ramokoena

Signed at Johannesburg, South Africa

On the 2nd of June 2023

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I would like to express my sincere gratitude to God, who has granted me the strength to finish what I started; indeed, everything is beautiful in its own time. My research journey was not easy, but I kept the focus and came back stronger. A big thank you to my family, TTT, my husband, Thabang, and the boys, Tlhomphe and Thoriso, for the unwavering support, love and prayers they granted me through this journey. I became a presently absent wife and mother, and they would just encourage me to keep on keeping on. Thank you to my mother, brother, friends and church family for the support.

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Abstract

E-commerce growth brings new challenges and opportunities into logistic services, especially delivery services: increased customer demands and expectations, rising online shopping and frequency of purchasing. Automated parcel lockers, introduced as an alternative to home deliveries, create opportunities for an efficient distribution model for small parcels. Little has been explored in the South African context regarding consumers' behavioural intention to use automated parcel lockers and how this can lead to their actual use. This study aimed to address the identified research gap from a consumer perspective. To achieve its goal, the unified theory of acceptance and use of technology was adopted to investigate factors influencing consumer behavioural intention to use automated parcel lockers for last mile delivery in Gauteng. Quantitative data through an online distributed questionnaire was used to answer the primary research questions. This study utilised convenience sampling to select a sample of 172 study respondents. The findings support four of the five proposed hypotheses, holding true that consumers' behavioural intention fully mediates the relationship between performance expectancy, social influence and facilitating conditions to use automated parcel lockers.

Keywords: e-commerce, automated parcel lockers, logistic services, unified theory of acceptance and use of technology, last mile delivery

TABLE OF CONTENTS

DECLARATION	I
ACKNOWLEDGEMENTS	II
ABSTRACT	III
LIST OF FIGURES.....	VII
LIST OF TABLES	VIII

CHAPTER 1. INTRODUCTION TO THE RESEARCH.....1

1.1. INTRODUCTION	1
1.2. BACKGROUND OF THE STUDY	1
1.3. DEFINITIONS OF TERMS	3
1.4. RESEARCH PROBLEM	4
1.5. RESEARCH QUESTION AND OBJECTIVES	7
1.6. SIGNIFICANCE OF THE STUDY	7
1.7. DELIMITATIONS AND ASSUMPTIONS OF THE STUDY	9
1.8. STUDY OUTLINE	10

CHAPTER 2. LITERATURE REVIEW11

2.1 INTRODUCTION	11
2.2 CONTEXTUALISING THE USE OF AUTOMATED PARCEL LOCKERS	11
2.2.1 E-COMMERCE AND LAST MILE DELIVERY.....	11
2.2.2 DELIVERY VIA AUTOMATED PARCEL LOCKERS.....	12
2.2.3 AUTOMATED PARCEL LOCKERS GLOBAL COVERAGE.....	13
2.2.4 AUTOMATED PARCEL LOCKERS DISTRIBUTION COVERAGE IN SOUTH AFRICA.....	14
2.2.5 BENEFITS OF PARCEL LOCKERS.....	16
2.3 THEORETICAL FOUNDATION OF THE STUDY	17
2.4 REVIEW OF STUDY VARIABLES	19
2.4.1 PERFORMANCE EXPECTANCY.....	19
2.4.2 EFFORT EXPECTANCY.....	19
2.4.3 SOCIAL INFLUENCE.....	21
2.4.4 FACILITATING CONDITIONS	21
2.4.5 BEHAVIOURAL INTENTION TO USE	22
2.4.6 ACTUAL USE OF AUTOMATED PARCEL LOCKERS.....	23
2.5 CONCEPTUAL FRAMEWORK	23

CHAPTER 3. RESEARCH METHODOLOGY28

3.1 RESEARCH APPROACH	28
3.2 RESEARCH DESIGN	30
3.3 SAMPLING DESIGN.....	32
3.3.1 POPULATION.....	32
3.3.2 SAMPLING FRAME.....	32
3.3.3 SAMPLE SIZE.....	32

3.3.4	SAMPLING METHODS	33
3.4	DATA COLLECTION METHODS	33
3.5	RESEARCH INSTRUMENT	34
3.6	DATA ANALYSIS.....	36
3.7	VALIDITY AND RELIABILITY	37
3.7.1	VALIDITY.....	38
3.7.2	RELIABILITY	39
3.8	ETHICAL CONSIDERATION	40
3.9	ANTICIPATED CONTRIBUTION OF THE STUDY	41

CHAPTER 4. PRESENTATION OF FINDINGS42

4.1	INTRODUCTION	42
4.2	DESCRIPTIVE STATISTICS.....	42
4.2.1	SAMPLE DESCRIPTION	42
4.3	MEASUREMENT INSTRUMENT ASSESSMENT	48
4.3.1	RELIABILITY TESTING	49
4.3.2	VALIDITY TESTING	51
4.3.2.1	CONVERGENT VALIDITY TESTING (CONSTRUCT VALIDITY)	51
4.3.2.2	DISCRIMINANT VALIDITY: CORRELATION MATRIX	52
4.3.3	MODEL FIT ASSESSMENT.....	55
4.3.4	MODEL FIT INDICES.....	56
4.3.4.1	CHI-SQUARE INDEX.....	57
4.3.4.2	BASELINE COMPARISONS	57
4.3.4.3	THE ROOT MEAN SQUARE ERROR OF APPROXIMATION	58
4.3.4.4	GOODNESS OF FIT INDEX.....	58
4.4	STRUCTURAL EQUATION MODELLING.....	59
4.4.1	PATH MODELLING AND HYPOTHESIS TESTING	59
4.5	SUMMARY OF THE HYPOTHESES	63
4.6	SUMMARY OF THE RESULTS AND FINDINGS	64

CHAPTER 5. DISCUSSION OF THE RESULTS AND FINDINGS 65

5.1	INTRODUCTION	65
5.1.1	PERFORMANCE EXPECTANCY AND CONSUMERS' BEHAVIOURAL INTENTION TO USE AUTOMATED PARCEL LOCKERS	66
5.1.2	EFFORT EXPECTANCY AND CONSUMERS' BEHAVIOURAL INTENTION TO USE AUTOMATED PARCEL LOCKERS	66
5.1.3	SOCIAL INFLUENCE AND CONSUMERS' BEHAVIOURAL INTENTION TO USE AUTOMATED PARCEL LOCKERS	68
5.1.4	FACILITATING CONDITIONS AND CONSUMERS' BEHAVIOURAL INTENTION TO USE AUTOMATED PARCEL LOCKERS	68
5.1.5	CONSUMERS' BEHAVIOURAL INTENTION TO USE AUTOMATED PARCEL LOCKERS.....	69
5.2	SUMMARY OF FINDINGS	70
5.3	CONCLUSION	71

CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS	72
REFERENCES	78
APPENDIX A: RESEARCH INSTRUMENT.....	84
APPENDIX B: ETHICS CLEARANCE CERTIFICATE	93
APPENDIX C: CERTIFICATE OF COPY-EDITING	95
APPENDIX D: CRONBACH’S ALPHA COEFFICIENT	96

List of figures

Figure 1.1 Example of automated parcel locker	4
Figure 2.1 Automated parcel lockers in South Africa	15
Figure 2.2 Conceptual framework	23
Figure 4.1 Gender distribution of the sample population.....	43
Figure 4.2 Age distribution of the sample population	43
Figure 4.3 Education level of the sample population.....	44
Figure 4.4 Respondents' use of e-commerce shopping	45
Figure 4.5 Respondents' online shopping frequency	46
Figure 4.6 Respondents who have heard of automated parcel lockers.....	47
Figure 4.7 Respondents who have used automated parcel lockers.....	47
Figure 4.8 Confirmatory factor analysis (measurement model).....	56
Figure 4.9 Structural model	62

List of tables

Table 2.1 Benefits of parcel lockers	16
Table 3.1 Research construct and measurement items	35
Table 3.2 Cronbach's alpha coefficient	40
Table 4.1 Accuracy analysis statistics	49
Table 4.2 Composite reliability value.....	50
Table 4.3 Factor loading estimates	52
Table 4.4 Inter-item correlation matrix.....	53
Table 4.5 Highest shared variance (HSV).....	54
Table 4.6 Average variance extracted (AVE) and highest shared variance (HSV)	55
Table 4.7 Chi-square index	57
Table 4.8 Baseline comparisons	58
Table 4.9 The root mean square error of approximation	58
Table 4.10 Goodness of fit index.....	59
Table 4.11 Hypotheses results and path coefficients	60
Table 5.1 Hypothesis results	71

CHAPTER 1. INTRODUCTION TO THE RESEARCH

1.1. Introduction

The purpose of this study was to investigate consumers' behavioural intention to use automated parcel lockers as the last mile delivery method. Factors influencing the behavioural intention to use automated parcel lockers must be investigated to increase actual use to align it with e-commerce growth. The growth of e-commerce brings new challenges for last mile delivery, and focus must be placed on understanding consumer behavioural intention to use this delivery method. Parcel locker delivery has diversified last mile delivery by reducing delivery costs and improving customer experience (Lai et al., 2022).

Deloitte (2021) shows that with the Covid-19 lockdown, there has been an uptake in online shopping, which challenged any barriers that consumers had regarding online shopping. This growth continues to drive the digital commerce discussion to the top of the executive agenda. It is believed that every company that wants to go into digital commerce is challenged with understanding customer needs.

1.2. Background of the study

Businesses and consumers are using the internet to purchase goods, which has given rise to e-commerce (Bask et al., 2012). According to Kawa (2017), e-commerce is currently one of the most important economic megatrends, contributing to the development of retail and logistics services (Vakulenko et al., 2019).

E-commerce growth brings new challenges and opportunities to logistic services, especially delivery services: increased customer demands and expectations, rising online shopping and frequency of purchasing (Buldeo Rai et al., 2021). Logistics service providers deal with high volumes of delivered and returned goods and the costs associated with last mile delivery (van Duin et al., 2020). They are also under pressure to manage their inventory and offer timely, cost-effective and high-quality delivery (Bopage et al., 2019).

To address these challenges and opportunities while maintaining the competitive edge, innovations have emerged in the logistics service with a strong focus on last mile delivery: drones delivery, crowd-sourcing, electric freight vehicle, reverse logistics and self-collection via automated parcel lockers (Wang et al., 2020). It is mentioned that new logistic innovation can provide market differentiation through services like buy online pick up in store, autonomous delivery solutions, automated parcel lockers, and drone delivery (Lim et al., 2018).

Most e-commerce players and start-ups recognise last mile delivery services as a critical differentiator. Online shoppers' decision-making is based on the availability of different delivery options and the quality of the delivery service. This has forced service providers to work hard to improve delivery times and customer experience (Joerss et al., 2016). Parcel collection has become a part of consumer daily activity as e-commerce has grown (Cai et al., 2021). It is believed that consumers always prefer home delivery, although the chance of being home to receive their orders is low. These delivery failures increase the delivery costs for logistic service providers (Buldeo Rai et al., 2021). A study

conducted by Deloitte (2021) shows that the biggest frustration with deliveries is unreliable delivery time rather than the delivery time itself. Choice of delivery is one of seven factors that matters to South African online shoppers.

Automated parcel lockers create opportunities for an efficient distribution model for small parcels (Orenstein et al., 2019). Introduced as an alternative to home deliveries, they enable service providers to deliver parcels to close destinations like malls, office buildings, petrol stations and post offices (Vakulenko et al., 2018). Automated parcel lockers are self-collection boxes that allow consumers to pick up their packages at their leisure and their preferred location. When the delivery is ready for pickup, the customer receives an email or sms with a password they may use to retrieve it (Cai et al., 2021).

1.3. Definitions of terms

E-commerce: Different definitions of e-commerce have been provided. The Organisation for Economic Co-operation and Development (OECD, 2002, para. 1) definition of an e-commerce transaction has been adopted, which is “the sale or purchase of goods or services conducted over computer networks by methods specifically designed for the purpose of placing of orders. The goods or service are ordered by those methods, but the payment and ultimate delivery of goods or services do not have to be conducted online”.

Last mile delivery is “The activities necessary for physical delivery to the final destination chosen by the receiver” (Olsson et al., 2019, p. 13). It is the final stage of delivering products to customers, focusing on providing things in the shortest time possible and ensuring customer satisfaction (Awwad et al., 2018).

According to Lim et al. (2018), customers appreciate last mile delivery because it provides them with convenience and flexibility.

Automated parcel lockers implies “A parcel collection service that allows customers to have their parcels delivered to service points and pick them up at any time of day using digital pickup codes” (Orenstein et al., 2019, p. 684). A parcel locker is a device that can provide consumers and logistic service providers with a 24/7 automatic and simplified parcel receiving and unloading process (Wang et al., 2018).



Figure 1.1 Example of automated parcel locker

Source: TechCentral (2021)

1.4. Research problem

The last mile delivery consumes the majority of the time and money across the entire logistics operations, and it has emerged as the most important problem influencing the logistic service's efficiency (Jeon et al., 2020). According to

Zhou et al. (2020), self-service parcel delivery has become a fresh approach to handle this issue. Consumers can send out or pick up packages by automated parcel lockers.

Recently, freight volume on global e-commerce marketplaces has increased, with goods ranging from luxury goods to low-end consumer goods. Other than changing in retail landscape, it also changes consumer activities. The last mile delivery industry is experiencing serious logistical challenges due to the rising number of items (Thongkam et al., 2021). Home delivery becomes costly and creates first time failure deliveries which incur cost to carriers as well as opportunity cost for customers such as waiting time, late delivery or self collection at the carrier hub consumer acceptance of this new technology is not as sanguine as the service providers anticipates. For instance, less than 65% of mainland China's express delivery providers use their self-service express services (Chen et al. 2018).

According to Wang et al., 2018 last mile logistics is a consumer-oriented business with a strong behavioural component. A thorough understanding of consumer perceptions and behavioural responses towards the technology is imperative in providing desirable services that fulfil consumer's needs. The author further argues that this aspect of consumer behavioural element has rarely been addressed, which is the major knowledge gap in the extant literature of the e-commerce logistics.

Understanding consumer preferences and behaviour is crucial for e-commerce research because of increasing consumer demands (Kiba-Janiak et al., 2021). Last mile delivery using automated parcel lockers is a response to challenges

faced by consumers when it comes to delivery; therefore, it is important to understand consumer perceptions and behavioural responses, as the full benefits of automated parcel lockers cannot be achieved without understanding consumer needs (Wang et al., 2020). According to Kiba-Janiak et al. (2021), satisfying consumers' expectations regarding last mile delivery is a topic of interest, emphasising the importance of understanding consumers' behaviours by looking at the factors that lead to behavioural intention to use. There is emerging research on parcel locker adoption that focuses on consumer attitude (Wang et al., 2018; Thongkam et al., 2021). Studies conducted on last mile delivery focused on the technological impact and placed more attention on what is in the parcel lockers and how it addresses the failed delivery (Vakulenko et al., 2018; Buldeo Rai et al., 2021). The context of the studies focused on the supplier response to delivery challenges using automated parcel lockers as an innovation that can provide logistic service providers with a market differentiation advantage (Lim et al., 2018). A study was conducted by Iwan et al. (2016) to analyse the parcel locker's efficiency as the last mile delivery solution. Lai et al. (2022) investigated the antecedents of customer satisfaction with parcel locker services in last mile delivery.

Research purpose (aim and objectives) statement

The purpose of this study was to investigate the consumer's behavioural intention to use automated parcel lockers. The research investigated whether performance expectancy, effort expectancy, social influence and facilitating conditions positively affect consumer behavioural intention to use automated parcel lockers and the actual use of parcel lockers.

1.5. Research question and objectives

The primary research question was: What factors influence consumer behavioural intention to use automated parcel lockers as the last mile delivery method in Gauteng?

Research objectives

- To investigate if performance expectancy influences consumer behavioural intention to use automated parcel lockers.
- To investigate if effort expectancy influences the consumer behavioural intention to use automated parcel lockers.
- To investigate if social influence influences consumer behavioural intention to use automated parcel lockers.
- To investigate if facilitating conditions influence consumer behavioural intention to use automated parcel lockers.
- To investigate if behavioural intention to use automated parcel lockers influences the actual use of automated parcel lockers.

1.6. Significance of the study

According to Joerss et al. (2016), there has been a great focus on last mile delivery from media and investors. Most of the research has emerged as a result of last mile delivery challenges faced by retailers. The growth and development of e-commerce and changing consumer behaviour contribute to further understanding last mile delivery (Olsson et al., 2019). Last mile delivery is very important to online shoppers, and the 2018 Global Consumer Insights

Survey by PWC confirmed that online shoppers value fast and flexible deliveries (PWC, 2018). However, little has been explored in the South African context regarding consumers' behavioural intention to use automated parcel lockers and how consumers' behavioural intention to use can lead to the actual use of automated parcel lockers.

It is important to note that the majority of the current study on logistics innovation is constrained to a B2B setting, which is intra- or inter-organizational and where the development of service innovation is mostly a result of commercial considerations. Nevertheless, with the strong proliferation of B2C e-commerce globally, last mile logistics is increasingly offering innovative services that interact directly with end consumers (Wang et al., 2018).

Automated parcel locker networks are growing globally and locally, and they have been well-received by consumers and businesses according to industrial reports (Vakulenko et al., 2018). The sustainability of automated parcel lockers is dependent on consumers' adoption (Wang et al., 2018). According to Bopage et al. (2019), most last mile deliveries fail because there is a lack of expectation understanding from key stakeholders, including customers, e-commerce players, retailers and last mile logistic service providers. Automated parcel lockers are beneficial from both operational and societal perspectives as it represents a fundamental shift in the nature of e-commerce logistics.

This study is significant as it focused on consumer behaviour, which is very important in designing and implementing any solution. The study can inform different stakeholders, including e-commerce retailers and logistics service

providers, on how consumers perceive automated parcel lockers as a last mile delivery service and how the technology can be improved to address consumers' needs. Understanding consumer behaviours can also assist in further innovation development in last mile logistics and e-commerce.

1.7. Delimitations and assumptions of the study

Delimitations

- This research only focused on online shoppers and potential online shoppers in Gauteng.
- The research focused on business to consumers e-commerce rather than business to business.
- The research only focused on delivery of physical goods using automated parcel lockers, not grocery deliver and consumer to consumer delivery.

Assumptions

- It is assumed that automated parcel lockers is a new delivery method that is transforming e-commerce.
- It is assumed that using Gauteng participants will give us the insights required as there are many automated parcel lockers installed.

1.8. Study outline

ORIENTATION	
Chapter 1	Chapter 1 outlines the context of the study, the purpose of the study, research problem, research objectives, research questions and significance of the study.
LITERATURE REVIEW	
Chapter 2	Chapter 2 is the literature review of the study.
RESEARCH METHODOLOGY	
Chapter 3	Chapter 3 covers the study's methodology. It covers the research approach taken, research design, research method, population and sampling, validity and reliability, data collection, ethical considerations and limitations.
RESULTS	
Chapter 4	Chapter 4 presents the results obtained from the data analysis.
Chapter 5	Chapter 5 presents the findings, analysis, discussion and conclusion.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

This chapter introduces the literature review, starting with a description and discussion of e-commerce, last mile delivery and automated parcel lockers. The second part of this chapter examines the theoretical framework underpinning this study. This is followed by the conceptual model, which describes the variables: performance expectancy, effort expectancy, social influence, facilitating conditions, behavioural intention to use and actual use. The theoretical framework and conceptual model informed the development of the study's hypothesis.

2.2 Contextualising the use of automated parcel lockers

2.2.1 E-commerce and last mile delivery

E-commerce is popularly defined as the “activity of buying or selling of products online or over the internet” (Bopage et al., 2019, p. 2339). E-commerce is a priority for logistics service providers (Vakulenko et al., 2018), and its growth has resulted in challenges for e-commerce players and logistics service providers in the last mile delivery process, as well as increases in freight traffic in urban areas. These challenges include delivery time pressure, customer service level expectation, transportation cost and environmental impact (Huong & Thiet, 2020).

These e-commerce last mile delivery challenges have led to new delivery methods in last mile delivery (Kapsner & Abdelrahman, 2020). According to

Bopage et al. (2019), [l]ast-mile delivery performance is an essential component in the interaction between the e-commerce shop and the final customer and can determine if the customers will reorder or buy online as customers have many options to switch to. To this extent, service providers pay attention to last mile delivery performance (Bopage et al., 2019).

Delivery failure detrimentally influences all stakeholders involved in the last mile delivery process, including logistics service providers, e-commerce providers, customers, and society. This incurs costs for logistic service providers and retailers. In other cases, delivery failures are caused by logistics service providers not being able to provide exact times that the delivery will take place and, on the other hand, the mismatch between consumers' lifestyles and working patterns (Buldeo Rai et al., 2021).

2.2.2 Delivery via automated parcel lockers

The delivery process from the parcel shipment from the last distribution centre to the final destination when it is received at the customer's home or collection station is referred to as last mile delivery (Bopage et al., 2019). The important step in the last mile delivery method is when a parcel is delivered at home. Researchers have criticised home deliveries for being inefficient and inflexible because customers are still expected to be at home to receive deliveries (Huong & Thiet, 2020). Smart lockers are more dependable than home delivery services since they lessen the chances of late or failed deliveries because they do not require someone to be present at the time of delivery (Yuen et al., 2018).

Automated parcel lockers are "the service point involved in self-collection service", and it "helps last mile service providers minimize failed deliveries" (Lai

et al., 2022, p. 25). It is a self-service technology because it does not require interaction with service staff and may be used at any time or for as long as the mall is open for receiving and returning packages (Wang et al., 2020). Automated parcel lockers “offer[s] an effective and efficient way to respond to increase in volumes of parcel delivered from the rising of e-commerce” (Thongkam et al., 2021, p. 1).

They are the most popular delivery technique because they allow customers to receive packages at their selected time and location with less effort than other technologies (Cai et al., 2021). A study by Chen et al. (2018) revealed that convenience of location has a direct and favourable impact on consumers’ willingness to employ self-service parcel delivery.

Huong and Thiet (2020) found that in last mile delivery, automated smart lockers are an alternate approach for home delivery. When consumers buy goods, they can be delivered to an automated parcel locker close to them, a facility with a digitalised interface (Wang et al., 2018). Consumers are notified via text message of the collection location and password required to enter the locker (Lai et al., 2022).

2.2.3 Automated parcel lockers global coverage

According to ReportLinker (2022)) the global intelligent parcel locker market size is expected to reach \$1.5 billion by 2028, rising at a market growth of 11.8% CAGR during the forecast period (Doddle, 2021).

While last mile logistics innovations are of diverse characteristics and in different stages of development, automated parcel lockers have been made

available to consumers. Examples include ByBox in UK, Packstation in Germany, InPost in Poland and POPStation in Singapore (Wang et al., 2018).

Parcel lockers are found everywhere in China. Hive Box has 150,000 locker locations, China Post has 100,000, JD.com has 50,000 and Cainiao has 10,000 locker locations. That's a total of 310,000 locker installations. By 2020, the network was up to 170,000 banks of lockers, making it the biggest player in China's parcel locker market, which in total ran to 400,000 lockers (Doddle, 2021).

In central and eastern European countries, Poland had the most automated parcel lockers, at nearly 19.7 thousand in 2021. Czechia ranked second with over 5.9 thousand parcel lockers. Bulgaria had only 117 APMs across the country (Statista, 2022).

2.2.4 Automated parcel lockers distribution coverage in South Africa

Several automated parcel lockers or click-and-collect services have been deployed in South Africa (Figure 2.1). This data was consolidated from the company websites, and it's not representative of all automated parcel lockers in South Africa.

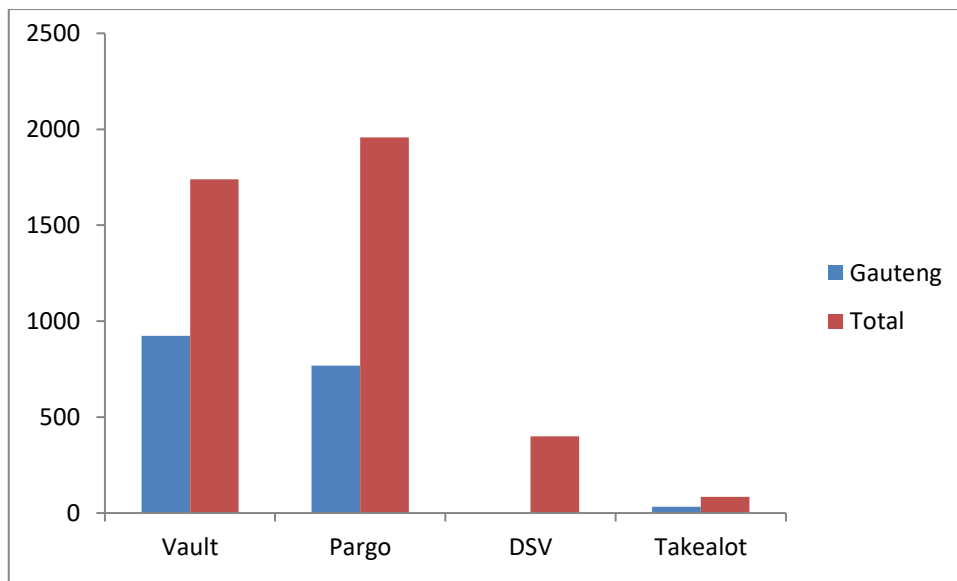


Figure 2.1 Automated parcel lockers in South Africa

Source: Author's construction

Pargo, VaultGroup™ and DSV are some players that offer the service to e-commerce retailers that do not have the logistic infrastructure. Takealot.com has its own collection stations. VaultGroup™ has been designing and creating innovative storage solutions customised to clients' needs. They have successfully launched and installed over 40 000 lockers, and 1 500 are installed across South Africa (VaultGroup, 2022).

Pargo is a logistics company that solves the challenges of last mile distribution. They allow consumers to collect “parcels at pickup points located at convenient retail stores across Southern Africa” (Pargo, 2022, para. 1). Popular e-commerce websites like OneDay and cosmetics e-commerce websites use the Pargo collection points.

DSV offers courier services with smart lockers to deliver a comprehensive delivery service to e-commerce retailers and other direct-to-consumer services.

DSV boasts more than 400 lockers across South Africa, more than 1000 routes travelled every week, 240 towns serviced every day, 1600 deliveries to outlying towns twice a week and 1.8 million parcels delivered every month. Most DSV collection points are located at Engen garages. Makro uses the DSV collection points (DSV, 2022).

Takealot.com, South Africa's leading online store, launched its own collection points; 89 collection services are located nationally, with most of them in Gauteng (Takealot, 2022). Superbalist.com uses Takealot.com collection points.

2.2.5 Benefits of parcel lockers

Several authors have highlighted the benefits that automated parcel lockers provide to stakeholders: consumers, logistic service providers and the environmental perspective, as outlined in Table 2.1 (Wang et al., 2018; Yuen et al., 2018; Huong & Thiet, 2020; van Duin et al., 2020; Lai et al., 2022).

Table 2.1 Benefits of parcel lockers

Consumers	Logistic service providers	Environmental
▪ Reduces shipping costs ▪ Convenience and fast delivery ▪ Convenience and pro-activeness in delivery return ▪ Protects customers	▪ Decreases delivery costs ▪ Provides better routing by consolidating deliveries ▪ Reduces failed deliveries ▪ Reduces drivers' pressure of wrong addresses	▪ Reduces road congestion, noise and air pollution

Research by Joerss et al. (2016) found that, notwithstanding the advantages listed above, consumers still prefer home delivery, especially if the delivery cost is less than \$3 ($\pm$ R50), which confirms that automated parcel lockers are an alternative, but they will not replace home delivery (Huong & Thiet, 2020).

2.3 Theoretical foundation of the study

The study adopted the technology acceptance theory because it examines individual behaviour and, in this case, consumers' ability to accept new technologies using constructs that focus on the psychological and behavioural perspectives of technology users (Momani, 2020). The unified theory of acceptance and use of technology (UTAUT) developed by Venkatesh et al. (2003) was adopted. UTAUT provides a general framework that can be used to explain in detail the consumer's behavioural intention to use technology (Cai et al., 2021). The technology acceptance model (TAM) was formerly used to explain user acceptance of various types of information and technology prior to the UTAUT (Jeon et al., 2020).

After reviewing eight older theories of technology acceptance (Theory of Reasoned Action, Theory of Planned Behaviour (TPB), TAM, the combination form of TAM and TPB, Model of PC Utilisation, Innovation Diffusion Theory, Motivational Model and the Social Cognitive Theory), the UTAUT was developed (Momani, 2020). Most studies that have used UTAUT have expanded the model to incorporate additional constructs, while others have decreased the constructs to fit their research better (Mtebe & Raisamo, 2014). The UTAUT model has good explanatory capabilities (Zhou et al., 2020). When it comes to intention and behaviour, and it surpasses the constraints of the

TAM, since its adoption, it has been used in both the organisational and consumer context (Jeon et al., 2020).

UTAUT has been used in different fields, including mobile learning acceptance, mobile banking acceptance, acceptance of technology and self-service technology in restaurants (Venkatesh et al., 2012; Mtebe & Raisamo, 2014; Jeon et al., 2020). UTAUT has been used in a few studies to determine whether customers intend to employ logistics technology or deliveries (Zhou et al., 2020). After reviewing the model and other related reviews, Momani (2020) concluded that the UTAUT model is broad, powerful and flexible enough to allow for additional extension as needed to analyse the adoption of any new technology. Furthermore, it was designed with less complexity because it has a smaller number of constructs and moderating variables that make it more relevant for studying any new technology acceptance. The UTAUT has been extended to UTAUT2 to include new constructs like hedonic motivation, price and habitat (Venkatesh et al., 2012). According to Zhou et al. (2020), self-service technologies are very new, and most consumers are yet to develop applicable habits. For the context of this study, UTAUT was used.

This study investigated the behavioural intention to use and the actual use of automated parcel lockers. Six constructs from the UTAUT were studied: performance expectancy, effort expectancy, social influence, facilitating conditions, behavioural intention to use and actual use. Performance expectancy, effort expectancy, social influence and facilitating conditions are independent variables, and actual use is the dependent variable. Behavioural intention to use is the mediating variable.

2.4 Review of study variables

2.4.1 Performance expectancy

Performance expectancy is “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” (Venkatesh et al., 2003, p. 447). In the TAM, performance expectancy is related to perceived ease of use. “It is related to usefulness and increases in productivity and efficiency that users perceive when using new technology” (Jeon et al., 2020, p. 537). According to Zhou et al. (2020), performance expectancy is a key determinant of behavioural intention, and other constructs integrated include extrinsic motivation (motivation model), perceived usefulness (TAM), job fit (Model of PC Utilisation), relative advantage (Innovation Diffusion Theory) and outcome expectations (Social Cognitive Theory) (Momani, 2020). According to Ain et al. (2016), performance expectancy is concerned with individuals' belief about the usefulness of technology to execute certain activities.

In this study, to fit the online shoppers and e-commerce context, performance expectancy can be defined as the ease of use to deal with deliveries (Zhou et al., 2020).

2.4.2 Effort expectancy

Effort expectancy is “the extent of convenience perceived for using system” (Ghalandari, 2012, p. 801). Other constructs added in other models are perceived ease of use (TAM) and complexity (Model of PC utilisation). Technology that is easily accessible to consumers can motivate them to use it and increase their chances of accepting and adopting the technology

Venkatesh et al. (2003). Online shoppers do not have time to shop and follow up on their purchases. According to Zhou et al. (2020), using automated parcel lockers saves time and provides convenience. Regarding delivery, convenience is critical as it relates to the effort and time consumers require to complete a task (Tsai & Tiwasing, 2021). Relating to this study, it is the effort of collecting the parcel, the convenience of the location and the time it will take to collect the parcel. Zhou et al. (2020) highlighted that consumers would choose to use parcel lockers if they are convenient to the user's location as they drive home from their offices.

Effort expectancy is less significant for technologies already implemented but highly significant for technologies in a pre-implementation phase that seems appropriate for the parcel lockers delivery context (Schmidt, 2021). According to Venkatesh et al. (2003), effort expectancy considerably impacts technology adoption in the early introduction stages, and as time passes, the influences reduce. This is important to the current study as automated parcel lockers are still in their introduction stage in South Africa.

Because technology acceptance research is still in its early stages, the chances of a causal relationship between effort expectancy and acceptance could be high (Jeon et al., 2020).

In this study, the definition of effort expectancy was adopted from Schmidt (2021): the effort necessary to use automated parcel lockers for last mile delivery.

2.4.3 Social influence

Social influence is “the changing of a person’s behaviour after interaction with other people’s organisation especially their society” (Guzzo et al., 2016, p. 199-200). It is believed that an individual’s opinions can be influenced by other individuals. A good example of social influence is peer pressure to use a technology (Im et al., 2011). A focus group study by Buldeo Rai et al. (2021) highlighted that respondents did not identify as early adopters of automated parcel lockers. Some of them mentioned that they would only accept it if it is successfully used by relatives and friends or the majority of people.

Three characteristics define social influence: “1) conformity which occurs when an individual express an opinion to meet other people ‘s expectation even if they do not believe that the opinion is appropriate, 2) power which is the ability to force someone to behave in a particular way by controlling their outcomes, 3) authority which is power that is believed to be legitimised by those who are subjected to it” (Guzzo et al., 2016, p. 200).

2.4.4 Facilitating conditions

Facilitating conditions can be defined as ‘the expected level of organisational and technical infrastructure that can support the use of technology” (Venkatesh et al., 2003, p. 453). The related constructs used in facilitating conditions include perceived behavioural control (TPB) and compatibility (Innovation Diffusion Theory). Facilitating conditions can further be explained as objective factors that make it easy for consumers to accomplish a task. If consumers have access to technical support for the technology used, this will facilitate the use of technology (Im et al., 2011). Using the self-service delivery context as it

relates to automated parcel lockers, facilitating conditions include guidance and knowledge to open the locker and the step-by-step process of using the locker to collect the delivery (Wang et al., 2018). According to Zhou et al. (2020), good facilitating conditions can reduce the psychological uneasy feeling consumers might experience before using the technology. In banking, consumers will use online banking if they have access to the banking application on their smartphones.

According to research based on the UTAUT principle, enabling conditions directly impact actual technology use (Zhou et al., 2020). Venkatesh et al. (2003) found that whereas enabling conditions had no direct effect on behavioural intention, they did affect actual usage. In the context of automated parcel lockers and South Africa, facilitating conditions will be tested against behavioural intention because enabling conditions are not a prerequisite for automated parcel lockers.

2.4.5 Behavioural intention to use

Behavioural intention refers to “individuals’ intention to use a particular technology for different tasks” (Ain et al., 2016, p. 7). Furthermore, Yuen et al. (2019) define customers’ intention to use smart lockers as the customer’s plan to repeatedly use smart lockers for last mile deliveries. Theoretically, Kapser and Abdelrahman (2020) found that the major component that predicts actual usage is behavioural intention; however, they mention that they could not investigate use behaviour because autonomous ground vehicles were not available as a delivery option. Practically and in the context of automated parcel lockers, actual use can be investigated as the technology is available.

Additionally in the current study's context, the consumer's commitment to engage with automated parcel lockers can be measured through behavioural intention. Ain et al. (2016) reported that behavioural intention could significantly impact actual use. Yuen et al. (2019) used attitudinal variable to measure behavioural intention: intending to spread favourable word of mouth about smart lockers by recommending them to others.

2.4.6 Actual use of automated parcel lockers

To understand the actual use of automated parcel lockers, the mediating role of behavioural intention to use was studied as a factor that can predict the actual use of automated parcel lockers.

2.5 Conceptual framework

This study's conceptual framework is outlined in Figure 2.2.

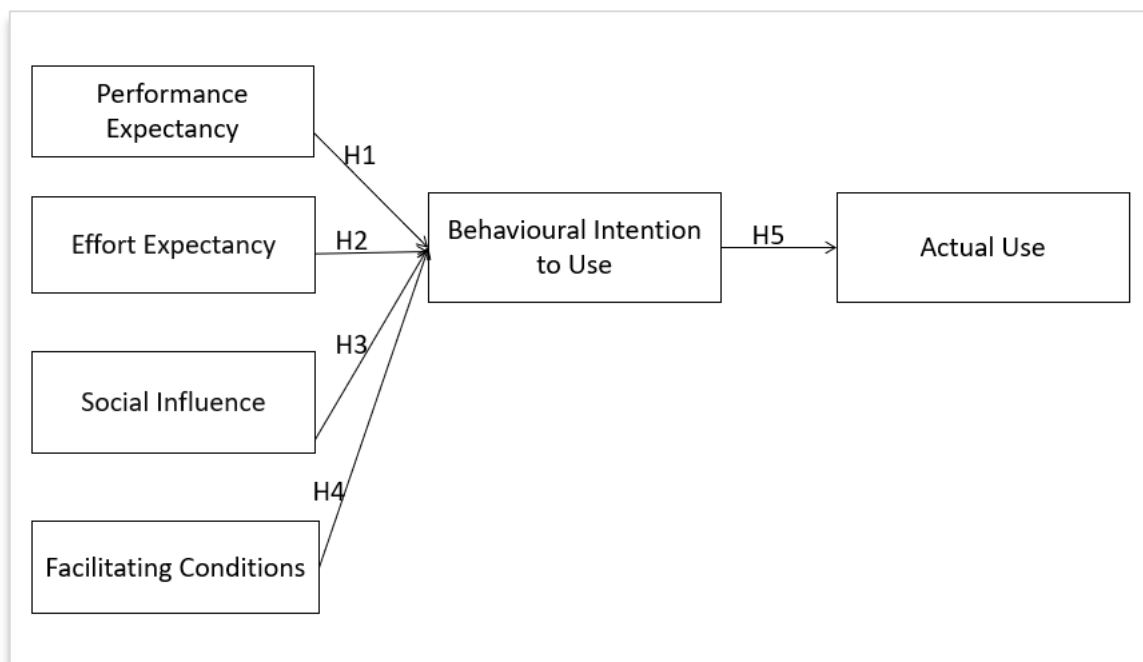


Figure 2.2 Conceptual framework

Source: Adopted from Venkatesh et al. (2003)

2.6 Hypothesis development

The following hypotheses were developed based on the literature and theoretical framework that shaped the conceptual framework. The factors are applied to automated parcel lockers as a last mile delivery method.

H1: Performance expectancy positively impacts consumers' behavioural intention to use automated parcel lockers.

According to research in several domains, performance expectancy has a major impact on the user's intention to adopt and ultimately use. Zhou et al. (2020) conducted a study in the field of logistic services to assess the impact of psychological factors on online consumers' behavioural intention to adopt self-service delivery services. A study by Buldeo Rai et al. (2021) revealed that despite some practical challenges, customers consider smart lockers to be beneficial and simple to use. Ghalandari (2012) investigated the effects of performance expectancy on the acceptance of e-banking services in Iran by considering the role of age and gender. Their findings supported the hypothesis and shows that performance expectancy significantly affects users' behavioural intention.

H2: Effort expectancy positively impacts consumers' behavioural intention to use automated parcel lockers.

A study by Cai et al. (2021) focused on three logistics technologies: buy-online-pickup-in-store, smart lockers and drone delivery, to better understand how consumers use them. The UTAUT was modified to include habitat and attitude elements. Effort expectancy is a factor that influences attitudes towards logistic

technologies. The findings revealed that attitude positively impacts consumer behavioural intention to use logistic technologies. To examine students' behavioural intentions to adopt and utilise mobile learning in East Africa, researchers discovered that effort expectancy benefits students' behavioural intention to use mobile learning (Mtebe & Raisamo, 2014).

H3: Social influence positively impacts consumers' behavioural intention to use automated parcel lockers.

Several studies reported the positive influence of social influence on consumer behavioural intention to adopt technologies. As mentioned earlier, peer pressure is associated with social influence. A study by Zhou et al. (2020) revealed that the willingness of online consumers to use self-service delivery services is greatly increased by the pleasant experiences provided by friends or others. It was discovered that prior experience has a significant role in influencing consumer behaviour. Schmidt (2021) conducted a study to learn more about the factors that impact consumer adoption of drones in Germany. Another study was conducted by Jeon et al. (2020), extending the criteria to include risk and innovativeness to explore the antecedents that influence consumers' intention to use self-service technologies in restaurants. The findings confirmed that social influence significantly influences behavioural intention to use.

H4: Facilitating conditions positively impacts consumers' behavioural intention to use automated parcel lockers.

A study conducted by Ain et al. (2016) looked into UTAUT's perceived value construct in the setting of a learning management system, where the construct

is refined from its initial pricing value conceptualisation. The findings supported the hypothesis that facilitating conditions influences behavioural intention towards learning management systems. The authors explained that this is because the students did not detect the link between effort expectancy to use the learning management system; hence they don't think the facilitating conditions would influence them to adopt the learning management system. Zhou et al. (2020) found that facilitating conditions positively influences online consumers' usage behaviour towards self-service delivery services.

H5: Behavioural intention to use positively impacts the use of automated parcel lockers.

Zhou et al. (2020) found that behavioural intention to use self-service delivery services positively impacts actual use. Another study conducted by Ghalandari (2012) found that users' behavioural intention significantly affects users' behaviour.

To examine key factors that affect the intention to accept and the subsequent use of mobile commerce among Jordanian consumers, Jaradat and Rababaa (2013) found a direct effect between behavioural intention and the eventual use of mobile commerce services in Jordan.

2.7 Conclusion

The accelerated growth in business to consumers and the ever-changing needs of consumers create challenges in the logistic services regarding last mile delivery. Different innovations have emerged to address the challenges; automated parcel lockers are prominent in South Africa. Automated parcel lockers are a cost-effective and efficient approach to addressing last mile delivery difficulties. They have demonstrated good benefits to both consumers and logistic service providers, as well as the environment. This can be seen as a win-win situation. However, there is still a gap in how this new delivery method can replace home delivery. Consumers still prefer home deliveries, although it has high delivery failures. Understanding factors that influence behavioural intention to use automated parcel lockers is important as this can unlock more value in improving the service and assist in further development in last mile delivery methods.

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Research approach

Research approaches are research strategies and processes that outline the data gathering, analysis and interpretation process in detail. The main goal is to determine which method should be employed for the proposed study (Creswell & Creswell, 2018).

Research Strategy

Even though there are many other categories for research methodologies, quantitative and qualitative methods still dominate.

Qualitative method is used to collect the in-depth details on a particular topic. Furthermore, this method presupposes that one individual represents the group's emotions, which the quantitative method ignores and which are as crucial to comprehend (Rahi, 2017). Qualitative research, generally framed with words rather than figures (Creswell & Creswell, 2018).

Quantitative method ignores an individual's emotions and sentiments as well as the context of the surroundings and instead concentrates on gathering new data from a broad population in line with the problem (Rahi, 2017). The quantitative approach utilizes figure/numerical-based methods for collecting data. The sample is considerably larger than that of the qualitative approach and the integrity of the data is dependent on the sample size. Quantitative research, framed with numbers and structured with open-ended and closed-ended questions (Creswell & Creswell, 2018).

Lastly, a mixed-method approach combines qualitative and quantitative methods (Creswell & Creswell, 2018).

This study adopted a quantitative approach, allowing the researcher to measure variables numerically. Additionally, the methodology for investigation and research is scientific, non-biased and can establish facts and test hypotheses that have already been stated.

Research Approach

The two main research approaches are deductive and inductive. According to Schindler (2019), hypothesis testing, the procedure of demonstrating if a hypothesis is true, relies heavily on using inductive and deductive reasoning. Inductive approach aims to develop a theory, it involves searching for patterns from data collected and thereafter developing theories for the observed patterns through a series of hypotheses. Deductive approach aims to test an existing theory, this involves coming up with hypotheses from existing theories in literature (Rahi, 2017). The deductive approach is mainly associated with quantitative research, while the inductive approach is associated with qualitative research (Rahi, 2017).

The research adopted deductive approach because the hypotheses formulated from the literature were tested with the online questionnaire.

3.2 Research design

Research design is defined by Schindler (2019) as a blueprint for collecting data that fulfils objectives and answer questions. A study's research design gives methods specific direction (Creswell & Creswell, 2018).

The research process is a step-by-step procedure with multiple clearly defined stages, including the research questions, study design, data collection and preparation, data analysis and interpretation, report writing, and recommendation making (Schindler (2019). The research design process answers two questions during the planning phase:

- Data collection design: What data need to be collected, how and in what format? A survey was sent out to consumers in Gauteng to collect data to answer the research question.
- Sampling design: From whom or what do the data need to be collected, and from how many? A sample of 172 participants was used, representing the target population. Furthermore all the constructs were measured using instruments that had been used earlier on a five-point Likert scale (Schindler (2019).

According to (Rahi, 2017), there are three basic forms of research objectives: exploratory research, descriptive research and explanatory research.

Exploratory research, which is typically used in the early stages of study and is supported by a qualitative method, seeks fresh insights and determines what is happening. The goal of descriptive research is to learn more about current state phenomena. Explanatory research explains a situation or problem usually in the form of casual relationships. This type of research helps one to get fresh insight

into a situation in order to build, elaborate, extend or test a theory. The prime objective of explanatory research is to identify issues and key variable in a given research problem. This approach is much relevant to quantitative.

A research design is a methodical approach to studying a particular subject, the type of design is determined by the research problem. According to Indu & Vidhukumar (2019), research designs can be qualitative or quantitative. Quantitative designs can be experimental: are experiments on human subjects in which experimental groups are created that are exposed to different treatments or agents and observational, whereby data is analysed at the population level rather than individual level. Observational studies are further classified into descriptive studies and analytical studies. Descriptive studies are primarily useful for the development of hypotheses which can be tested later by the analytical studies. Analytical studies assess the exposure and outcome in the study participants at the same point in time (Indu & Vidhukumar (2019)).

The purpose of the research was to investigate factors that influence the behavioural intention to use automated parcel lockers, studying the relationship between the variables. Descriptive research can help to understand more about this topic. A quantitative research design was used to answer the research question.

3.3 Sampling design

This section introduces the study's sampling design, expanding on the target population, including the description of the target population, sampling frame, sampling size and sampling methods.

3.3.1 Population

- A population is defined by Schindler (2019, p. 36) as “people, events, or records that possess the desired information to answer the research question”. This study's population was online shoppers and potential online shoppers as the study sought to understand the behavioural intention to use automated parcel lockers.

3.3.2 Sampling frame

Sample or population frame “is the list of cases in the target population from which the sample is drawn; it is a complete and correct list of population members only” (Schindler, 2019, p. 90). All individuals that have transacted on an e-commerce platform and potential e-commerce users in Gauteng were used as the targeted sampling frame.

3.3.3 Sample size

The most challenging part of planning a statistical study is determining the sample size. To this extent, sample size has been discussed extensively in the literature (Worthington & Whittaker, 2006). According to Creswell and Creswell (2018, p. 212), “sample size determination indicate the number of people in the sample and the procedures used to calculate this number”. Statistical formulas determine the actual sample size (Schindler, 2019). A trade-off is required

because a larger sample will provide more accuracy, but recruiting participants is expensive and requires a lot of time (Creswell & Creswell, 2018). According to Worthington and Whittaker (2006, p. 818), a “suitable size for structural equation modelling is a ratio of 5:1 for participants to items”. This has been widely cited as a rule of thumb. In the current study, 25 items are analysed with structural equation modelling (SEM) leading to a required sample size of 125. The researcher aimed to get a sample size of 150 because Worthington and Whittaker (2006) suggest that a sample size between 150 and 200 is likely to be adequate for structural equation modelling.

3.3.4 Sampling methods

There are two types of sampling methods: probability and non-probability. According to Schindler (2019) what differentiates the two is the random selection, which means every individual in the population has an equal probability of being selected.

Random or probability sampling, in general, allows the findings to be generalised to the population of interest from the sample population (Schindler, 2019). Non-probability sampling allows the researcher to select samples based on their subjective judgement (Creswell & Creswell, 2018). Non-probability (convenience) sampling methods were used for this study because it allows the researcher to choose participants based on convenience and availability and use their own judgement when sending the instrument.

3.4 Data collection methods

The primary data collection method adopted for this study was an online questionnaire developed in Qualtrics. The researcher distributed the

questionnaire link using various social media platforms, such as Facebook, Twitter, LinkedIn and WhatsApp. The questionnaire was sent to a few participants for pretesting to ensure that participants could respond without any issues. Feedback received was incorporated, and changes were made to the questions before the final questionnaire was sent to the participants.

3.5 Research instrument

The research instrument addressed the sub-research questions as stated in Chapter 1 and the detailed instrument is provided in Appendix A. Part A provided the research background and purpose, respondents' demographic information was collected in Part B and lastly, Part C measured the six theoretical constructs: performance expectancy, effort expectancy, social influence, facilitating conditions, behavioural intention to use and actual use. Most of the measurement elements came from Venkatesh et al., 2003 and other similar studies that measured related constructs. The study adopted a five-point Likert scale to measure each item ranging from strongly disagree to strongly agree.

Table 3.1 Research construct and measurement items

Construct	Measurement items	Source Adopted
Performance expectancy	I find that automated parcel lockers useful in my daily life.	Venkatesh et al., 2003; Cai et al., 2021
	Using automated parcel lockers increases my chances of achieving things important to me.	
	Using automated parcel lockers delivery is better than home delivery.	
	Using automated parcel locker for online delivery is effective for delivery.	
Effort expectancy	Learning how to use automated parcel lockers delivery is easy for me.	Venkatesh et al., 2003; Cai et al., 2021
	I think picking up parcels by automated parcel lockers is simple.	
	I feel that automated parcel lockers allow me to collect my delivery at my convenience.	
	Using automated parcel lockers requires less effort	
Social Influence	People who are important to me think that I should use automated parcel lockers.	Venkatesh et al., 2003; Cai et al., 2021
	People who influence my behavior think that I should use automated parcel lockers.	
	People whose opinions that I value prefer that I use automated parcel lockers.	
Facilitating conditions	I have the resources necessary (mobile device) to receive deliveries by automated parcel lockers.	Venkatesh 2012; Cai et al., 2021; Jeon et al., 2020
	I can get help from others when I have difficulties receiving deliveries by automated parcel lockers.	
	I feel comfortable using automated parcel lockers	
Behavioural Intention to use	I will choose automated parcel locker in the future	Venkatesh et al., 2003; Chen et al., 2018
	If a get a chance, I will use automated parcel lockers for receiving deliveries.	
	I am willing to use automated parcel lockers when shopping online.	
	I plan to use automated parcel lockers when buying online.	
Actual use of automated parcel lockers	I currently use automated parcel lockers for my deliveries.	Venkatesh 2012
	I will recommend automated parcel lockers to my friend and families.	

	Automated parcel lockers is my first choice when my online shopping needs a delivery.	
	I plan to use automated parcel lockers when shopping online	

3.6 Data analysis

SEM was used to analyse the study's hypothesised relationships. The data was statistically analysed using SPSS Statistics and AMOS software.

To assess the reliability and validity of the measures, two-step SEM was applied (Hsiaet al.2016). First, the measurement model was evaluated using confirmatory factory analysis (CFA) and, secondly, the structural model was evaluated using the path model. The structural equation modelling (SEM) approach was used to analyse the data for both the measurement model and structural model. SEM is a multivariate statistical analysis technique used to analyse structural relationships (Tenenhaus, 2008). This technique uses the combination of factor analysis and multiple regression analysis and was used to analyse the structural relationship between measured variables and tested hypotheses. The researcher prefers this estimation technique because estimates of multiple and interrelated dependence can be estimated in a single analysis. To ensure the appropriateness of instrument, the reliability and validity of the measurement model were tested before. AMOS was used to carry out confirmatory factor analysis (CFA) and path modelling. CFA was conducted first to determine reliability and validity of the data. Thereafter, path modelling was conducted to assess model fitness and to test hypotheses.

The steps followed in data analysis, as outlined by Creswell and Creswell (2018), were:

- (i) The number of surveys sent out versus those returned and the number of spoilt questionnaires were noted.
- (ii) Response bias was considered. The degree to which non-respondents would have influenced the outcomes if they had answered is known as response bias.
- (iii) The data were descriptively analysed using means, standard deviations and ranges of scores.
- (iv) For each variable, the scoring range, mean and standard deviation were determined to show the average score and level of variation from the average score using a 95% confidence level (Cooper & Schindler, 2014). This is done to test data reliability.
- (v) The results, represented in tables or figures, were interpreted, and conclusions were drawn based on the study's hypotheses and research questions.
- (vi) A thorough literature review confirmed that the findings were accurate and consistent.

3.7 Validity and reliability

According to Schindler (2019, p. 237), validity and reliability provide characteristics of a good measurement tool because the tool should be accurate, easy and efficient to use. The concepts are closely related and used together; however, they offer different properties of the measuring instrument. Validity is concerned with a measure's precision, while reliability is concerned

with its consistency. According to Sürücü and Maslakçi (2020), a measuring instrument can be accurate without being valid, but if it is valid, it is more likely to be accurate.

3.7.1 Validity

Validity is defined by Schindler (2019) as “the extent to which a chosen scale actually measures what is intended to be measured”. According to Sürücü and Maslakçi (2020), a measuring instrument’s validity can be determined by a meaningful and correct interpretation of the data acquired from it. Furthermore, establishing the validity of the scores help researchers determine whether or not an instrument is suitable for survey research (Creswell & Creswell, 2018). Literature mentions many forms of validity. External validity allows the data to be generalised across persons, settings and times (Schindler, 2019). Internal validity allows the research instrument to measure what it is meant to measure (Schindler, 2019). For this study, internal validity was the acceptable form of validity because the researcher cannot generalise the data because the e-consumers exhibit different behaviours. According to Schindler (2019), internal validity consists of three widely accepted forms: “content validity, predictive or concurrent validity and construct validity. Content validity which measures if the items measure the content they were intended to measure 2) predictive or concurrent validity which measures if the scores predict a criterion measure, do the results correlate with other results and 3) construct validity which measures if the items measure hypothetical constructs or concepts” (Creswell & Creswell, 2018, p. 215).

3.7.2 Reliability

Reliability refers to “the consistency or repeatability of an instrument” (Creswell & Creswell, 2018, p. 215). According to Schindler (2019), the degree to which the measure produces consistent results defines its reliability. The reliability of instrument scores also determines if scores obtained from previous use of the instrument are reliable (Creswell & Creswell, 2018). Schindler (2019) mentions that reliability is an important factor that can ensure validity; however, Sürücü and Maslakçi (2020) argue that reliability alone cannot guarantee validity, making reliability not as valuable as validity.

Test-retest reliability, alternative forms and internal consistency tests are three methods used to determine the reliability of the scales (Sürücü & Maslakçi, 2020). Internal consistency is “the degree to which sets of items on an instrument behave in the same way” (Creswell & Creswell, 2018), and it is the most important reliability method. The Cronbach’s alpha coefficient method was used to measure the internal consistency by determining the extent to which a set of attributes adequately measures a single-dimension construct (Sürücü & Maslakçi, 2020). When a coefficient of 0.75 or more is reached, the instrument is considered reliable, as shown in Table 3.1.

Table 3.2 Cronbach's alpha coefficient

Cronbach's alpha coefficient	Interpretation
$\geq 0,9$	The internal consistency of the scale is high
$0,7 \leq \alpha < 0,9$	The scale has internal consistency
$0,6 \leq \alpha < 0,7$	The internal consistency of the scale is acceptable
$0,5 \leq \alpha < 0,6$	The internal consistency of the scale is weak
$\alpha \leq 0,5$	The scale has no internal consistency

Source: Adopted from (Sürücü & Maslakçı, 2020)

3.8 Ethical consideration

The researcher must ensure that ethical considerations are adhered to (Schindler, 2019). To ensure that the study was conducted ethically, the following process was adhered to:

- (i) Ethical clearance from the University of the Witwatersrand Ethics Committee was obtained (Appendix B).
- (ii) All participants provided consent to participate in the study.
- (iii) No responses were associated with respondents' names, ensuring respect for privacy and anonymity.
- (iv) The research objectives were articulated to ensure transparency was adhered to.
- (v) Every effort was made to ensure that the correct type of participants was selected and that nobody was discriminated.
- (vi) A plagiarism declaration was signed stating that the researcher acknowledges other researchers where necessary.

3.9 Anticipated contribution of the study

Theoretical contribution

From a consumer perspective, the research findings will add to the existing literature on e-commerce and last mile logistics services.

Practical application

- (i) Provide logistics service providers and e-commerce retailers with factors that consumers perceive to be important for them when using automated parcel lockers.
- (ii) Provide insights on how consumer behaviour shapes last mile delivery for e-commerce.

CHAPTER 4. PRESENTATION OF FINDINGS

4.1 Introduction

An overview of the study's findings is provided in this chapter, highlighting descriptive statistics, validity and reliability testing. The chapter concludes with a thorough examination of SEM, path modelling and hypothesis testing.

4.2 Descriptive statistics

The following sections showcase the demographic profile, including the respondent's gender, age, level of education and e-commerce shopping behaviour.

4.2.1 Sample description

Of the 202 research questionnaires sent, data was collected from 172 respondents in Gauteng. The response rate was 85% by the end of the survey period.

Detailed profile of the participants is show below.

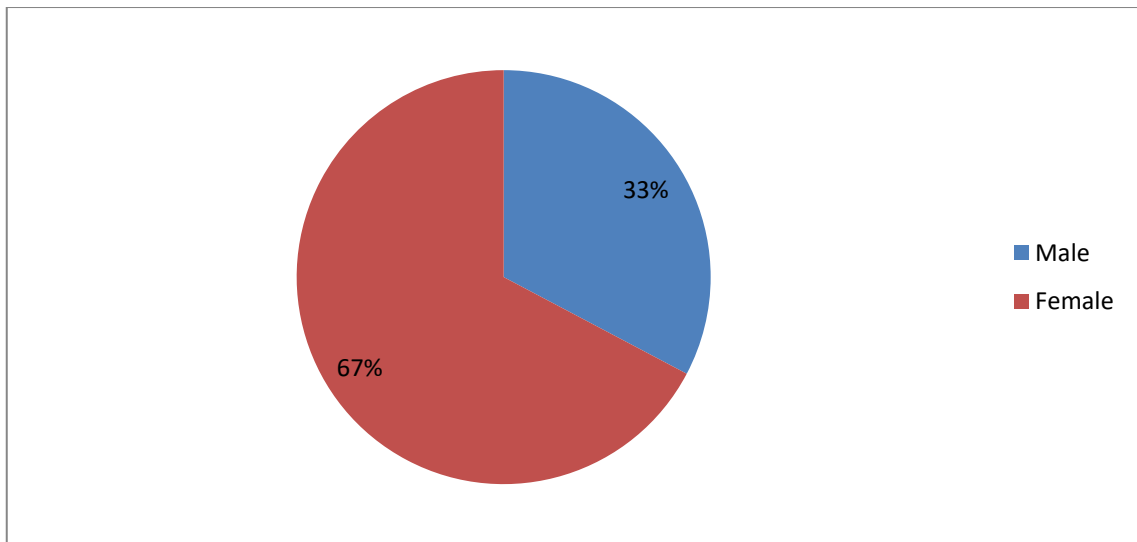


Figure 4.1 Gender distribution of the sample population

Sixty-seven per cent (n = 116) of the respondents are female, and 33% (n = 56) are male (Figure 4.1).

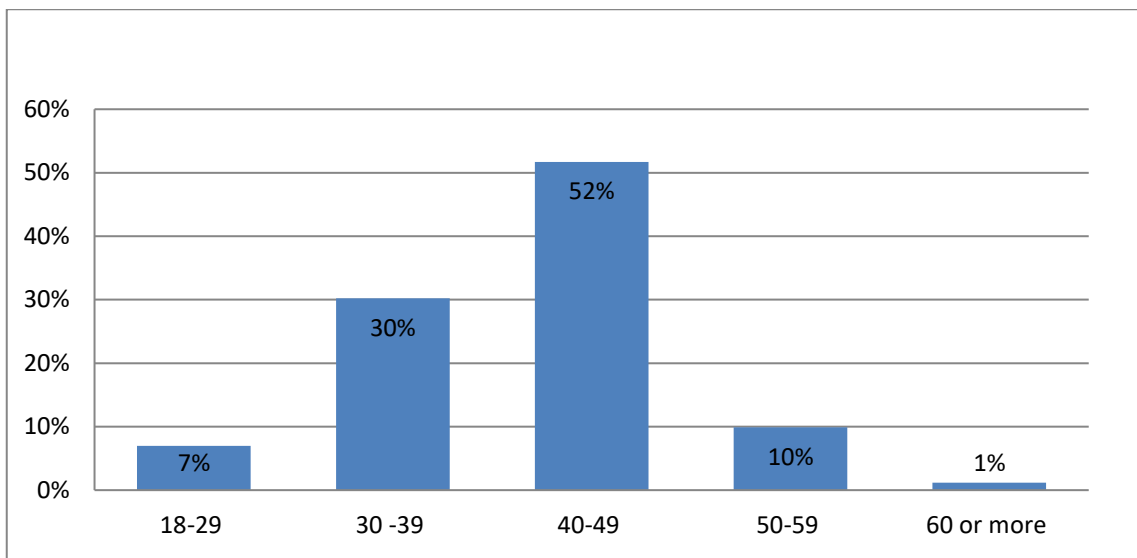


Figure 4.2 Age distribution of the sample population

A little more than 80% (n = 114) of the respondents are 30 to 49 years old. Figure 4.2 shows that 52% (n = 89) of the respondents are 40 to 49 years old, while 30% (n = 52) are 30 to 39 years old, and 10% (n = 17) and 7% (n = 12)

are in the 50 to 59 and 18 to 29 age groups, respectively. Only two respondents (1%) are over 60 years old.

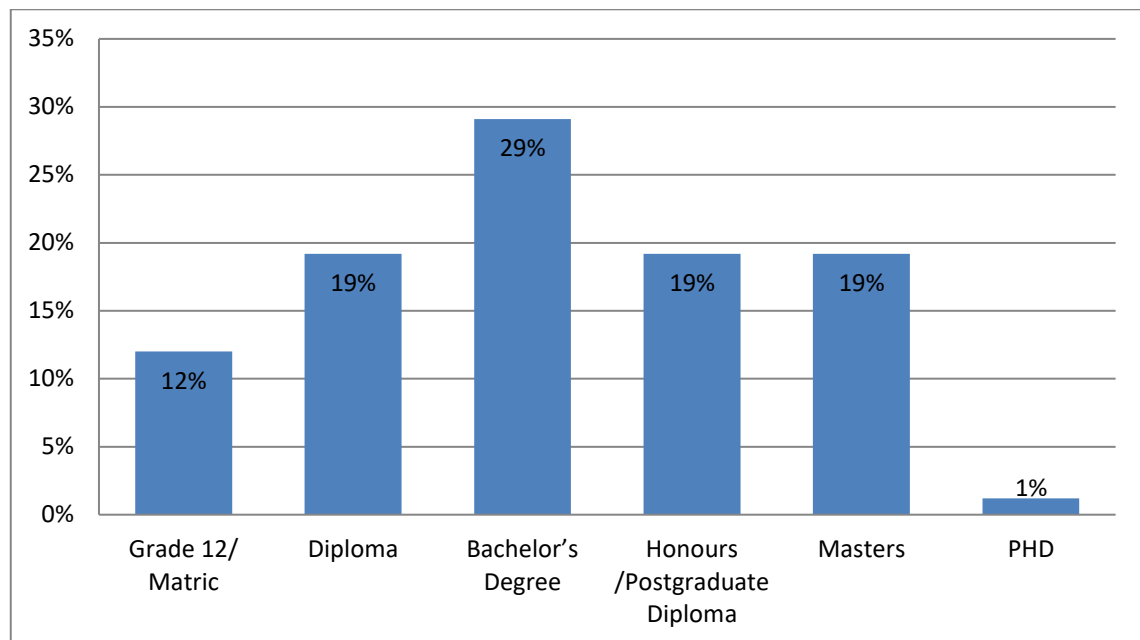


Figure 4.3 Education level of the sample population

The education level shows that 88% (n = 151) of the respondents have a formal qualification, leaving only 12% with matric as their highest qualification. Figure 4.3 shows that 29% (n = 50) of the respondents have a bachelor's degree, while 19% (n = 33) have a diploma, honours/postgraduate diploma or master's degree. Two respondents (1%) have a PhD as their highest qualification.

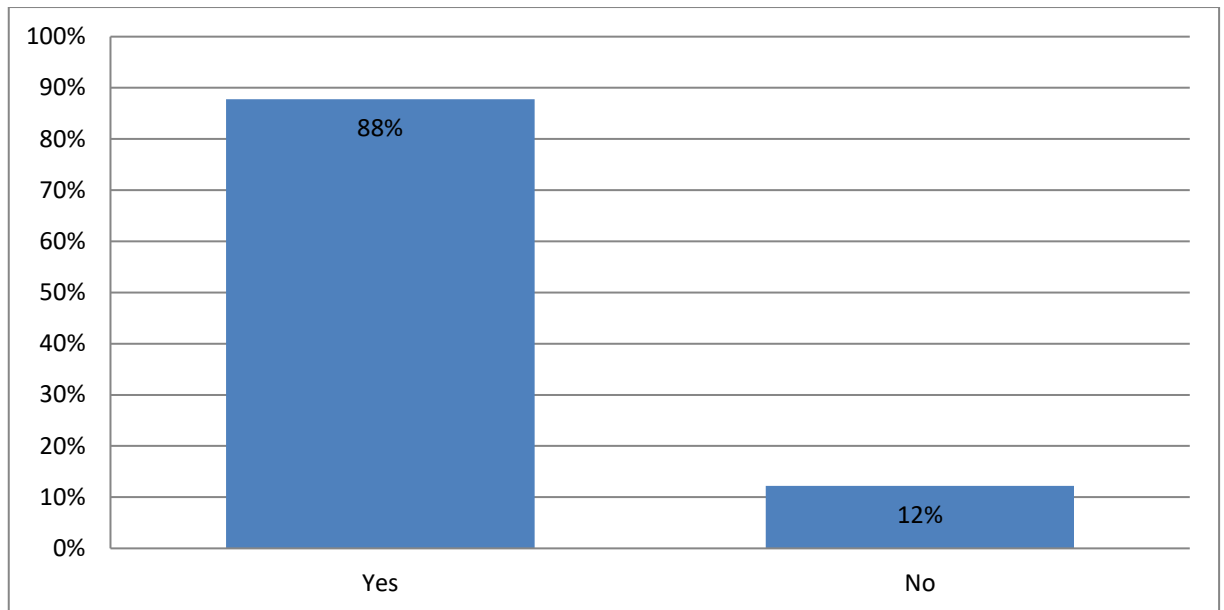


Figure 4.4 Respondents' use of e-commerce shopping

Of 172 respondents, 88% (n = 151) have used e-commerce websites for shopping online, which is considered representative of a good sample for the purpose of this study (Figure 4.4). While the study was looking at e-commerce users, the 12% (n = 21) who have not used e-commerce websites was considered as the study sought to understand the behavioural intention to use automated parcel lockers.

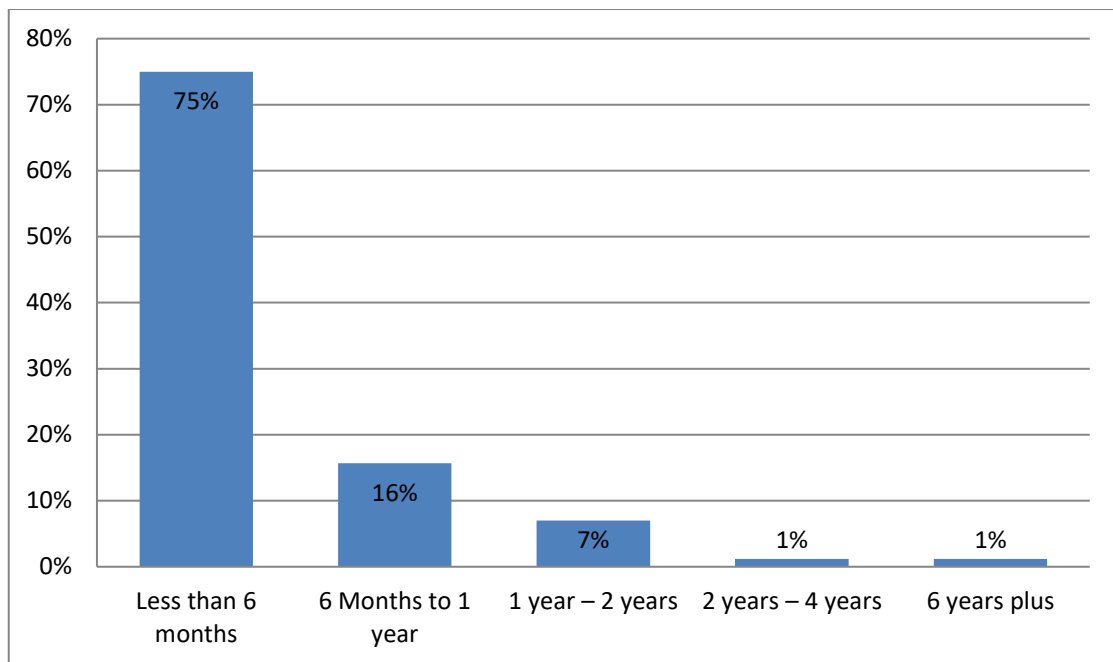


Figure 4.5 Respondents' online shopping frequency

Figure 4.5 shows that 75% (n = 129) of the respondents have shopped online in less than six months and 16% (n = 27) between six months and one year, while 7% (n = 12) have shopped online between one year and two years. Two respondents (1%) each shopped online either between two and four years or more than six years ago.

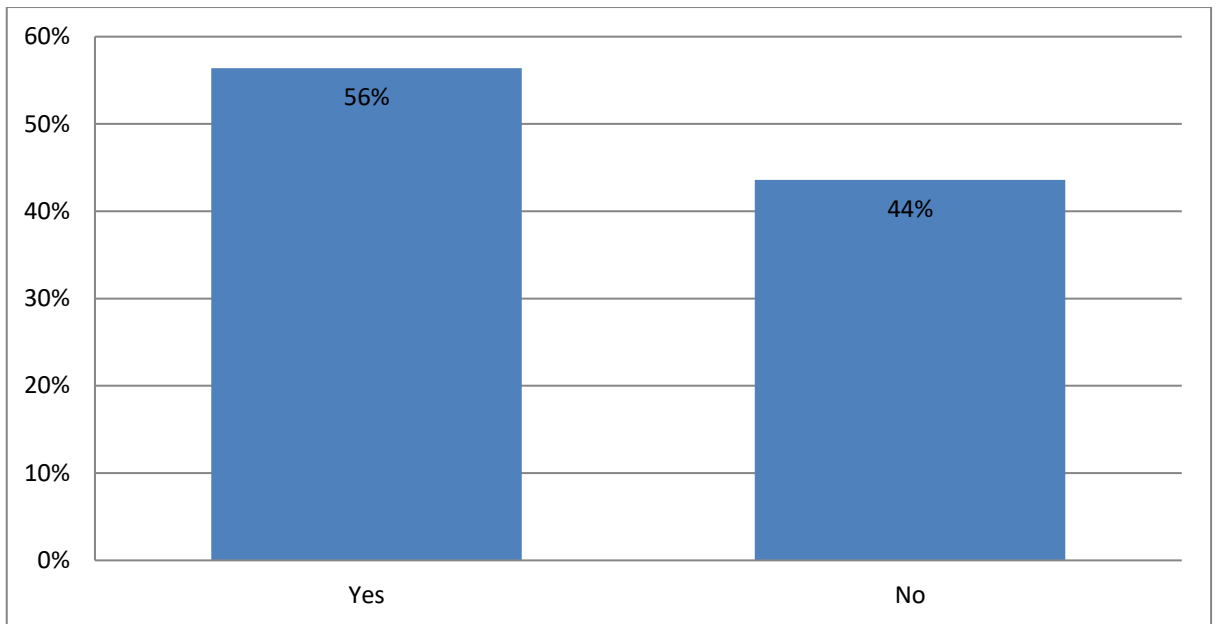


Figure 4.6 Respondents who have heard of automated parcel lockers

Figure 4.6 shows that 56% (n = 97) of the respondents have heard of automated parcel lockers while 44% (n = 75) have not heard of automated parcel lockers.

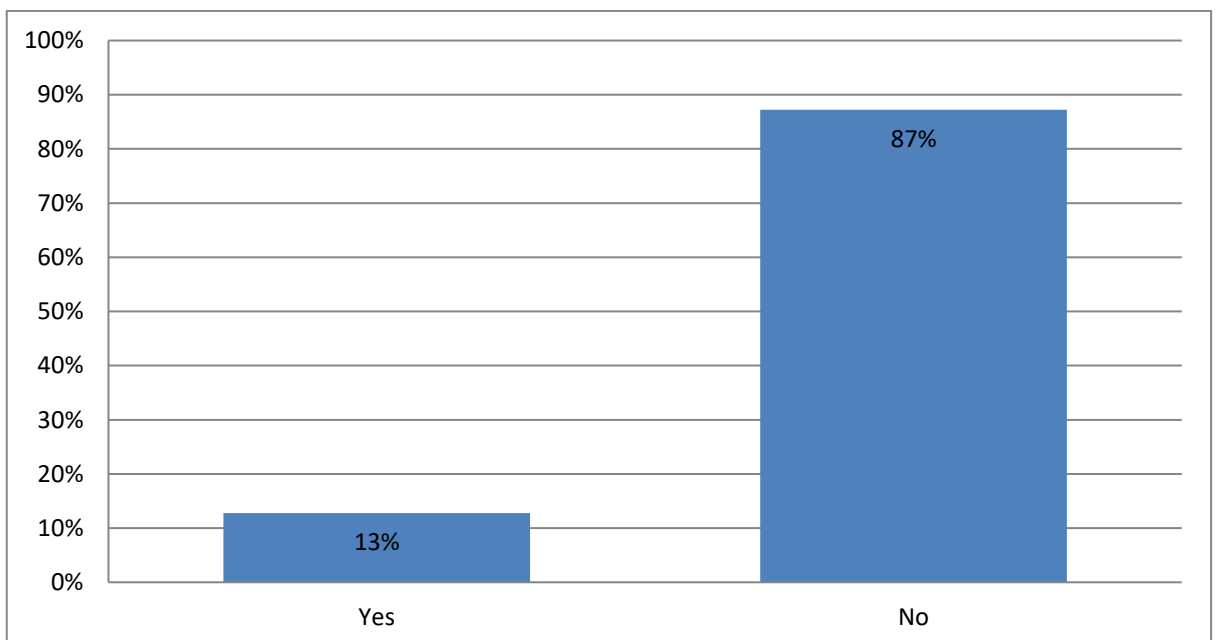


Figure 4.7 Respondents who have used automated parcel lockers

An overwhelming percentage of respondents, 87% (n = 150), have not used automated parcel lockers, while 13% (n = 22) have used them (Figure 4.7).

4.3 Measurement instrument assessment

This section will give a detailed view of the reliability and validity of the measuring instrument. As previously discussed, the research constructs were measured on a five-point Likert scale. Performance expectancy, effort expectancy, facilitating conditions, behavioural intention and actual use were measured with four items, while social influence was measured with three items. According to Hsu and Lin (2015), the measurement model should be evaluated and fixed before assessing the structural model. When evaluating the measurement model, some items could be removed to ensure the satisfactory reliability and validity of the measurement instrument. In this study, item FC1 was dropped because of low factor loading (<0.5 , see section 4.3.3.1).

Table 4.1 Accuracy analysis statistics

Research Construct		Descriptive Statistics				Cronbach 's Test		C.R. Value	AVE Value	Highest Shared Variance	Factor Loading
		Mean Value		Standard Deviation		Item-total	α value				
PE	PE1	2.67	2.74	0.845	0.958	0.594	0.833	0.832	0.555	0.450	0.649
	PE2	2.63		0.878		0.732					0.763
	PE3	3.01		1.137		0.613					0.719
	PE4	2.64		0.972		0.701					0.836
EE	EE1	2.47	2.37	0.775	0.899	0.563	0.818	0.818	0.531	0.458	0.645
	EE2	2.29		0.836		0.721					0.788
	EE3	2.16		0.929		0.647					0.699
	EE4	2.55		1.056		0.622					0.774
SI	SI1	2.87	2.89	1.026	1.086	0.892	0.951	0.952	0.868	0.267	0.926
	SI2	2.89		1.105		0.911					0.947
	SI3	2.91		1.128		0.889					0.922
FC	FC2	2.20	2.39	0.922	0.92	0.535	0.758	0.739	0.491	0.438	0.577
	FC3	2.55		0.993		0.553					0.822
	FC4	2.42		0.845		0.641					0.682
BI	BI1	2.28	2.34	1.012	1.045	0.890	0.930	0.931	0.771	0.486	0.916
	BI2	2.36		0.978		0.803					0.863
	BI3	2.25		1.044		0.823					0.852
	BI4	2.45		1.146		0.825					0.881
AU	AU1	3.78	3.1	1.259	1.189	0.565	0.819	0.803	0.512	0.590	0.543
	AU2	2.47		1.045		0.641					0.85
	AU3	3.47		1.221		0.697					0.637
	AU4	2.69		1.231		0.659					0.791

Key: PE = Performance Expectancy; EE = Effort Expectancy; SI = Social Influence; BI = Behavioural Intention; AU = Actual Use

4.3.1 Reliability testing

According to Ab Hamid et al. (2017), the most common measurements used for internal consistency are Cronbach's alpha coefficient and composite reliability value (CR) to measure the reliability based on the interrelationship of the observed variables.

4.3.1.1 Cronbach's alpha coefficient

Cronbach's alpha coefficient was used to confirm the reliability of each of the variables in the measurement instrument. According to Sürücü and Maslakçi (2020), a reliable Cronbach's alpha value needs to be between 0.7 and 0.9 to have internal consistency. The results show that all the variables returned a satisfactory level of reliability ranging between 0.758 and 0.951; the lowest Cronbach coefficient was 0.758 for facilitating conditions (Table 4.1). The

results of this study indicate good reliability. The results of the Cronbach coefficient alpha values are shown in Appendix D.

4.3.1.2 Composite reliability value

Another measurement of internal consistency is the CR. According to Ab Hamid et al. (2017), for the CR to be accepted, the value needs to be more than 0.7. Tables 4.1 and 4.2 show the CR values, ranging from 0.739 to 0.952, validating that the measurement items are reliable.

Table 4.2 Composite reliability value

				Composite reliability value			
				$(\sum \lambda Y_i)^2$	Summation of error terms		$CR\eta=(\sum \lambda y_i)^2/[(\sum \lambda y_i)^2+(\sum \epsilon_i)]$
Estimate					ϵ_i	$\sum \epsilon_i$	
PE	<---	PE1	0.649	8.803	0.579	1.781	0.832
	<---	PE2	0.763		0.418		
	<---	PE3	0.719		0.483		
	<---	PE4	0.836		0.301		
EE	<---	EE1	0.645	8.445	0.584	1.875	0.818
	<---	EE2	0.788		0.379		
	<---	EE3	0.699		0.511		
	<---	EE4	0.774		0.401		
SI	<---	SI1	0.926	7.812	0.143	0.396	0.952
	<---	SI2	0.947		0.103		
	<---	SI3	0.922		0.150		
FC	<---	FC2	0.577	4.331	0.667	1.526	0.739
	<---	FC3	0.822		0.324		
	<---	FC4	0.682		0.535		
BI	<---	BI1	0.916	12.334	0.161	0.914	0.931
	<---	BI2	0.863		0.255		
	<---	BI3	0.852		0.274		
	<---	BI4	0.881		0.224		
AU	<---	AU1	0.543	7.958	0.705	1.951	0.803
	<---	AU2	0.85		0.278		
	<---	AU3	0.637		0.594		
	<---	AU4	0.791		0.374		

Key: PE = Performance Expectancy; EE = Effort Expectancy; SI = Social Influence; BI = Behavioural Intention; AU = Actual Use

4.3.2 Validity testing

To determine the validity of the measuring instrument, convergent validity and discriminant validity were used. For these two types of validity, different factors were used to evaluate the measuring instrument's validity: factor loading estimates, inter-item correlation matrix, average variance extracted (AVE) and highest shared value (HSV). An outline of the results for these indices is provided in the following sub-sections.

4.3.2.1 Convergent validity testing (construct validity)

Convergent validity is the measurement of the degree of agreement between several indicators of the same construct (Ab Hamid et al., 2017). To establish convergent validity, the factor loading of the indicators, CR and the AVE were considered. The value ranges from 0 to 1. According to Ab Hamid et al. (2017), the value should be more than 0.50 to be suitable for convergent; for this reason, FC1 was discarded due to low factor loading. Table 4.3 shows that all factor loading estimates displayed loadings above 0.5, which is deemed acceptable. The estimates ranged from 0.543 to 0.947.

Table 4.3 Factor loading estimates

Research construct		Estimates
PE1	Performance expectancy	0.649
PE2	Performance expectancy	0.763
PE3	Performance expectancy	0.719
PE4	Performance expectancy	0.836
EE1	Effort expectancy	0.645
EE2	Effort expectancy	0.788
EE3	Effort expectancy	0.699
EE4	Effort expectancy	0.774
SI1	Social influence	0.926
SI2	Social influence	0.947
SI3	Social influence	0.922
FC1*	Facilitating conditions	
FC2	Facilitating conditions	0.577
FC3	Facilitating conditions	0.822
FC4	Facilitating conditions	0.682
BI1	Behavioural intention	0.916
BI2	Behavioural intention	0.863
BI3	Behavioural intention	0.852
BI4	Behavioural intention	0.881
AU1	Actual use	0.543
AU2	Actual use	0.850
AU3	Actual use	0.637
AU4	Actual use	0.791

***FC1 discarded due to low factor loading**

4.3.2.2 Discriminant validity: Correlation matrix

Discriminant validity testing is an increasingly common requirement for examining correlations between latent variables. Discriminant validity is the degree to which the constructs empirically diverge from one another (Ab Hamid et al., 2017). A latent variable with discriminant validity can explain more variation in the observed variables related to it than other constructs in the conceptual framework measurement (Farrell & Rudd, 2009). There is discriminant validity when each measurement item correlates weakly with all other constructs (except for the one to which it is theoretically associated)

(Henseler et al., 2015). Furthermore, for the measurement instrument to achieve discriminant validity, the inter-item correlation values should deviate from one.

Table 4.4 Inter-item correlation matrix

	Performance expectancy	Social influence	Effort expectancy	Facilitating conditions	Behavioural intention	Actual use
Performance expectancy	1					
Social influence	0.677	1				
Effort expectancy	0.517	0.455	1			
Facilitating conditions	0.552	0.662	0.382	1		
Behavioural intention	0.697	0.583	0.597	0.597	1	
Actual use	0.671	0.558	0.622	0.585	0.768	1

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

Table 4.4 shows that the inter-item correlation values deviate from one, demonstrating discriminant validity. The highest distinction can be observed between effort expectancy and facilitating conditions, and social influence and effort expectancy with values of 0.382 and 0.455, respectively.

The correlation between behavioural intention and actual use indicates lower discriminant validity with a value of 0.768 (Table 4.4). All the correlations are significant because all variables are different from one another, with all values indicating a weak linear relationship.

Table 4.5 Highest shared variance (HSV)

	Performance expectancy	Social influence	Effort expectancy	Facilitating conditions	Behavioural intention	Actual use
Performance expectancy	1					
Social influence	0.458	1				
Effort expectancy	0.267	0.207	1			
Facilitating conditions	0.305	0.438	0.146	1		
Behavioural intention	0.486	0.340	0.356	0.356	1	
Actual use	0.450	0.311	0.387	0.342	0.590	1

After the analysis of the inter-correlation values, discriminant validity was obtained by determining whether the AVE was greater than the HSV. Table 4.5 shows the highest shared variance. According to Farrell and Rudd (2009, p. 3), AVE and HSV are comparable to some extent and it “is the average amount of variance in observed variables that a latent construct is able to explain”.

Table 4.6 Average variance extracted (AVE) and highest shared variance (HSV)

Research Construct		AVE Value	Highest Shared Variance
Performance expectancy	PE1	0.555	0.450
	PE2		
	PE3		
	PE4		
Effort expectancy	EE1	0.531	0.458
	EE2		
	EE3		
	EE4		
Social influence	SI1	0.868	0.267
	SI2		
	SI3		
Facilitating conditions	FC2	0.491	0.438
	FC3		
	FC4		
Behavioural intention	BI1	0.771	0.486
	BI2		
	BI3		
	BI4		
Actual use	AU1	0.512	0.590
	AU2		
	AU3		
	AU4		

Discriminant validity is supported if the AVE value for each concept is higher than its shared variance with any other construct (Farrell & Rudd, 2009). Table 4.6 shows that the AVE for all variables was greater than or closer to the HSV, indicating that discriminant validity is supported.

4.3.3 Model fit assessment

Rigorous model fit assessments determine whether the model is appropriately fit to the data. This study incorporated confirmatory factor analysis (CFA). CFA

was primarily used to determine the scale accuracy, including reliability, convergent validity and discriminant validity. Figure 4.8 shows the CFA model.

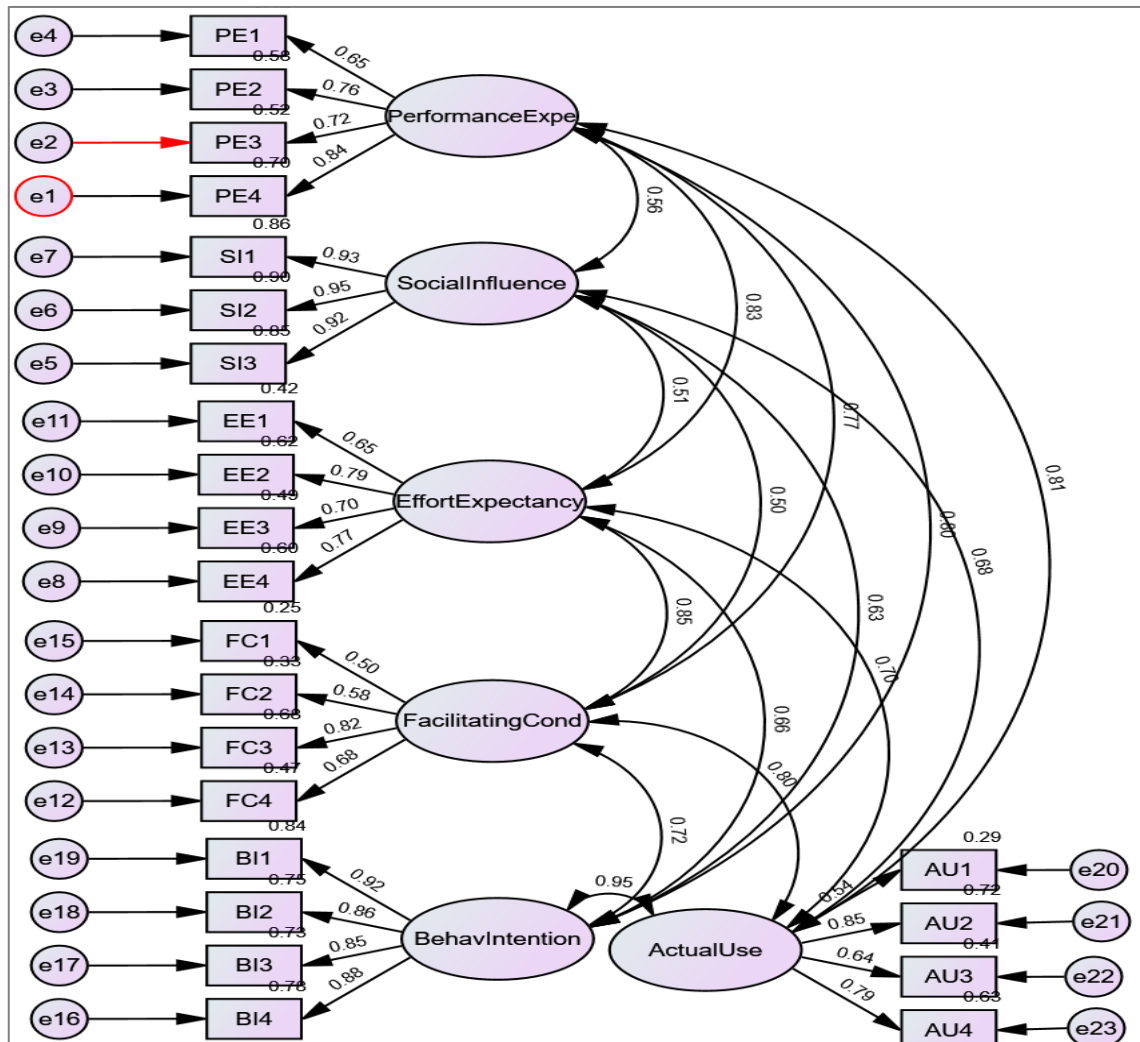


Figure 4.8 Confirmatory factor analysis (measurement model)

4.3.4 Model fit indices

A goodness of fit test is used to statistically evaluate how well a model fits the covariance matrix (Barrett, 2007). According to Stage et al. (2004), model fit indices are important for model analysis.

The following indices were used to test the overall fitness of the measurement instrument: chi-square value (**CMIN**), baseline comparison, root mean square error of approximation (**RMSEA**) and goodness of fit index (**GFI**).

A good model fit is accepted if the **CMIN/degrees of freedom** is less than five, the **RMSEA** approximation is less than 0.08, the **GFI** is greater than 0.90 and the confirmatory fit index (**CFI**) is greater than 0.90 (Stage et al., 2004; Worthington & Whittaker, 2006; Farrell & Rudd, 2009). According to Worthington and Whittaker (2006), it is important for researchers to remember that the stated cut-off criteria are suggestions and not necessarily firm rules.

The following sub-sections will be assessing different model fit indices.

4.3.4.1 Chi-square index

The CMIN of 2.679 indicates a good model fit as it is less than five (Table 4.7).

Table 4.7 Chi-square index

Chi-square value (CMIN)					
Model	Non-parametric	CMIN	*DF	P-value	CMIN/DF
Default model	61	514.306	192	0	2.679
Saturated model	253	0	0		
Independence model	22	3166.029	231	0	13.706

* degrees of freedom

4.3.4.2 Baseline comparisons

Baseline comparisons include the commonly used normed fit index, relative fit index, incremental fit index, Tucker-Lewis index and confirmatory fit index.

The following was found after analysing the baseline comparison indices: the normed fit (0.918), relative fit (0.905) and Tucker-Lewis (0.908) indices indicated an acceptable model fit with values greater than 0.9 (Table 4.8).

Table 4.8 Baseline comparisons

Baseline comparison					
Model	NFI*	RFI*	IFI*	TLI*	CFI*
	Delta1	rho1	Delta2	rho1	
Default model	0.918	0.905	0.920	0.908	0.900
Saturated model	1		1		1
Independence model	0	0	0	0	

*NFI: normed fit index; RFI: relative fit index; IFI: incremental fit index; TLI: Tucker-Lewis index; CFI: confirmatory fit index

4.3.4.3 The root mean square error of approximation

According to Barrett (2007), the model has a close fit when the RMSEA is $\leq .05$. It has acceptable fit and poor fit when the RMSEA is up to .08 and $\geq .10$, respectively. A close fit is considered acceptable (Worthington & Whittaker, 2006). From the results the RMSEA is accepted with the value of 0.059, indicating a good model fit (Table 4.9).

Table 4.9 The root mean square error of approximation

Root mean square error of approximation (RMSEA)				
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.059	0.089	0.109	0
Independence model	0.273	0.264	0.281	0

4.3.4.4 Goodness of fit index

A GFI that is greater than 0.9 is acceptable and is recommended for a good model fit. This was achieved, with a value of 0.906 (Table 4.10).

Table 4.10 Goodness of fit index

Goodness of fit index (GFI)				
Model	RMR*	GFI	AGFI*	PGFI*
Default model	0.068	0.906	0.918	0.596
Saturated model	0	1		
Independence model	0.49	0.173	0.094	0.158

*RMR: root mean square residual; AGFI: adjusted GFI; parsimony GFI

4.4 Structural equation modelling

After evaluating the measurement model with CFA, the structural model was evaluated for data analysis using SEM. SEM is the most recently recognised method for doing CFA (Worthington & Whittaker, 2006). According to Barrett (2007), SEM is a modelling tool (it fits models to data) and not a tool for descriptive analysis. SEM and CFA were performed using SPSS Statistics and AMOS software to evaluate the relationships between the constructs.

4.4.1 Path modelling and hypothesis testing

This section presents the results of the hypotheses and the correlating path coefficients. The main advantage of using path modelling over regression analysis is that the indirect and total effects are analysed instead of only analysing direct effects, which are prevalent when using regression analysis (Stage et al., 2004).

The purpose of this study was to investigate consumers' behavioural intention to use automated parcel lockers. The research investigated whether performance expectancy, effort expectancy, social influence and facilitating conditions positively affect consumers' behavioural intention to use automated parcel lockers and the actual use of parcel lockers.

In Table 4.13, the path coefficients reflect the nature of the strength between variables: the higher the value, the stronger the relationship. The p-values were analysed to detect whether the hypotheses are supported or not.

Table 4.11 Hypotheses results and path coefficients

Hypothesis results						
Path coefficient			Hypothesis	Estimate	P-value	Results
Behavioural intention	<---	Performance expectancy	H1	0.503	***	Significant and supported
Behavioural intention	<---	Effort expectancy	H2	-0.279	***	Not Significant and not supported
Behavioural intention	<---	Social influence	H3	0.292	***	Significant and supported
Behavioural intention	<---	Facilitating conditions	H4	0.764	***	Significant and supported
Actual use	<---	Behavioural intention	H5	1.03	***	Significant and supported
Actual use	<---	Effort expectancy	H6	0.143	0.017	Significant and supported

Significance level: $p < 0.05$, *; $p < 0.01$, **; $p < 0.001$, ***

According to Stage et al. (2004), a path coefficient is a standardised regression coefficient that depicts the path model's direct relationship between an independent and a dependent variable.

The SEM revealed that performance expectation, social influence and facilitating impact on consumers' behavioural intention to use automated parcel lockers. Effort expectancy does not significantly impact behavioural intention but significantly impacts actual use.

The impact of performance expectancy on consumers' behavioural intention to use automated parcel lockers was significant and supported, thus supporting H1. The impact of effort expectancy on consumers' behavioural intention to use automated parcel lockers was not significant and not supported; thus, H2 was not supported. Effort expectancy impacts actual use; thus, a new hypothesis (H6) was developed. The impact of social influence on consumers' behavioural intention to use automated parcel lockers was significant and supported, thus supporting H3. The impact of facilitating conditions on consumers' behavioural intention to use automated parcel lockers was significant and supported, thus supporting H4. Overall, behavioural intention fully mediates the intention to use automated parcel lockers with a path coefficient of 1.03 (Table 4.11).

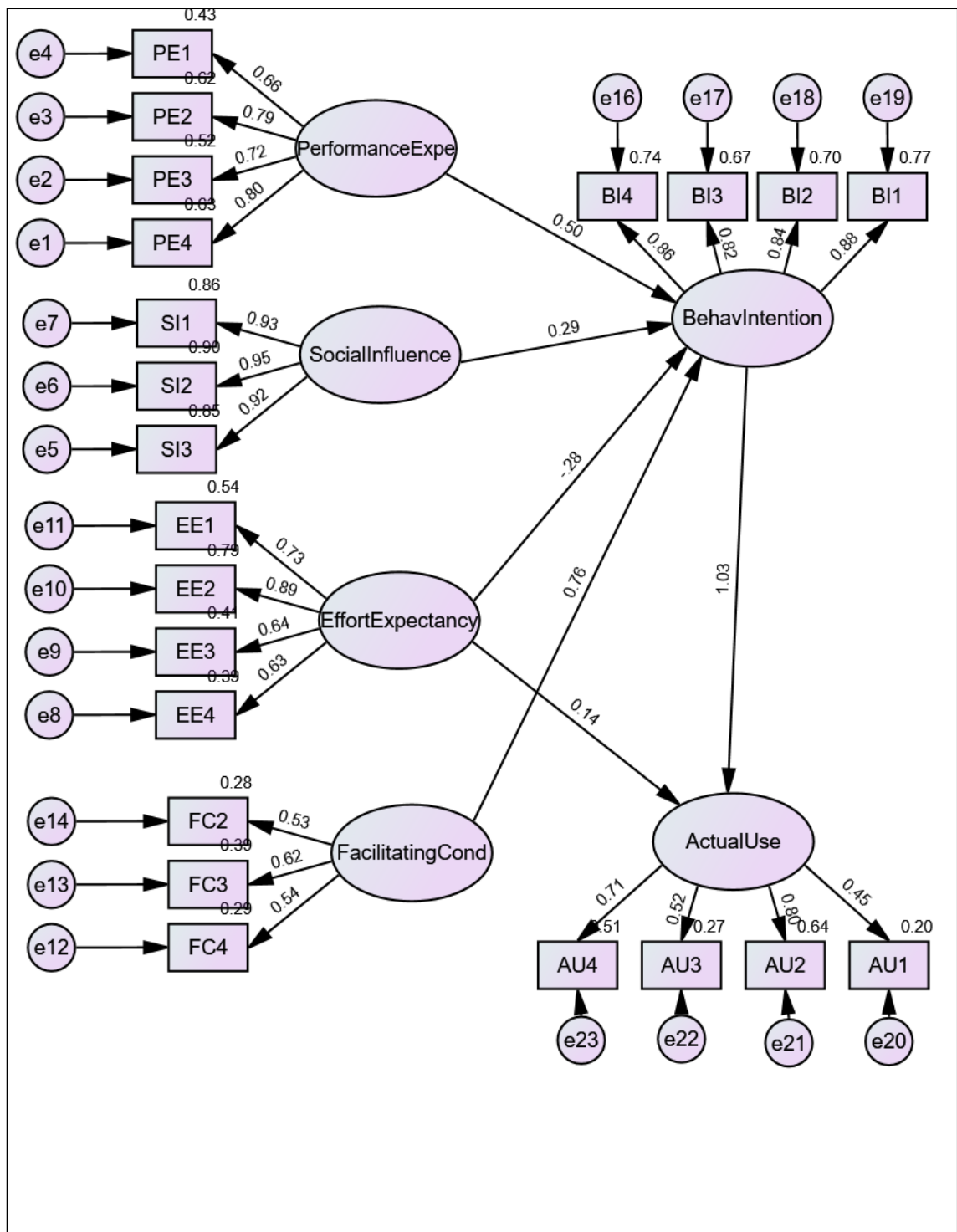


Figure 4.9 Structural model

4.5 Summary of the hypotheses

Hypothesis 1: Performance expectancy positively impacts consumers' behavioural intention to use automated parcel lockers.

The study supported the hypothesis 1. This indicates that performance expectancy positively impacts consumers' behavioural intention to use automated parcel lockers. This suggests that if consumers find automated parcel lockers useful in their daily lives, they are most likely to use them instead of home delivery.

Hypothesis 2: Effort expectancy positively impacts consumers' behavioural intention to use automated parcel lockers.

The study findings are not in support of hypothesis 2. This indicates a negative relationship between effort expectancy and behavioural intention to use automated parcel lockers. This suggests that if consumers find it effortless to use automated parcel lockers, they are most likely to use them as this does not impact their behaviour.

Hypothesis 3: Social influence positively impacts consumers' behavioural intention to use automated parcel lockers.

The study supported hypothesis 3. This indicates a positive relationship between social influence and behavioural intention to use automated parcel lockers. This suggests that consumers are most likely to listen to other's opinions regarding the use of automated parcel lockers.

Hypothesis 4: Facilitating conditions positively impacts consumers' behavioural intention to use automated parcel lockers.

The study supported hypothesis 4. This indicates a positive relationship between facilitating conditions and behavioural intention to use automated parcel lockers. The findings suggest that consumers believe that they have the resources to use automated parcel lockers and that using them will not be complex. Most users have professional qualifications and have shopped online. Hence they have the resources to use automated parcel lockers.

Hypothesis 5: Behavioural intention to use positively impacts the use of automated parcel lockers.

The study supported hypothesis 5. This indicates that behavioural intention fully mediates the intention to use automated parcel lockers. The findings is supported by the other factors impacting behavioural intention.

4.6 Summary of the results and findings

This chapter gave an overview of the data analysis. The results of descriptive statistics, reliability, model fit assessment, structural model assessment, path modelling and hypotheses testing were presented. Four out of five hypotheses were supported, holding true that consumers' behavioural intention fully mediates the relationship between performance expectancy, social influence and facilitating conditions to use automated parcel lockers. The study also revealed that effort expectancy does not significantly impact consumers' behavioural intention to use but positively and significantly impacts actual use.

The next chapter offers a critical discussion of the study's findings against the research objectives stated in the first chapter.

CHAPTER 5. DISCUSSION OF THE RESULTS AND FINDINGS

5.1 Introduction

This chapter discusses the research findings in light of previous research and the respective hypotheses built in Chapters 3 and 4. Each of the five key hypotheses findings is presented and discussed.

The purpose of this study was to investigate consumers' behavioural intention to use automated parcel lockers in Gauteng. The research investigated whether performance expectancy, effort expectancy, social influence and facilitating conditions positively affect consumers' behavioural intention to use automated parcel lockers and the actual use of parcel lockers.

The results of the current study show that the UTAUT is a framework that can be used to understand consumer behaviour in relation to technology acceptance.

The results support previous studies, and the study has new findings. Performance expectancy, social influence and facilitating conditions significantly and positively impact consumers' behavioural intention to use automated parcel lockers. Effort expectancy does not significantly impact behavioural intention but positively impacts actual use of automated parcel lockers.

5.1.1 Performance expectancy and consumers' behavioural intention to use automated parcel lockers

The results show that performance expectancy positively impacts consumers' behavioural intention to use automated parcel lockers. Hypothesis 1 was supported. The path coefficient (0.503) reflected a strong relationship between performance expectancy and behavioural intention to use automated parcel lockers. In most studies and using different models, performance expectancy has always been shown to be the strongest predictor of behavioural intention to use (Venkatesh et al., 2003). In this study's findings, it is not the strongest predictor but shows a strong relationship. The finding implies that consumers believe the ease of use to deal with deliveries is important and that automated parcel lockers can be more effective than home deliveries. Consumers are more likely to use automated parcel lockers if they believe that it will improve their daily lives; in this case, they are not required to wait for the parcel to be delivered to their home, but they can collect it when it is ready for collection. The waiting time provides consumers with opportunity costs, which can help them achieve important things. Similarly, Buldeo Rai et al. (2021) found that despite some practical challenges, consumers consider smart locks beneficial and simple to use. The current study's findings support those by Venkatesh et al. (2003), Ghalandari (2012), Zhou et al. (2020) Buldeo Rai et al. (2021) and Lai et al. (2022).

5.1.2 Effort expectancy and consumers' behavioural intention to use automated parcel lockers

Contrary to the proposed hypothesis, the results indicate that effort expectancy does not positively impact consumers' behavioural intention to use automated

parcel lockers. Hypothesis 2 is not supported and not significant. Venkatesh et al. (2012) found them significant and a strong predictor of behavioural intention to use after performance expectancy. The path coefficient (-0.279) reflected a negative relationship between effort expectancy and behavioural intention to use.

Effort expectancy, similar to TAM's perceived ease of use, is the effort necessary to use automated parcel lockers, as well as the element of convenience. According to Zhou et al. (2020), consumers are more likely to use automated parcel lockers if they believe receiving deliveries via them is highly valuable. This suggests that consumers find it easy to use automated parcel lockers, which does not impact their behaviour but their actual use. This could also be associated with the perceived convenience associated with using automated parcel lockers for most consumers. In most cases, consumers will use automated parcel lockers for the convenience benefit it provides; instead of waiting for delivery, they can choose to go and collect it themselves.

Scholars tend to have different views on the role of effort expectancy and its impact on behavioural intention to use. According to Zhou et al. (2020), most empirical studies using the UTAUT framework found that effort expectancy is a significant but weak variable influencing behavioural intentions. Effort expectancy significantly influences technology adoption initially, but the influence lessens as time passes (Venkatesh et al., 2003). According to Mtebe and Raisamo (2014), effort expectancy is a strong predictor of acceptance and usage. In their study of mobile learning, they found that if students believe using mobile learning will be easy, they will use it.

5.1.3 Social influence and consumers' behavioural intention to use automated parcel lockers

Social influence significantly impacts consumers' behavioural intention to use automated parcel lockers. Hypothesis 3 was supported by a moderate relationship. The path coefficient (0.292) reflected a moderate relationship between effort expectancy and behavioural intention to use.

The finding implies that consumers partially depend on their peer's opinions. Venkatesh et al. (2003) found that social influence has a significantly strong influence on behavioural intention in a mandatory context but exerts a minimal effect in a voluntary context. Using automated parcel lockers can be regarded as a voluntary context because consumers have a choice to use them or not. This is supported by Zhou et al. (2020), who found that the willingness of online consumers to use self-service delivery services is greatly increased by the pleasant experiences provided by friends or others. According to Zhou et al. (2020), prior experience substantially influences consumers' behaviour in most online purchasing fields. However, it is noted that this relationship is positive and significant. When comparing the results with that of Jaradat and Al Rababaa (2013), we find that social influence had a stronger impact on a younger age group. The findings support that of Jaradat and Al Rababaa (2013), Jeon et al. (2020) and Schmidt (2021).

5.1.4 Facilitating conditions and consumers' behavioural intention to use automated parcel lockers

Facilitating conditions positively impacts consumers' behavioural intention to use automated parcel lockers. Hypothesis 4 was supported, and facilitating conditions is the main predictor of behavioural intention to use. The path

coefficient (0.764) reflected a strong positive relationship between facilitating conditions and behavioural intention to use.

In this study and the context of automated parcel lockers, facilitating conditions refer to the belief that consumers have the resources to use the technology and to get help from others if needed. Facilitating conditions include guidance and knowledge to open the locker and the step-by-step process of using the locker to collect a delivery (Wang et al., 2018). Item FC1, “I have the resources necessary (mobile device) to receive delivery by automated parcel lockers”, is of interest. This item was removed during the model fit assessment because of low factor loading (<0.5), which affected model fit. This suggests that this item does not have a positive relationship with behavioural intention to use. It is assumed that consumers view physical resources as a basic need; therefore, it does not impact their behavioural intention. The study’s findings support those of Ain et al. (2016) and Zhou et al. (2020).

5.1.5 Consumers’ behavioural intention to use automated parcel lockers

Behavioural intention fully mediates the relationship between performance expectancy, social influence and facilitating conditions to use automated parcel lockers. Theoretically, Kapser and Abdelrahman (2020) found that behavioural intention is the major component that predicts actual usage. The current study’s findings support this statement as the investigation revealed a robust relationship (path coefficient of 1.03). This indicates that consumers in Gauteng are willing to accept and use automated parcel lockers based on these factors.

Items like “I will choose automated parcel lockers in the future”, “If I get a chance, I will use automated parcel lockers for receiving deliveries”, “I am

willing to use automated parcel lockers when shopping online” and “I plan to use automated parcel lockers when buying online” showed a strong relationship. This suggests that consumers expect using automated parcel lockers to be easy, and given an option, they will use them. The study supported the findings from scholars such as Jaradat and Al Rababaa (2013), Ain et al. (2016) and Yuen et al. (2019).

5.2 Summary of findings

In summary, this study showed that the UTAUT is a good framework that can be used for behavioural studies that focus on technology acceptance. Not all factors significantly impact consumers' behavioural intention to use automated parcel lockers. Four out of five hypotheses are supported (Table 5.1). Hypothesis 1 showed a positive relationship between performance expectancy and behavioural intention. Hypothesis 2 showed a negative relationship between effort expectancy and behavioural intention. Hypothesis 3 showed a significant relationship between social influence and behavioural intention. Hypothesis 4 showed a significant relationship between facilitation conditions and behavioural intention to use. Hypothesis 5 showed a significant relationship between behavioural intention to use and actual usage. Lastly, effort expectancy was found to significantly impact actual usage of automated parcel lockers, thus leading to the development of hypothesis 6.

Table 5.1 Hypothesis results

Hypotheses	Results
H1: Performance expectancy and consumers' behavioural intention to use automated parcel lockers	Supported *
H2: Effort expectancy and consumers' behavioural intention to use automated parcel lockers	Not Supported
H3: Social influence and consumers' behavioural intention to use automated parcel lockers	Supported *
H4: Facilitating conditions and consumers' behavioural intention to use automated parcel lockers	Supported *
H5: Consumers' behavioural intention to use automated parcel lockers	Supported *
H6: Effort expectancy and consumers' behavioural intention to use automated parcel lockers	Supported *

5.3 Conclusion

The primary study findings were discussed in detail in this chapter. The findings were substantiated by existing literature. The overall findings show that behavioural intention fully mediates the relationship between performance expectancy, social influence and facilitating conditions to use automated parcel lockers. While effort expectancy does not positively impact consumers' behavioural intention to use, it does on the actual use of automated parcel lockers. The implications of these findings are presented in the next chapter, particularly for logistic service providers and e-commerce companies.

CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

This study sought to establish the factors influencing consumers' behavioural intention to use automated parcel lockers in Gauteng. This chapter offers the concluding remarks of the study, highlighting the degree to which the research questions have been answered.

6.2 Conclusions and main findings

This study identified the factors that affect consumers' behavioural intention to use automated parcel lockers in Gauteng using the UTAUT framework. The UTAUT included different constructs: performance expectancy, effort expectancy, social influence and behavioural intention to use automated parcel lockers. Four of the five hypotheses were found to be significant. Behavioural intention fully mediates the relationship between performance expectancy, social influence and facilitating conditions to use automated parcel lockers. Of all the factors, facilitating conditions was found to be the main predictor, then performance expectancy and social influence. Effort expectancy is not a significant predictor of behavioural intention to use but is significant regarding actual use; this led to the development of hypothesis 6. The strength of the relationships differs. A strong relationship was found between facilitating conditions and behavioural intention, meaning that if consumers have the resources to use automated parcel lockers, they will use them, and since 82% of the respondents have a formal qualification, using new technology will not be

challenging. The weakest relationship was between social influence and behavioural intention, which could be attributed to most consumers not having used automated parcel lockers, therefore, not being able to share their experiences. From the findings, 56% of respondents have not heard of parcel lockers, highlighting the opportunity for awareness creation and the importance of where these lockers are.

6.3 Managerial implications

The findings of the study have several implications that might be interesting for logistics service providers and e-commerce retailers. It is valuable to understand factors influencing consumers' behavioural intention to use automated parcel lockers. If consumers believe that using automated parcel lockers will benefit them and are willing to use them, this will assist logistic service providers to improve last mile delivery by reducing failed deliveries, which is currently a major concern.

The findings show that 87% of the respondents have not used automated parcel lockers. This means that most consumers are still using home delivery. This is no different to other countries as studies by Huong and Thiet (2020) and Joerss et al. (2016) found that consumers still prefer home deliveries. For e-commerce retailers, it is important to communicate the benefits of automated parcel lockers to their consumers to ensure their use. This can be done by creating awareness of automated parcel lockers for online consumers. A study by Deloitte (2021) shows that choice of delivery is one of the seven factors that matter to South African online consumers. Self-collection delivery services should be promoted

on e-commerce websites. “Post the purchase”, an email campaign can be sent to consumers to remind them to use automated parcel lockers.

Items like “I will choose automated parcel lockers in the future”, “If I get a chance, I will use automated parcel lockers for receiving deliveries”, “I am willing to use automated parcel lockers when shopping online” and “I plan to use automated parcel lockers when buying online” shows that there is an opportunity for consumers to use automated parcel lockers. E-commerce retailers could incentivise consumers by rewarding them. If consumers use automated parcel lockers, they could be rewarded with points allocated to them on their next purchase.

Social media plays a huge role in creating awareness. Social influencers are popularly used to create awareness, which is a tactical approach that has shown significant success. Consumers could be influenced if they see people they can relate to using automated parcels. This can also support the findings as social influence showed a weak relationship to behavioural intention to use.

For logistics service providers, this provides insights into how consumers’ behaviour shapes last mile delivery for e-commerce. Consumers are most likely to use automated parcel lockers if they are simple to use and convenient. It is important for logistic service providers to create simple-to-use automated smart lockers and continuously improve the technology to make it easy for consumers to get help when needed. Using technology and intelligence through data in areas prone to failed deliveries and traffic congestion could assist when partnering with most e-commerce retailers whilst choosing the right locations for

the automated parcel lockers. Although logistics service providers depend on e-commerce retailers to educate consumers, when consumers are aware of the services, this creates opportunities for more competition, increasing the number of automated parcel lockers. The environmental and societal benefits of automated parcel lockers cannot be underestimated, especially in Gauteng, where traffic congestion is an issue. The research findings could also assist logistic service providers in staying ahead of market demands through innovation and ongoing delivery service development based on foresight.

6.4 Limitations

The study attempted to investigate consumers' behavioural intention to use automated parcel lockers in Gauteng. Despite some interesting findings of the study and the contribution to the body of knowledge, several limitations of the study are acknowledged. Firstly, the sample size was 172; larger sample sizes may be more conducive to better understand the interaction mechanisms. Secondly, this was an online survey, the respondents might not have been fully engaged when answering the questionnaire, which may have distorted the results. The researcher used convenience sampling, possibly creating a limitation of sample bias and variability. The present study required respondents to respond using pre-defined answers, implying that the study was not able to capture other factors that influence behavioural intention to use automated parcel lockers but only those set within the parameters of the hypotheses.

6.5 Future research

Based on the study's findings, most consumers are not using automated lockers and have not heard of them. In their study, Zhou et al. (2020) recommended that the theoretical model based on the UTAUT2 should be expanded in the future to add "habitat" or "experience" when consumers are used to automated parcel lockers. Attitude is an important factor in behavioural studies. It is important to understand consumers' attitudes towards logistic technologies as they focus on improving last mile delivery.

Given that the landscape for last mile deliveries is actively evolving, future research could be conducted within the context of self-service technology within which automated parcel lockers fall. This can provide better insights from a consumer point of view as we see self-service technology emerge and being adopted.

While it may appear that consumers are not using automated parcel lockers, it will be important in the future to compare attended and unattended self services. Attended self service is when consumers go into a shop and collect the delivery with the assistance of a person (Wang et al., 2020). A lot of these services are offered using petrol stations, banks and some retail stores for collections.

Given that automated parcel lockers seek to address the challenges of last mile delivery, considering a rural geographic location where the physical address is a challenge, the research might give new insight into behavioural intention.

Another area of research will be to conduct a qualitative study with respondents to gather more insights by using interview methods, providing deeper and meaningful understanding.

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APPENDIX A: RESEARCH INSTRUMENT

Dear Participant,

My name is Dineo Ramokoena, I am a Masters student at the University of the Witwatersrand Business School in Johannesburg. Parts of my studies require me to undertake a research project. My research project is to investigate consumer behavioural intention to adopt and use automated parcel locker for last mile delivery in Gauteng under the supervision of Dr Nakuze Chalomba. The objective of this study is to investigate factors that influence the consumer behavioural intention to use the automated parcel lockers and the actual use of automated parcel lockers as last mile delivery method.

As part of this project, I would like to invite you to participate in answering a questionnaire, which will take approximately 10-15 minutes.

This research project will not put you at risk or compromise your personal information in any manner. Your participation will be anonymous and no personal information will be requested from you. There are no costs involved for you to participate in this study. Your participation is voluntary and you may at any point during the completion of this survey choose to withdraw from it. There will be no penalties. You may only complete the survey once.

Should you have questions about this survey or the study please feel free to contact me on the following details: 2370293@students.wits.ac.za

Yours sincerely

Dineo Ramokoena

082 8028805

Consent

I agree to voluntarily participate in the following research study: Investigating consumer behavioural intention to adopt and use automated parcel locker for last mile delivery in Gauteng.

I understand my right as a participant to choose to withdraw my participation for whatever reason at any point and will not be subjected to any form of discrimination, penalties or any level of prejudice as a result.

I understand that my submission will be treated with confidentiality and will not be used for any other purpose except for the purpose of this study and all data provided will be anonymous.

I consent ☐

Demographic information

This section is about background information. Please tick (X) appropriate answer:

A1: Gender

Male		Female	
------	--	--------	--

A2: Age

18 – 29 years	
30 – 39 years	
40 – 49 years	
50 – 59 years	
60 or more years	

A3: Level of Education

Grade 12/Matric	
Certificate	
Bachelor's Degree	
Honours/Postgraduate Diploma	
Masters	
PhD	

Screening Information

The following information will enable me to find out about you. Kindly please select the option that you feel best represents your answer

Have you used e-commerce website to shop online?

Yes ☐

No ☐

When was your last online purchase?

1. Less than 6 months ☐

2. 6 Months to 1 year ☐

3. 1 year – 2 years ☐

4. 2 years – 4 years ☐

5. 4 years – 6 years ☐

6. 6 years plus ☐

What do you buy online?

1. Media/Books/ ☐

2. Clothes/Shoes ☐

3. Electronics incl. Computer ☐
4. Make up ☐
5. Sport/Leisure ☐
6. Inferior/Furniture ☐
7. Others ☐

Have you heard of automated parcel lockers?

Yes ☐

No ☐

Have you used automated parcel lockers for last mile delivery?

Yes ☐

No ☐

Please select the appropriate answer which applies best to you in relation to the below attributes.

Performance Expectancy

Statement	Strongly Agree	Agree	Not sure	Strongly disagree	Disagree
I find automated parcel lockers useful in my daily life					
Using automated parcel lockers increases my chances of achieving things important to me					
Using automated parcel lockers delivery is better than home delivery					
Using automated parcel locker for online					

purchase is effective for delivery					
------------------------------------	--	--	--	--	--

Effort Expectancy

Statement	Strongly Agree	Agree	Not sure	Strongly disagree	Disagree
Learning how to use automated parcel lockers for delivery is easy for me					
I think picking up parcels by automated parcel lockers is simple					
I feel that automated parcel lockers allow me to collect my delivery at my convenience					
Using automated parcel lockers requires less					

Social Influence

Statement	Strongly Agree	Agree	Not sure	Strongly disagree	Disagree
People who are important to me think that I should use automated parcel lockers					
People who influence my behaviour think that I should use automated parcel lockers					
People whose opinions I value prefer that I use automated parcel lockers					

Facilitating Conditions

Statement	Strongly Agree	Agree	Not sure	Strongly disagree	Disagree
I have the resources necessary (mobile device) to receive delivery by automated parcel lockers					
I can get help from others when I have difficulties receiving deliveries by automated parcel lockers					
I feel comfortable using automated parcel					

lockers					
Using automated parcel lockers is compatible with other technologies I use					

Behavioural Intention to use automated parcel lockers

Statement	Strongly Agree	Agree	Not sure	Strongly disagree	Disagree
I will choose automated parcel lockers in the future					
If a get a chance, I will use automated parcel lockers for receiving deliveries					
I am willing to use automated parcel lockers when shopping online					
I plan to use automated parcel lockers when buying online					

Actual use of automated parcel lockers

Statement	Strongly Agree	Agree	Not sure	Strongly disagree	Disagree
I currently use automated parcel lockers for my deliveries					
I will recommend automated parcel lockers to my friend and family					
Automated parcel lockers is my first choice when my online shopping needs a delivery					
I plan to use automated parcel lockers often when shopping online					

APPENDIX B: ETHICS CLEARANCE CERTIFICATE

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg



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

Ethics Clearance Certificate

Ethics protocol number: WBS/DB2370293/604

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

Project title	Investigating consumer's intention to adopt and use automated parcel lockers for last-mile delivery in Gauteng
Investigator / Researcher	Mrs Dineo Ramokoena
Nature of Project	MM (Digital Business)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed anonymity and confidentiality.
Issue Date of Certificate	2022-11-25
Expiry date	Date of submission of the project / research report
Chairperson	Prof Anthony Stacey ☎ +27 11 717 3587 ☎ +27 82 880 4531 ✉ anthony.stacey@wits.ac.za

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

Date:

APPENDIX C: CERTIFICATE OF COPY-EDITING



CERTIFICATE OF COPY-EDITING

**INVESTIGATING CONSUMER'S INTENTION TO ADOPT AND USE
AUTOMATED PARCEL LOCKERS FOR LAST MILE DELIVERY IN
GAUTENG**

**By
DINEO RAMOKOENA**

Has been copy-edited by
DR S H Taylor

19 January 2023

info@topacademicediting.co.za

APPENDIX D: CRONBACH'S ALPHA COEFFICIENT

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.826	0.833	4

Item Statistics			
	Mean	Std. Deviation	N
PE1	2.67	0.845	172
PE2	2.63	0.878	172
PE3	3.01	1.137	172
PE4	2.64	0.972	172

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PE1	8.28	6.506	0.594	0.500	0.806
PE2	8.31	5.889	0.732	0.601	0.748
PE3	7.94	5.283	0.613	0.446	0.810
PE4	8.31	5.606	0.701	0.511	0.757

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
10.95	9.781	3.127	4

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.812	0.818	4

Item Statistics			
	Mean	Std. Deviation	N
EE1	2.47	0.775	172
EE2	2.29	0.836	172
EE3	2.16	0.929	172
EE4	2.55	1.056	172

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
9.47	8.379	2.895	4

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
EE1	7.00	5.696	0.563	0.461	0.795
EE2	7.17	4.987	0.721	0.579	0.725
EE3	7.30	4.867	0.647	0.441	0.756
EE4	6.92	4.485	0.622	0.447	0.777

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.951	0.951	3

Item Statistics			
	Mean	Std. Deviation	N
SI1	2.87	1.026	172
SI2	2.89	1.105	172
SI3	2.91	1.128	172

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
SI1	5.80	4.674	0.892	0.800	0.933
SI2	5.78	4.290	0.911	0.831	0.916
SI3	5.76	4.268	0.889	0.792	0.934

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
8.67	9.685	3.112	3

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.758	0.761	4

Item Statistics			
	Mean	Std. Deviation	N
FC1	1.75	0.773	172
FC2	2.20	0.922	172
FC3	2.55	0.993	172
FC4	2.42	0.845	172

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
FC1	7.17	4.940	0.509	0.268	0.726
FC2	6.73	4.375	0.535	0.300	0.712
FC3	6.37	4.083	0.553	0.351	0.706
FC4	6.50	4.322	0.641	0.423	0.655

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
8.92	7.287	2.699	4

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.928	0.930	4

Item Statistics			
	Mean	Std. Deviation	N
BI1	2.28	1.012	172
BI2	2.36	0.978	172
BI3	2.25	1.044	172
BI4	2.45	1.146	172

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
BI1	7.06	8.236	0.890	0.805	0.888
BI2	6.99	8.807	0.803	0.705	0.916
BI3	7.10	8.370	0.823	0.685	0.910
BI4	6.90	7.825	0.825	0.701	0.912

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
9.35	14.427	3.798	4

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.817	0.819	4

Item Statistics			
	Mean	Std. Deviation	N
AU1	3.78	1.259	172
AU2	2.47	1.045	172
AU3	3.47	1.221	172
AU4	2.69	1.231	172

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
AU1	8.62	8.845	0.565	0.361	0.805
AU2	9.94	9.452	0.641	0.446	0.772
AU3	8.94	8.277	0.697	0.497	0.740
AU4	9.72	8.436	0.659	0.498	0.759

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
12.41	14.664	3.829	4